

Questions on notice – Singtel

1. REQUEST FOR DOCUMENTS

Email received by Singtel Board members from Singtel CEO on 19 September regarding the 18 September Optus Triple Zero service outage, together with the attachment (email from the Optus CEO to the Singtel CEO).

Answer:

Please refer to Appendix 1.

2. What functions carried out at the networks operations centre in Chennai are being brought back to Australia, and on what deadlines and timeframes?

Answer:

Optus is progressively strengthening its Australian operational capability across network operations.

As part of this work, Optus is working with its operational partners to transition a number of network operations activities currently supported from offshore locations to Australian-based teams. These activities include elements of network monitoring, incident management, operational support, and associated technical functions.

The transition is being undertaken in a staged manner to ensure that service stability and customer experience are not impacted. This includes recruiting and training specialised operational personnel in Australia and ensuring appropriate knowledge transfer and operational readiness before functions are migrated.

Optus expects this transition to occur progressively over approximately 6 to 18 months, aligned with workforce recruitment, training and operational readiness milestones.

3. When were the relevant Australian security agencies first notified about the 2022 Optus cyber attack incident and were there any conversations between Singtel (or its Board members) and those agencies?

Answer:

Singtel did not notify any Australian security agencies regarding the 2022 Optus cyber attack incident, nor were there any conversations between Singtel (or its Board members) and these agencies.

Given that Optus was the subject of the cyber attack, Optus was responsible for responding to the incident, including by notifying Australian security agencies.

Optus Answer:

Optus provided formal notification of the 2022 Optus cyber attack incident to the Australian Cyber Security Centre at 7:58pm on 21 September 2022.

Senate Environment and Communications References Committee Inquiry into the Triple Zero service outage

- 4. Was Optus given any directions by Singtel as to how to comply with security guidelines in relation to the Optus 2022 cyber attack incident?**

Answer:

Singtel did not direct Optus on how to comply with security guidelines in relation to the 2022 Optus cyber attack incident.

It is a Singtel Group policy that all Singtel Group companies must abide by all applicable laws in the jurisdictions where they operate.

- 5. In relation to the 2022 Optus cyber attack incident, who did Singtel take security advice from, given that Singtel's answer (from Questions on Notice submitted on 7 March 2026) referenced Singaporean guidelines rather than Australian guidelines?**

Answer:

As the question was originally posed to Singtel, a Singapore company, and did not specifically refer to the 2022 Optus cyber attack incident, Singtel's response (submitted on 7 March 2026) referenced its adherence to the guidelines from the Cyber Security Agency of Singapore (CSA). Singtel also confirmed that it has not paid any ransom in relation to any ransomware incident.

It is a Singtel Group policy that all Singtel Group companies must abide by all applicable laws in the jurisdictions where they operate.

- 6. Has there been any other ransomware incidents in Optus affecting Australian customers since the 2022 Optus cyber attack incident?**

Answer:

This is a question better directed to Optus.

Optus Answer:

Optus confirms there have not been any ransomware incidents in Optus since the 2022 Optus cyber attack incident.

Senate Environment and Communications References Committee Inquiry into the Triple Zero service outage

7. Provide a breakdown of the A\$9.3 billion over the past five years and A\$33 billion since 2001 invested in Optus.

Below tables show the composition of the cumulative capital and spectrum related investment since Singtel acquired Optus in 2001 (A\$33bn) and for the last 5 years (A\$9.3bn). Spectrum acquisition can be considered to be investment in the mobile network, so cumulatively 55% of Optus' capex has been invested in the mobile network, and 65% in the last 5 years.

A\$bn	2001 - 2025	2021 - 2025
Mobile	14.4	4.2
Consumer & Small Business	5.8	1.0
Wholesale and Enterprise	2.5	0.3
Core Network & Other	6.4	2.0
Total CAPEX	29.0	7.5
Spectrum	3.8	1.9
Total	32.8	9.3

8. Has Singtel or Optus has been in contact with the Australian Government or related agencies (including the ACMA) regarding a reduction of licence fees and spectrum costs?

Answer:

Singtel has not contacted the Australian Government or related agencies regarding any reduction of license fees and spectrum costs.

Questions about Optus' engagement with the Australian Government should be directed to Optus.

Optus Answer:

Optus has been an ongoing participant in the ACMA's consultation process on Expiring Spectrum Licences (ESLs) since it began in 2023. As part of this process, Optus made submissions at every stage, commissioned expert reports and held meetings with members of the spectrum branch of the ACMA.

As the consultation aims to determine the renewal process and renewal pricing, Optus has engaged on the topic of licence fees and spectrum costs. In particular, the Optus submission to Stage 4 of the industry consultation process focussed on the methodological choices the ACMA (and their consultant) have made in determining a 'reasonable' spectrum price.

**Senate Environment and Communications References Committee
Inquiry into the Triple Zero service outage**

9. Has there been any formal meetings between Optus officials and Australian Government ministers or the ACMA Chair specifically in relation to the spectrum fee, as distinct from broader industry discussions?

Answer:

As above, questions about Optus' engagement with the Australian Government should be directed to Optus.

Optus Answer:

Optus has not met with any Australian Government ministers or the ACMA Chair to specifically discuss spectrum pricing.

10. REQUEST FOR DOCUMENTS

Copies of any submissions or correspondence in relation to the proposed spectrum with ACMA, the Department, and the Minister's office.

Answer:

These documents should be obtained from Optus.

Optus Answer:

Please refer to Appendix 2.

Appendix 1

From: Kuan Moon Yuen [REDACTED]
Sent: Friday, 19 September 2025 12:53 pm
To: LEE Theng Kiat [REDACTED]; Gail Kelly [REDACTED]; John Arthur [REDACTED];
[REDACTED]; Yong Ying-I [REDACTED];
[REDACTED]; Lim Swee Say [REDACTED];
'Tan Tze Gay' [REDACTED]; Wee Siew Kim [REDACTED]; 'Rajeev Suri'
[REDACTED]; Dinesh KHANNA [REDACTED]; Gautam Banerjee
[REDACTED]
Cc: [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
Subject: Fw: Confidential: IMPORTANT | 000 outage in SA, WA and NT

Dear Board,

I wanted to provide an update regarding the Optus network incident that affected emergency calls on September 18th.

Stephen is in contact with the relevant authorities and stakeholders. An ad hoc Optus Board meeting will be convened shortly to oversee this incident.

Please see the update from Stephen below.

Thanks, Moon.

Dear Directors,

I want to update you on a network issue we experienced during a software upgrade which caused an outage for certain 000 calls in South Australia, Western Australia and Northern Territory.

Background

At 00:40 AEST on 18 September (ie early hours Thursday morning) a network upgrade to a security firewall was commenced. The normal procedure did not appear to have been undertaken with the resultant unintended consequence of impacting traffic flow for certain 000 calls (other calls were not impacted). Optus was notified of some 000 calls failing to connect by an EB customer at 1:25pm AEST Thursday. Changes made to the network were rolled back, restoring traffic flows by 3pm, and we started investigation into the outage. In total, it appears that 624 calls to 000 were impacted, of which a percentage, dependant on device used to make the call, would have successfully connected through Telstra, TPG or another Optus gateway (successfully rerouted to elsewhere on the Optus network). The exact percentage we are currently determining.

The initial indications were that 100 calls failed to connect to 000. Accordingly, at 8.14pm we commenced welfare checks and 40 of these were completed successfully. The remaining 60 calls were referred to the police for follow up. We are aware that 4 of the 40 customer we followed up were impacted including 2 potential fatalities.

By 11.30pm the Networks team completed a deep dive into the data using a secondary method and a total of 624 failed 000 calls were noted. The 100 calls identified earlier formed part of this cohort of 624 calls. The remaining 524 welfare checks are currently being completed, with one additional fatality being reported to us at this stage.

We are finalising the facts and are in the process of informing stakeholders such as the ACMA, Ministers' office, comms department, Premiers of SA, WA, emergency services ministers in SA, WA, NT, the TIO, ACCAN (consumer group) etc.

I plan to make a live media statement at 3.30. I will send the statement to you all once finalised. I will not be taking questions.

I will organise a Board call later today, where we can dive in to detail and provide you with our stakeholder plan.

Kind regards

Stephen

OPTUS

Follow us



Optus acknowledges the Traditional Owners and Custodians of the lands on which we live, work, and serve. We celebrate the oldest living culture and its unbroken history of storytelling and communication. We pay our respect to Elders – past, present, and future – and we strive together to embrace an optimistic outlook for our future in harmony, across all of Australia and for all of its people.

From: [REDACTED]
Sent: Fri 19/09/2025 2:32:59 PM (UTC+10:00)
To: Moon – Group Chief Executive Officer [REDACTED]; Kuan Moon Yuen (SINGTEL [REDACTED]; John Arthur (Chairman [REDACTED]; Michaela Browning [REDACTED]; Michaela Browning (Director) [REDACTED]; Andrew Parker (Director) [REDACTED]; Nicky Tan (Director) [REDACTED]; Michael Venter [REDACTED]
Cc: Stephen Rue [REDACTED]
Subject: Confidential: IMPORTANT | 000 outage in SA, WA and NT

Dear Directors,

Please see the note below from Stephen regarding an urgent matter.

Kind regards

[REDACTED]

Dear Directors,

I want to update you on a network issue we experienced during a software upgrade which caused an outage for certain 000 calls in South Australia, Western Australia and Northern Territory.

Background

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Kind regards
Stephen

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Appendix 2

The logo for Optus, featuring the word "OPTUS" in a bold, teal, sans-serif font. The letters are closely spaced and have a slight shadow effect.

Submission in response to
ACMA Consultation Paper

**Approach to expiring
spectrum licences**

Public Version

August 2023

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Section 1. EXECUTIVE SUMMARY

- 1.1 Optus welcomes the opportunity to provide feedback to the Australian Communication and Media Authority's (ACMA) consultation paper on its *Approach to expiring spectrum licences* (the Consultation Paper).
- 1.2 The mobile telecommunications industry is the backbone of Australia's digital economy and 30 years of mobile competition has enabled the delivery of new and innovative services to millions of Australians, driving productivity improvements across the economy. Mobiles services are essential services, and mobile infrastructure is critical national infrastructure. While the Government¹ and the ACMA² recognises telecommunications as an essential service, no reference is made to the essential nature of mobile services in the context of the expiring spectrum licences; and there remains no presumption of renewal for expiring licences. This risks future investment in this critical infrastructure and the long term supply of essential services. It is a risk that must be addressed as a priority.
- 1.3 The use of mobile services has resulted in significant economic growth in Australia. Studies have estimated that the economic impact of 4G mobile services was \$22.9 billion to value added, including \$14.7 billion of indirect activity in 2019.³ This impact has grown over time as newer and better generations were deployed. Economic modelling undertaken by Deloitte for the Australian Mobile Telecommunications Association (AMTA) estimates that 5G will increase Australia's GDP by \$67 billion in 2022 dollars over the eight years to 2030.⁴ Optus estimates that the competitive deployment of 5G services will drive a further 1.2% of economic growth in 2030, equivalent to \$36.7 billion to gross value add (GVA) each year.⁵
- 1.4 Mobile telecommunication networks are nationally critical infrastructure and provide an essential service to all Australians. As recognised by the ACMA Chair, it is not "up for debate any more than telco services are essential services for all",⁶ and that "it is essential that all Australians, regardless of their individual circumstances, are able to access and use telecommunications services".⁷ The Minister has also stated that telecommunications are "a necessity to support ... access to critical services".⁸
- 1.5 Yet the mobile market is facing material financial pressure. Industry returns on capital are far below the cost of capital, putting into question the ability to invest in advanced mobile networks. As a result, there is a growing digital investment gap between what is needed to deliver Australia's digital ambitions and what mobile operators can afford to invest. If left unaddressed, this investment gap threatens Australia's digital future and the long term supply of essential services.

¹ <https://minister.infrastructure.gov.au/rowland/media-release/albanese-government-improve-safeguards-telco-consumers-experiencing-financial-hardship>

² <https://www.acma.gov.au/publications/2022-09/speech/speech-nerida-oloughlin-acma-chair-accanect-2022-better-basics>

³ <https://amta.org.au/wp-content/uploads/2019/05/mobile-nation-2019-the-5g-future.pdf>

⁴ https://amta.org.au/wp-content/uploads/2022/03/5G-Unleashed-Final-Report_combined-21-March-2022.pdf, p.14

⁵ Optus 5G Impact Report and PwC's *Productivity Insights 2020: Recent productivity trends* – using PwC's geospatial economic model (GEM) we estimate that the cumulative additional GVA across a decade would be \$130 billion, equivalent to 205,000 net new jobs created across a ten-year period.

⁶ Speech by Nerida O'Loughlin PSM, ACMA Chair, CommsDay Summit 2023, <https://www.acma.gov.au/publications/2023-05/speech/speech-nerida-oloughlin-psm-acma-chair-commsday-summit-2023>

⁷ ACMA, *What consumers want – Consumer expectations for telecommunications safeguards*, A position paper for the telecommunications sector, July 2023, p.2

⁸ See: <https://minister.infrastructure.gov.au/rowland/media-release/albanese-government-improve-safeguards-telco-consumers-experiencing-financial-hardship>

- 1.6 The annual cost⁹ of spectrum to industry has grown from \$241 million in 2015 to \$818 million in 2024. Few if any industry sectors pay such sizeable upfront licence fees, with no linkage to future revenue or profits generated from use of those licences. In the broader context of the sector's financial health, high spectrum costs are unsustainable.
- 1.7 This is the context in which this Consultation Paper lies. The ACMA is potentially contemplating a significant readjustment to the arrangements for the use of spectrum that is subject to expiring spectrum licences (ESLs). The proposed ESL process presents significant risks to operators that have relied on the high degree of certainty and exclusivity of spectrum access that has underpinned billions of dollars in mobile network investments and many billions more in economic and social benefits. No other provider of essential services faces such a risk.
- 1.8 Despite mobile services being an essential service, underpinning Australia's digital economy, there is no presumption of renewal in the Consultation Paper. No other nationally critical infrastructure industry faces such a risk to the continual supply of essential services. Jeopardising long term investment in critical infrastructure that delivers essential services across Australia conflicts with Government policies on digital inclusion, regional connectivity and Closing the Gap.¹⁰ The potential long-term consequences of decisions over future arrangements for this spectrum must be carefully considered in developing the ACMA's preferred approach. The effective management of risks must be a key priority for the ACMA.
- 1.9 The starting position of the ESL process must be a presumption that it is in the public interest to renew all ESLs to existing licensees. It is clear that the continued use of spectrum allocated to mobile services to provide essential services results in the greatest public benefits – as required under the Act. Mobile services are nationally critical essential services, contributing upwards of \$37 billion to society each year at 2030.
- 1.10 The ACMA has material discretion in this ESL process. To ensure an efficient process going forward, Optus submits that:
- (a) There should be a presumption of renewal at administrative costs given that ESL spectrum is used to supply critical and essential services;
 - (b) Any public interest assessment must prioritise the essential nature of mobile services and the associated long term socio-economic benefits;
 - (c) The ESL process must deliver certainty sufficiently early and across all bands;
 - (d) Public benefits arise from lower spectrum prices which are necessary to sustain a competitive mobile sector; and
 - (e) Mobile technologies are the optimal/efficient users of spectrum and there is no evidence that alternative uses produce higher public benefits.

ESL spectrum is used to supply critical and essential services

- 1.11 The starting position of the ESL process must be a presumption that it is in the public interest to renew all ESLs to existing licensees. Modern mobile networks and services are essential to Australian society and spectrum is essential to mobile networks and services. To presume that ESL spectrum may be allocated to a higher value use is

⁹ Amortisation of spectrum licence payments

¹⁰ ACMA Statement of Expectations, p.3

inconsistent with the expectations of Government and society that mobile services are essential to daily life.

- 1.12 Mobile networks supply essential communications services to Australians across the country, providing access to emergency, education, health, social and government services among others. Access to these services has become even more critical since the COVID-19 pandemic.¹¹ The Government's Statement of Expectations for the ACMA confirms that the ACMA "has an important role to support industry and consumers in delivering and accessing essential communications services".¹²
- 1.13 Optus submits that the essential and critical nature of mobile services to all facets of Australian society means that the ACMA's starting position is a presumption of renewal of all ESLs at a nominal price.
- 1.14 Optus strongly recommends that:
 - (a) All spectrum licences used to supply mobile and WA WBB services are deemed to be renewable upon application from spectrum licence holder
 - (b) The spectrum access charge for renewal should be no more than necessary to cover the ACMA's costs of administering the ESL spectrum bands.

Public interest assessment must prioritise supply of essential mobile services

- 1.15 All available evidence shows that the continued use of spectrum allocated to mobile services results in the greatest public benefits – as required under the Act. Mobile services contribute upwards of \$37 billion to society each year in 2030. There is no evidence that any other use produces such large public benefits. Absent this evidence, the ACMA cannot take any other action other than renew existing licences. Any other approach puts at risk the sector's ability to deliver on digital transformation, meet the significant growth in mobile data driven by 5G and 6G and puts sustainable competition at risk.
- 1.16 The ESL process presents a real opportunity to establish spectrum arrangements for the long-term public interest. The public interest will be best served by an approach to ESLs that ensures the continual supply of essential services and maximises socio-economic value of spectrum to Australian businesses and consumers. This means renewal of ESLs to existing licensees at a nominal price promotes long term investment and sustainable market competition.
- 1.17 Optus is generally supportive of the five criteria that the ACMA has proposed for undertaking its public interest assessment, though suggests that specific consideration be given to the essential nature of mobile services and to supporting industry sustainability over the long term as a relevant criterion.
- 1.18 Many of the criteria, such as the efficiency, investment and competition considerations are interrelated. Consistency in the application of regulatory criteria will also help promote certainty and ultimately stakeholder acceptance of the ACMA's decision-making. To this end, Optus suggests that the ACMA have regard to the ACCC's

¹¹ ACMA, What consumers want – Consumer expectations for telecommunications safeguards A position paper for the telecommunications sector; July 2023.

¹² Australian Communications and Media Authority Statement of Expectations; December 2022, p.1

approach to promoting competition, investment and economic efficiency (productive, allocative and dynamic) in undertaking its public interest assessment.¹³

- 1.19 The Act provides the ACMA with a very broad discretion to have regard to “the matters it considers relevant” to determining whether to renew a spectrum licence.¹⁴ Optus cautions that an overly broad discretion, while providing the ACMA with flexibility to adapt to changes in circumstances, can also create unnecessary uncertainty and the potential for disputation. To promote certainty and planning the ACMA should publish clear guidance on the ESL Process, and the scope and application of its public interest criteria by early-2024 at the latest.

The ESL process must deliver certainty sufficiently early and across all bands

- 1.20 For ESLs that commenced prior to the reforms, such as the majority of Optus ESLs, the Act provides the ACMA with the options to renew, partially renew or refuse to renew.
- 1.21 If not managed carefully, the regulatory uncertainty created by these arrangements have the potential to undermine longer term planning and investment in mobile networks. The ACMA must ensure the ESL process provides for engagement with industry and clear dates for publishing ESL related decisions and information.
- 1.22 While the period 2028-2032 may seem distant, network deployment planning along with infrastructure and spectrum investment plans have similarly long lead times. Given the potential substitutability, similarity in use and existing holdings of licensees in some bands (e.g., 1800 MHz, 2100 MHz and 2600 MHz), any decision on the future use of a band will have implications for an operator’s use, strategy and ultimately valuation of other bands.
- 1.23 It is critical that the ESL process be designed to provide mobile operators with early certainty on whether they can or cannot renew their existing spectrum in relation to all spectrum that is to expire during the period 2028-2032. Ideally such certainty would be provided no later than March 2025, via the ACMA’s publication of its preferred view or a Ministerial Direction deeming all ESLs to be renewable upon application from a licence holder.
- 1.24 Optus welcomes the ACMA’s four stage approach, however we consider that the next iteration of the ESL Process must be designed from a project and risk management perspective. To this end, Optus has set out a number of suggested additional steps and more definitive dates for the ESL Process at **Appendix A**.

Spectrum renewal prices must sustain investment and competition

- 1.25 In high fixed cost industries such as mobile telecommunications, high input costs depress incentives for investment. This may lessen competition, increasing consumer prices and lowering service quality.
- 1.26 Spectrum costs directly impact the investment that operators can make in new technology and coverage. Lower spectrum costs mean that operators will have more capital to invest in networks and services. This in turn can provide downstream benefits

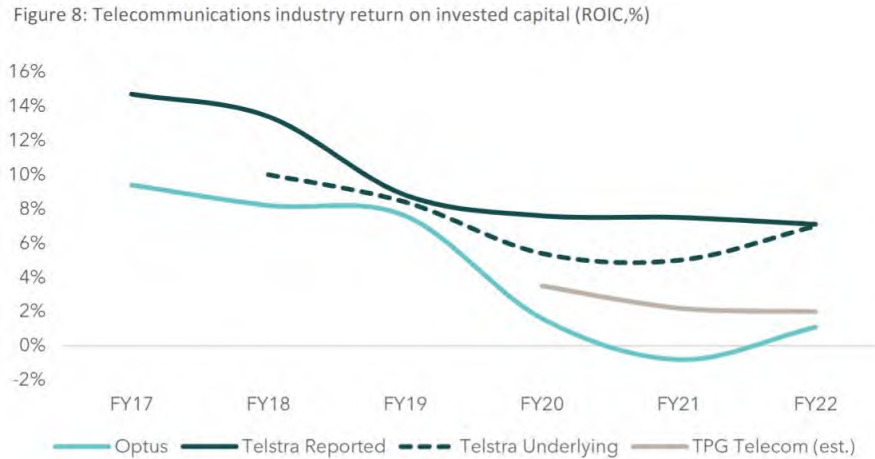
¹³ To this end, the ACMA has noted that there is significant alignment between the long-term interests of end-users, which guides the ACCC’s decision-making under the Competition and Consumer Act 2010, and the objects of the Radiocommunications Act. For example, the ACMA states that the object of the Act enables the ACMA to consider the role of competition in downstream markets, as well as incentives for efficient investment in spectrum using services and infrastructure.

¹⁴ Section 77C(8) of the Act

in the form of higher quality and more affordable services, thereby promoting supply of essential services and helping to maximise total welfare across the Australian economy.

- 1.27 In comparison to other industries, telecommunications does not achieve high returns on capital invested. Industry return on invested capital (ROIC) is less than half what it was five years ago and has fallen below the cost of capital – this is not suggestive of a sustainable industry. This decline in ROIC is demonstrated in Figure 1 below:

Figure 1 Decline in telecommunications industry ROIC



Source: Venture Insights

- 1.28 The annual cost (amortisation of spectrum licence payments) of spectrum to industry was \$241 million in 2015, by 2024 it will be \$818 million. Few if any industry sectors pay such sizeable upfront licence fees, with no linkage to future revenue or profits generated from use of those licences. In the broader context of the sector’s financial health, high spectrum costs are unsustainable.
- 1.29 High renewal prices, while attractive to Government revenue, undermine sustainable competition and investment in 5G and 6G. Any short-term benefit of higher renewal fees to public finances should not override broader long term economic benefits that will flow from lower renewal prices. It is without doubt that the economic benefits of mobile use from low spectrum fees far exceed the benefits of increased Government revenue from higher spectrum fees.¹⁵

Mobile and WBB services remain the most economically efficient use for ESL spectrum

- 1.30 In Optus’ view, the current allocation of spectrum is likely to be efficient or reflect the optimal use of the spectrum. This is because:
- The public benefit from mobile use of the ESLs amounts to more than \$37 billion each year from 2030, no alternative use case compares to this public benefit;
 - Mobile infrastructure is nationally critical infrastructure and supplies essential services to all Australians;

¹⁵ Hazlett & Munoz, 2009, A welfare analysis of spectrum allocation policies, RAND Journal of Economics, Vol. 40, No. 3, pp. 424–454

- (c) As has been revealed in many auctions, either through the lack of non-mobile operator bidders and/or other bidders have not been able to demonstrate the willingness to pay of mobile operators at auction;
- (d) mobile operators have strong incentives to use their spectrum efficiently to optimise the balance between the number of sites and maximum network coverage;
- (e) the secondary market for spectrum allows for the transfer of spectrum to users that may value the spectrum more highly; and
- (f) Non-mobile operators have not sought to acquire or access spectrum, and any trade or access arrangements have tended to be mobile operators acquiring from non-mobile operators.

1.31 Optus submits that if the ACMA decide to hold an auction of ESL and the net result is that the existing spectrum holders retain the spectrum, this would indicate that the ESL process had failed. This is because the auction would have caused unnecessary disruption and uncertainty to the industry with no higher value use identified and no public gain. Such an ESL process is inconsistent with the objectives of the Act.

Mobile technologies are the optimal/efficient uses for ESL spectrum

1.32 Optus note that the ACMA has proposed a number of different approaches to examining use of spectrum to help inform its assessment of whether changes to existing spectrum arrangements or alternative arrangements could better facilitate efficiency.¹⁶

1.33 Optus agrees that efficient use of spectrum is a key objective of the ACMA's mandate under the Act. Optus also recognises that any increased demand on spectrum access will require a cooperative approach to co-existence and coordination with other spectrum users. However, Optus has concerns that several of ACMA proposals may serve to undermine this objective. To mitigate these risks, Optus considers that:

- (a) Assessment of use must be proportionate, transparent and based on substantiated need
- (b) The ACMA must ensure that methodologies used and data collected to assess use is a fair comparison ("apples with apples") between use cases
- (c) The granularity of analysis of spectrum utilisation must reflect the specific use case – too granular an assessment runs the risk of being meaningless given national network deployment considerations
- (d) Levels of previous and planned investment in spectrum and network deployments must be given considerable weight in decision making
- (e) The ACMA should have recourse to relevant existing information in undertaking its assessment – the same levels of information should be demanded to substantiate all claimed use cases

1.34 In seeking to determine whether changing optimal use may warrant an adjustment to the spectrum arrangements for ESL spectrum, Optus emphasises that the ACMA's assessment must not be solely premised on technical efficiency considerations but

¹⁶ ACMA, Consultation Paper, p.28

consider the use that maximises the benefits that consumers, businesses and other organisations derive from use of the spectrum.

- 1.35 As noted above, mobile services increase Australia's wealth by \$37 billion each year in 2030. There are more than 28 million mobile services in operation.¹⁷ Absent clear evidence of a use that produces greater socio-economic public benefits, mobile remains the most efficient user of the ESLs.

¹⁷ ACCC Communications Market Report – 2021-22; p.11

Section 2. PROPOSED PUBLIC INTEREST CRITERIA

Question 1 – What are your views on the proposed public interest criteria? Are there other criteria we should consider?

- 2.1 The ACMA’s decision-making for ESLs should reflect Government policy priorities as well as Australian market conditions with a view to promoting investment and sustainable competition and consumer policy objectives over the long term.
- 2.2 The ACMA has noted that “there is no presumption of a particular outcome for ESLs” and that this “ESL process, therefore, poses an opportunity to review arrangements for the relevant spectrum to ensure that arrangements facilitate the long-term public interest into the future”.¹⁸
- 2.3 Optus agrees that the design of a new regulatory framework presents a real opportunity to achieve just this – the certainty required to promote investment and innovation in the supply of critical communications networks and services for the long-term benefit of Australians. However, Optus disagrees that there should be no presumption of a particular outcome. Rather, the essential and critical nature of mobile and WA WBB services, coupled with the overwhelming evidence of the economic and social public benefits derived from these services supplied via ESL spectrum, means that there must be a presumption that ESL licences will be renewed if a spectrum licence holder applies for renewal. The ACMA’s approach to ESLs must start from this position.
- 2.4 The ACMA has accepted that there is no longer any doubt that telecommunications is an essential service and should be treated as such. It is not clear to Optus the extent to which the essential nature of mobile services is considered in the Consultation Paper. We observe that the Paper makes no reference to mobile being critical infrastructure or that it is an essential service. This is a vital oversight that must be addressed.

Proposed public interest criteria are a good starting point for ESL assessment

- 2.5 The ACMA has proposed the following five criteria to assist in determining how different options may promote the long-term public interest, as well as whether renewal is in the public interest”.¹⁹
 - (a) Facilitates efficiency
 - (b) Promotes investment and innovation
 - (c) Enhances competition
 - (d) Balances public benefits and impacts
 - (e) Supports relevant policy objectives
- 2.6 Optus supports the ACMA’s five criteria as forming a sound general framework for the assessment of ESL options. Many of these factors, such as the efficiency, investment and competition considerations are interrelated. For example, facilitating the efficient use of spectrum would involve consideration of the degree to which a particular spectrum arrangement may promote (or lessen) competition in downstream markets.²⁰

¹⁸ ACMA, Consultation Paper, p.1

¹⁹ ACMA, Consultation Paper, p.2

²⁰ ExMemo to the Modernisation Act, p. 20

- 2.7 As the ACMA notes, and as confirmed by the fourth criteria, a public interest assessment must involve a balancing of potentially competing priorities.²¹ The criteria must be clearly defined and transparent. Similarly, the ACMA's application of the criteria to a specific context must be transparent and based on the published criteria with reasons for a decision provided to any affected stakeholder.
- 2.8 While the ACMA has indicated that it does not intend to apply weightings to each of the criteria, Optus recommends that the ACMA clearly set out how it will apply criteria to a specific context, such as an application for renewal, using examples to illustrate this where possible. Optus supports the ACMA making an explicit statement that mobile infrastructure is nationally critical infrastructure that provides essential services – and that the continual use of ESLs for this purpose is in the public benefit.
- 2.9 Importantly, there is clear evidence of the public benefits that flow from mobile services provided over ESLs. The benefits amounted to more than \$22.9 billion each year in 2019, and up to \$37 by 2030. While the ACMA may not wish to apply weightings to each criterion, the ACMA must recognise the significant public benefits that arise from renewal and the high threshold that alternative uses must reach to justify partial or no renewal.
- 2.10 Optus provides detailed commentary on each of the specific criteria below. Optus identifies matters that we consider will be relevant to the ACMA's consideration of the criteria in deciding whether to (i) renew (ii) partially renew or (iii) refuse an application for renewal and for ease of reference sets these out in table form at **Appendix A**.

The criteria should be clear, concise and transparent

- 2.11 The ACMA has noted elsewhere that there is significant alignment between the long-term interests of end-users, which guides the ACCC's decision-making under the *Competition and Consumer Act 2010* and the objects of the *Radiocommunications Act*, stating that the object of the Act enables the ACMA to consider the role of competition in downstream markets, as well as incentives for efficient investment in spectrum using services and infrastructure".²²
- 2.12 Given this overlap, Optus suggests that the ACMA have regard to the ACCC's approach to promoting competition, investment and economic efficiency (productive, allocative and dynamic) in undertaking its public interest assessment. Where necessary, Optus encourages the ACMA to engage the ACCC in the assessment process.
- 2.13 In deciding whether to renew a spectrum licence, ACMA must have regard to the matters it considers relevant to the renewal, and the effect that the renewal will have on radiocommunications.²³ However, the ACMA's discretion is actually much broader, with the explanatory material confirming that the ACMA may consider "any additional matters it considers relevant".²⁴
- 2.14 The definition of the public interest is at the discretion of the ACMA though needs to be "consistent with considerations that the ACMA currently applies to its spectrum licensing and management decisions".²⁵ Ultimately the "public interest":

"is a tool for ACMA to analyse the potential benefits that renewal of a spectrum licence may offer to the long-term public interest, consistent with the object of the Act. As such, some of the matters that ACMA may consider in making a decision

²¹ ACMA, Consultation Paper, p.19

²² ACMA, Our approach to radiocommunications licensing and allocation, p.33

²³ Subsection 77C(8) of the Radiocommunications Act

²⁴ ExMemo to the Modernisation Act, p.38

²⁵ Ibid, p.38

regarding the public interest of renewing a spectrum licence include: if the licence is used to supply essential public services and there is the potential that a change in licensees may put at risk delivery of services to a significant number of people, whether the incumbent can demonstrate substantial investment and past long-term use of the licensed spectrum, and considerations of the highest value use of the spectrum.”²⁶

- 2.15 Notwithstanding this broad mandate, Optus cautions against the ACMA maintaining an overly broad discretion in relation to its ESL assessments. An overly broad discretion, while enabling flexibility for the ACMA to decide on the merits of an ESL application, can create unnecessary uncertainty among stakeholders about the outcome. Uncertainty of outcomes in the context of the ESL process may have unintended consequences including acting as a disincentive to investment. The costs of this uncertainty will, in Optus view, outweigh any benefit of enhanced flexibility in the ACMA’s decision making.
- 2.16 The ACMA should provide clear, concise and transparent information over the matters it will consider. While the Act grants the ACMA discretion over the factors it considers, this does not mean that the criteria are not clearly articulated to interested parties. In fact, such wide discretion requires greater transparency.
- 2.17 Optus also notes that the ACMA has referred to the concept of “highest value use” (HVU) in the Consultation Paper but has not discussed it in any further detail. While this does not reflect the actual wording of section 3 of the Act, Optus assumes that the ACMA has included this reference deliberately to indicate that it will have regard to HVU in assessing the public interest. If so, Optus welcomes this clarification and notes that the concept of HVU is “consistent with considerations that the ACMA currently applies to its spectrum licensing and management decisions”.
- 2.18 If “HVU” is to be a factor, then further explanation as to its scope and application to the ESL process is required. In any event, based on Optus understanding of HVU, it is very likely to continue to be mobile and WBB services for all ESL spectrum. There is little or no alternative use or users for spectrum currently held by mobile operators. Accordingly, Optus consider that consideration of HVU supports the renewal of all ESLs.

“Facilitates efficiency” – an auction will not deliver efficient outcomes

- 2.19 Optus supports the ACMA’s proposal to have express regard to facilitating productive, allocative and dynamic efficiency in its ESL assessment. Optus agrees with the general definitions of productive, allocative and dynamic efficiency, though notes that there are potential differences with the ACCC’s approach to these definitions.
- 2.20 The key objective of economic efficiency in the context of the ACCC’s approach to promoting the long-term interests of end-users (LTIE) is directed towards encouraging “economically efficient use of, and investment in, infrastructure”.²⁷ Optus suggest that the ACMA’s approach to efficiency align with the approach taken by the ACCC and as reflected in numerous Competition Tribunal and/or Federal Court decisions.²⁸

²⁶ Ibid, p.34

²⁷ Subsection 152AB(2)(e) of the Competition and Consumer Act 2010; note that in determining the extent to which efficiency may be achieved, the ACCC is to have regard to (i) technical feasibility based on available technology, costs of supply and the likely effect on operation or performance of networks, (ii) the legitimate commercial interests of the suppliers, including its ability to exploit economies of scale or scope; (iii) incentives for investment in the infrastructure by which services are supplied (see further section 152AB(6) of the CCA

²⁸ See for example *Telstra Corporation Ltd (No. 3) [2007] ACompT* and subsequently *Telstra Corp Ltd v Australian Competition Tribunal* [2009] FCAFC 23; (2009) 175 FCR 2013 .and ACCC publications “A guideline to the declaration provisions for telecommunications services under Part XIC of the Competition and Consumer Act 2010”, p.42; and Public Inquiry into final

- 2.21 Spectrum is an essential input to all radiocommunications services. If spectrum is not managed effectively, it may be left under-utilised or fallow, with the potential public benefits of use of the spectrum unrealised. The ACMA is therefore tasked with managing spectrum in a manner that “facilitates the efficient planning, allocation and use of the spectrum”.²⁹
- 2.22 Optus considers that the following efficiency considerations will be relevant to the ACMA’s decision to renew an ESL:
- (a) Productive efficiency – productive efficiency “is achieved where individual firms produce the goods and services that they offer at least cost”.³⁰ Optus welcomes the ACMA’s recognition of the impact of spectrum fragmentation on technical efficiency and support the ACMA’s proposal to consider the defragmentation potential of an ESL option in its assessment.
 - (b) Allocative efficiency – efficiency considerations will be highly relevant to the ACMA’s decisions on allocation methodology and pricing. Allocative efficiency “is achieved where the prices of resources reflect their underlying costs so that resources are then allocated to their highest valued uses (i.e. those that provide the greatest benefit relative to costs)” adding that it can “also refer to the allocation of production across firms within an industry in a way that minimises industry-wide costs”³¹
 - (c) Dynamic efficiency – dynamic efficiency “reflects the need for industries to make timely changes to technology and products in response to changes in consumer tastes and in productive opportunities” and can also refer to “the efficient deployment of resources between present and future uses so that the welfare of society is maximised over time.”³² The mobile sector and technology remains exceptionally innovative. The technology neutral nature of spectrum licences as well as the adaptability of the technical frameworks efficiently facilitate technological change over the licence term.

“Promote investment and innovation” – ACMA must reflect on the market context

- 2.23 Optus has been a significant infrastructure investor since it entered the market over 30 years ago, having invested \$43.7 billion since 1992. Optus typically invests over \$1.5 Billion in capital expenditure annually in its mobile network and services. This investment has been possible through the security and certainty from spectrum licences. Optus supports the ACMA’s proposal to have regard to the promotion of “investment and innovation” in assessing the public interest. As the ACMA notes, investment and innovation play an important role in promoting the public benefits of efficient spectrum utilisation, through the introduction of new technologies and improved services.³³
- 2.24 Promoting the public benefit in the mobile market requires a long-term investment perspective. This involves limiting the risks to the significant capital investment required to support innovation and promote dynamic efficiency to the greatest extent practicable. Spectrum licences are afforded a high degree of exclusivity and certainty under the

access determinations for fixed line services”; p.97 and more recently, ACCC Public inquiry into the declaration of the domestic transmission capacity service, fixed line services and domestic mobile terminating access service; Discussion Paper, May 2023, p.8

²⁹ Radiocommunications Act, section 3

³⁰ ACCC, Public Inquiry into final access determinations for fixed line services, Discussion Paper, p.97

³¹ Ibid

³² Ibid

³³ ACMA, Consultation Paper. p.19

Radiocommunications Act 1992 (“the Act”). This has made the licence type suited to the supporting the long-term investment required for mobile network deployment.³⁴

- 2.25 Mobile is a high fixed cost industry. Mobile networks require significant large upfront capital investment to deploy physical infrastructure and network equipment followed by less expensive marginal investments to extend those networks and add new users. Mobile markets are also characterised by cycles of technological improvement and investment (4G to 5G, to 6G etc). The eventual obsolescence of older technology means that consumers will lose existing coverage, capacity, and capability if a mobile operator does not continually invest in the requisite infrastructure upgrades.
- 2.26 The attached report from Venture Insights shows that the Australian mobile industry is at an inflection point with declining revenue and the increasing levels of investment required to meet demand creating a digital investment gap. The capacity for operators to invest is further limited by the rising costs of capital. This investment gap threatens the ability of industry to invest sustainability in the networks and services that are critical to Australia’s long-term prosperity.
- 2.27 Spectrum policy settings must continue to support investment in networks and services to ensure Australia’s communications networks continue to evolve with technological developments and support our ongoing global competitiveness and productivity. The path to investment in 5G and 6G networks and services must be clear. Certainty about spectrum access rights and pricing must be the key considerations in the ACMA’s assessment of whether a particular ESL option promotes “investment and innovation”.
- 2.28 To this end, the ACMA should have regard to the following:
- (a) Mobile network deployment and planning decisions are made with considerable lead times – the significant capital expenditure involved requires careful assessment of where network deployment may provide a return on investment.
 - (b) A high degree of certainty about spectrum access is needed to promote long term investment – uncertainty about spectrum access will serve as a disincentive to investment.
 - (c) Network densification is likely to be important to meet growing demand for data, whether current spectrum holdings for mobile operators are maintained and regardless of whether additional mid-band spectrum is made available or not.
- 2.29 Optus submit that these considerations support the conclusion that spectrum should be renewed rather than reauctioned – re-auctioning the spectrum creates disproportionate investment uncertainty for the perceived benefit and has the potential to cause public harm including undermining continuity of service and competition.

“Enhancing sustainable competition” for the long-term benefit of end-users

- 2.30 Competition in the mobile sector has delivered enormous consumer benefit over the last 30 years in the form of high-quality affordable mobile communication services. Optus supports the ACMA’s consideration of the degree to which an ESL option may promote competition as part of its public interest assessment.

³⁴ ACMA, Our approach to radiocommunications licensing and allocation Implementing the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020*, March 2021, p.6

- 2.31 Competition can drive investment and innovation and ultimately the supply of higher quality and more affordable services to consumers. The promotion of competition will help deliver the productive, allocative and dynamic efficiency benefits identified in the Consultation Paper. Ultimately effective competition should deliver long term consumer benefit.
- 2.32 Mobile competition includes infrastructure and service-based competition. Infrastructure based competition describes competition on coverage, capacity, and capability of services, which depend upon the underlying network infrastructure. Service competition, on the other hand, occurs within the confines of available network infrastructure: mobile operators compete on, for example, price and inclusions (including data and content).

Promoting sustainable mobile market competition through the ESL process

- 2.33 Delivering the benefits of competition while not undermining the long-term sustainability of a vital sector of the Australian economy will require careful balancing of the ACMA's public interest criteria in assessing ESL options.
- 2.34 Competition in the mobile market depends on healthy and innovative infrastructure competition. The mobile industry has long been recognised as the most successful sector in the wider telecommunications industry – with multiple competing private investors, world-leading technologies and broadband speeds, and decreasing prices to consumers.
- 2.35 However, the long term health of the infrastructure competition is not certain given the financial situation of the mobile market. As noted above, industry returns on invested capital are far below the cost of capital. Industry revenues have been falling during a period of higher network investment with the roll-out of 5G. Consumers' and Governments' expectations of the mobile sector have never been higher.
- 2.36 The mobile sector is often referred to as an essential service, but the industry does not receive any of the regulatory benefits of being an essential service. Unlike electricity and water, the mobile sector has no regulated guaranteed return on the assets required to supply the service. This disconnect has very real implications for the long term viability of mobile investment.
- 2.37 There is a growing gap between the investment required to meet the future expectations of the industry, and the ability of private firms to deliver that investment. A report from Venture Consulting on the state of the telecommunications industry is attached to this submission (Venture Insights Report). This Report highlights:
- (a) Telecommunications investment is the backbone of the digital economy, it is the platform for future digital applications that will drive the required productivity improvements to grow the Australian economy.
 - (b) Many of the benefits of this investment flow to others in society. Mobile revenue has been flat while investing for greater coverage and speed. The inability of mobile operators to monetise their investment risks the emergence of a digital investment gap.
 - (c) The industry has faced long-term decline in return on invested capital (ROIC) since the GFC. The ROIC challenge is exacerbated by the rising cost of capital, reflecting the new economic environment of higher interest rates and greater risk.
- 2.38 Venture Consulting also notes that addressing this looming digital investment gap is a challenge for both industry and the Government, as the regulatory environment is an important determinant of investment attractiveness. Venture Consulting specifically calls

out “High costs from spectrum allocation policies that inflate spectrum unit prices, even as demand for spectrum to support wireless communications is surging”.³⁵

- 2.39 Venture Consulting warns that “these issues must be addressed to create the investment environment that will attract the capital Australia needs. In a global economy where capital is mobile, private capital investment cannot be sustained unless returns meet industry benchmarks.”³⁶
- 2.40 Optus anticipates that the ESL process will play a vital role in determining the sustainability of the mobile telecommunications industry. The annual cost (amortisation of spectrum licence payments) of spectrum to industry was \$241 million in 2015, by 2024 it will be \$818 million. Few if any industry sectors pay such sizeable upfront licence fees, with no linkage to future revenue or profits generated from use of those licences. In the broader context of the sector’s financial health, high spectrum costs are unsustainable
- 2.41 One of the main aims of this ESL process should be to ensure the industry has access to sufficient spectrum licences, with sufficient certainty, in a manner that addresses the investment gap challenge. A sustainably competitive market is only possible with mobile operators that earn sufficient revenue to cover the cost of capital. Expectations around licence certainty and cost play a key role in determining whether investors see Australia as an attractive market.

ESL spectrum renewal is in the public interest

- 2.42 Under this criterion, the ACMA would seek “to balance the impact and transitional costs to the public and industry incurred under each option with potential benefits that may be delivered to the public in the longer term”.³⁷ Optus agrees with the need for the ACMA to balance the public benefits and impacts in its assessment of an ESL proposal and considers that this is a necessary element of any public interest analysis. Optus welcomes the ACMA’s recognition of costs to industry as a factor in this balance.³⁸
- 2.43 While Optus appreciates the balancing exercise needs to be context specific, the description of the process provided is unclear. In particular, it is unclear how the ACMA would balance different criteria where they raise competing considerations if it does not intend to attach some weighting to the criteria.³⁹ Further, the manner in which the ACMA may assess the public interest on a more granular localised level must be clarified.
- 2.44 Optus suggest that ACMA’s approach to balancing public benefits and impacts should reflect a best practice risk analysis, including by way of a cost-benefit analysis and/or a clear and transparent application of the Government’s Policy Impact Analysis Framework.⁴⁰
- 2.45 Optus has reviewed the costs and benefits of the three main ESL options available to the ACMA namely, renewal, partial renewal or refusal to renew an ESL and then re-allocate the spectrum. In summary, Optus observes the following:

³⁵ Venture Insights Report, p.5

³⁶ Ibid.

³⁷ ACMA, Consultation Paper, p.21

³⁸ Ibid, p.21. The ACMA states that it would seek “to balance the impact and transitional costs to the public and industry incurred under each option with potential benefits that may be delivered to the public in the longer term.”

³⁹ Ibid.

⁴⁰ ACMA, Draft FYSO 2023-28, p.6. Refer to chapter on “Our approach to spectrum management”

- (a) Automatic renewal regimes are investment friendly but result in low levels of manageability. In addition, as with administrative reassignment, complicated issues such as how much to charge for the spectrum may arise.
- (b) Administrative reassignment procedures allow for maximum manageability and can be pro-competitive but are prone to regulatory failure. In particular, this manageability may be achieved at the cost of decreased investment incentives and minimal transparency.
- (c) While auction-based allocations are typically pro-competitive for initial allocations of spectrum, there are limited or no benefits from running auctions for spectrum renewal. Auctions are designed to allow the market to determine the efficient allocation of spectrum
- (d) Where spectrum is already efficiently allocated, there is no role for auctions. In the renewal context, the uncertainty auctions introduce for operators is likely to dampen investment incentives, while manageability and potentially service continuity are also reduced

Why ESL spectrum should be renewed in full

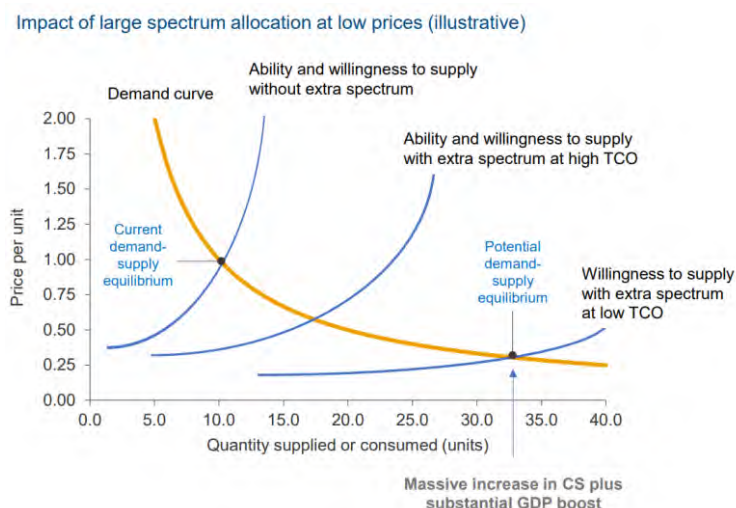
- 2.46 The broader socio-economic benefits of mobile networks and services are well documented. GSMA research shows that the baseline economic impact of mobile services increases when upgrading from one generation of mobile technology to the next (15% from 2G to 3G and 25% from 2G to 4G)⁴¹. A recent academic study⁴² found that a 10% increase of mobile broadband adoption causes a 0.8% increase in GDP, which is in line with previous research.
- 2.47 Government bodies at all levels are acknowledging the fundamental and growing importance of digital and communications services for the Australian economy and society, and the integral role of spectrum policy in achieving its digital development objectives. The ACMA has noted the ever-increasing demand for wireless connectivity over 5G networks, the importance of mobile networks, complemented by satellite and fixed wireless access technologies, in meeting the demand for wireless connectivity, and the importance of spectrum being available to enable Australia's transition to 5G⁴³.
- 2.48 Optus considers that the (administrative) renewal (in full) of ESL spectrum under long duration licences at a nominal price will maximise the public benefit. Renewal will provide greater assurance about longer term access to spectrum and will ultimately support continuity of and investment in services for the long-term benefit of end-users. This diagram illustrates the potential broader public benefits of low spectrum pricing:

⁴¹ GSMA, "Mobile technology: two decades driving economic growth", 2020, <https://data.gsmaintelligence.com/api-web/v2/research-file-download?file=121120-working-paper.pdf&id=54165922>

⁴² Edquist, H., Goodridge, P., Haskel, J., Li, X. & Lindquist, E. "How important Are Mobile Broadband Networks for the Global Economic Development?". Information Economics and Policy, Dec. 2018, <https://www.sciencedirect.com/science/article/abs/pii/S0167624517301695>

⁴³ ACMA, Five-year spectrum outlook 2022-27 and 2022-23 work program, September 2022, <https://www.acma.gov.au/five-year-spectrum-outlook>

Figure 2 Impact of large spectrum allocation at low prices⁴⁴



- 2.49 A refusal to renew ESL spectrum may jeopardise efficient use of the spectrum and result in significant costs to industry arising from service migration and spectrum replanning. In the absence of an inefficient allocation of existing licences, there is no benefit of holding a market auction. Optus repeats that auction and economic theory all agree that auctions are for the sole purpose of allowing market participants to determine the efficient allocation of rights.

The risks of partial renewal or amendments to spectrum licence terms

- 2.50 One ESL option is “partial renewal”. The ACMA has indicated that this may involve changed core conditions on spectrum access – for example, the parts of the spectrum or the geographic areas under the new licence may change. Optus anticipates that the ACMA may seek to re-allocate ESL spectrum to apparatus or class licences where the ACMA determines that such arrangements may facilitate higher value and/or more efficient use of the spectrum.
- 2.51 In particular, Optus notes that new Area Wide Licences (AWLs) are intended to provide a high degree of flexibility in the design of networks, operating as “building blocks” for licensees to ultimately aggregate into a single licence. AWLs enable a modular construction of network design, with AWL holders theoretically able to respond more directly to demand at a more localised level than may be intended by spectrum licences, which tend to be offered over wider geographic areas/lots.
- 2.52 However, AWLs are not consistent with the supply of national networks. Furthermore, affording AWLs the same priority as spectrum licensees inevitably introduces greater complexity in interference management, which adds to costs and may act as a disincentive to investment. Co-existence arrangements should be designed and enforced with a view to maximise spectrum utilisation and public benefit.
- 2.53 Optus has identified other potential implications of a partial renewal approach:
- (a) The introduction of new or varied spectrum licence boundaries;
 - (b) The reduction in the amount of spectrum available for current licensees to renew;

⁴⁴ Coleago, Mobile Spectrum and Network Evolution to 2025, p.33

- (c) The revision of core conditions for coexistence and coordination; and
 - (d) Changes to licence types.
- 2.54 Optus does not agree that any or all of these potential changes to ESL will deliver the efficiencies that the ACMA is striving to achieve. Partial renewal represents a highly complex approach to ESL that will require considerable data collection and analysis in order to undertake a sufficiently robust public interest assessment. Optus provides further detailed concerns about the likely implications of partial renewal in its response to question 4 below.
- 2.55 There are no functionally equivalent substitutes to mobile services. Satellite services are an important complement to terrestrial mobile networks.⁴⁵ However, mobile services will continue to do the heavy lifting in delivering Australia’s communications needs with satellite services playing an increasingly important role in “plugging gaps” in terrestrial connectivity, via innovative new technologies such as Optus and SpaceX’s deal to deliver 100% national coverage via direct-to-mobile handset technology.⁴⁶
- 2.56 National mobile networks are unrivalled in the benefits they deliver to the Australian public. Mobile telecommunications are an essential feature of all of our daily lives – the pandemic and recent natural disasters have revealed the need for high quality networks and services. Re-allocating ESL spectrum to new use cases under localised licensing arrangements risks undermining the business case and long-term planning needed for national mobile networks and ultimately the supply of essential communications services, including emergency services, to all Australians.
- 2.57 Mobile networks contribute significant productivity and economic benefits to the wider economy. Multiple studies have shown that the mobile industry contributes more than \$67 billion over the eight years to 2030 and this is only set to increase.⁴⁷ Optus is not aware of any other competing use case that produces such compelling public benefits. We welcome the ACMA to present evidence which supports alternative uses resulting in greater public benefits.
- 2.58 In summary, Optus strongly cautions against an approach that would unnecessarily fragment spectrum or result in the dilution of the exclusivity and certainty of spectrum access that has been afforded to spectrum licences to date. If the intention is to accommodate a “diverse range of use cases” to address perceived unmet demand for localised connectivity, then Optus considers that the ACMA must clearly substantiate any decision to allocate this spectrum on the basis of the public interest. Optus notes that if business cases for these operators are not tested and the operator fails, then spectrum may be stranded – particularly if it is not easily tradeable.

Policy objectives must be sufficiently transparent prior to ESL assessments

- 2.59 The ACMA intends to have regard to which ESL option may better support the communications policy objectives of the Government and in any event is obliged to do so under section 3 of the Act.
- 2.60 Optus considers that the renewal of ESL at a nominal price will be highly supportive of the following policy priorities of the Government:

⁴⁵ Draft FYSO 2023-28, p.15

⁴⁶ CommsDay, 13 July 2023

⁴⁷ 5G Unleashed, Deloitte Access Economics on behalf of AMTA, p.6

- (a) Promoting investment, innovation and the adoption of new and emerging technologies, while continuing to safeguard the interests of consumers and small businesses.
- (b) Supporting government policies related to regional, rural and remote Australia including by having regard to relevant ministerial policy statements in the planning and allocation of spectrum to support innovation and competition in these areas.
- (c) Promoting the long-term public interest derived from the spectrum, including the benefits of technological developments that improve spectrum utilisation and efficiency.⁴⁸

2.61 Optus also recognises that the key Government policy objectives relating to digital inclusion, Closing the Gap and regional connectivity must also feature in the ACMA's decision making on ESLs. Indeed, mobile networks and services are indispensable to the realisation of these Government policy objectives, providing further weight to the presumption that ESLs must be renewed. In the interests of transparency, all policy matters to which the ACMA is to have regard must be clear well before an ESL holder applies for renewal.

2.62 Optus considers that revenue raising via high spectrum fees are in direct conflict with the investment required to deliver digital connectivity objectives. Further, the introduction of any licensing conditions to support the realisation of such policy objectives must be balanced against the other public interest criteria, such as the impact on investment and innovation.

2.63 Optus welcomes the ACMA's commitment to clearly articulate how it will have regard to these policy priorities through its decision-making process. Optus would welcome further engagement with the ACMA on how industry and Government can work together to realise these policy objectives in a cooperative and cost-effective manner.

Other public interest considerations

2.64 The ACMA's proposed public interest criteria will form a sound basis upon which to assess whether or not a particular ESL proposal will promote the long-term public interest. Optus welcomes a clear articulation of the scope of the ACMA's discretion in assessing ESL options and any application for renewal. As noted, an overly broad discretion will further exacerbate the risks inherent in the ESL process.

2.65 However, Optus also considers that certain other key priorities must be considered in the ACMA's assessment. These include:

- (a) Industry sustainability – as highlighted throughout this submission, industry sustainability must also be an overarching consideration and is particularly relevant to decisions relating to preferred allocation methodology and pricing. The growing divide between declining ROIC and the investment requirements of next generation networks can be eased by low prices for ESL renewal.

Optus also notes that the ACMA's "Our approach to licensing and allocation" document indicates that, where public interest tests are required (such as where a licence includes a public interest test or the licence is to be renewed for 10 years or longer) the ACMA will have regard to whether an "incumbent would be significantly compromised if the licence were not renewed and

⁴⁸ Government's Statement of Expectations, December 2022

potential flow on effects” when assessing the public interest of renewing a licence.⁴⁹

- (b) Service continuity – The ESL process presents a risk to service continuity because a decision to re-auction spectrum will introduce a period of uncertainty over the holder’s future access to spectrum and raise the possibility of the spectrum changing hands as a result of the auction. If an operator were to lose access to part of its spectrum holdings, this is likely to impact network coverage or cause noticeable disruption to customers.

This applies to spectrum that is essential to meeting current demand and to demand as it grows in the near future, noting that large blocks of contiguous spectrum will be necessary to deliver the step change in quality of experience as 5G matures and 6G develops. In addition, operators will need significant spectrum in addition to their existing holdings to support 5G and 6G.

- (c) Effective risk management – while not a “public interest” consideration per se, the need to manage risk effectively is crucial to the success of the ESL process, as detailed in our response to Question 2 below.

⁴⁹ ACMA, Our approach to radiocommunications licensing and allocation, pp.25-26

Section 3. PROPOSED ESL PROCESS

Question 2 – What are your views on the proposed 4-stage approach to undertaking the ESL process?

- 3.1 Optus considers that the ACMA’s proposed four stage approach appears logical in that it moves from a general canvassing of stakeholder views (Stage 1) to information gathering (Stage 2) and the development of a general policy on the ACMA’s preferred arrangements (Stage 3) to further refinement for each specific band within which spectrum licences are due to expire (Stage 4).
- 3.2 Optus welcomes the ACMA’s confirmation that it is proposing to conduct Stages 1 to 3 once and agrees that “there is greater utility in concurrent evaluation of certain issues, noting that many of the spectrum licensed bands are substitutable or complementary”.⁵⁰ Optus also supports the proposal for stage 4 to be focussed on individual band specific issues.
- 3.3 However, the ACMA’s ESL Process is not definitive about timing for the commencement and completion of each of the stages nor are there detailed steps for each of the stages. In Optus view this raises the risk of slippage in project delivery. The ESL Process raises considerable risks for all affected stakeholders. To mitigate these risks, the ACMA must take a deliberate and well-planned approach to project management.
- 3.4 We consider that the next iteration of the ESL process must be detailed with clear deliverables and milestones against which progress can be measured. Optus sets out some suggestions in this regard at **Appendix A**.

The framework for the ESL Process creates significant implementation risk

- 3.5 For ESLs issued prior to the Modernisation Act, the ACMA can only make a final decision on renewal in response to an application made within the two-year period prior to licence expiry.⁵¹ Further, the ACMA must not renew a spectrum licence for 10 years or longer unless the ACMA is satisfied that it is in the public interest to do so. Therefore, absolute certainty of renewal can only be provided at most 2 years before expiry. In cases of partial renewal or refusal to renew, the ACMA may choose to auction the spectrum or to re-allocate for new use and/or under different licence arrangements.
- 3.6 These arrangements afford the ACMA considerable discretion and control over the management of ESL spectrum. Getting the right outcome relies heavily on the ACMA’s assessment of the public interest, placing considerable pressure on the ACMA. The ACMA also faces the risk of an existing ESL holder electing not to renew their ESL, which then would mean the ACMA would have to undertake a “truncated” planning and re-allocation process or risk leaving the spectrum unutilised.
- 3.7 Theoretically the process allows for ESL renewal applications up to the day before spectrum licence expiry. This means that if a spectrum holder decides not to renew a spectrum licence this will not be known by the ACMA until the day before spectrum licence expiry. If no application for renewal is made then the spectrum could lie fallow and unused until the ACMA has reallocated it.
- 3.8 Spectrum licences are due to expire as follows:

⁵⁰ ACMA, Consultation Paper, p.24

⁵¹ Section 77A, Radiocommunications Act

Table 3 Spectrum licence expiry timeframes

	Band	Earliest date renewal application can be made	Earliest deadline for ACMA decision on application	Date of Spectrum licence expiry
1	1800 MHz	18 June 2026	18 December 2026	17 June 2028
2	850 MHz	18 June 2026	18 December 2026	17 June 2028
3	2600 MHz	1 October 2027	1 April 2028	30 September 2029
4	700 MHz	1 January 2028	1 July 2028	31 December 2029
5	2300 MHz	25 July 2028	25 November 2028	24 July 2030
6	3400-3600 MHz	14 December 2028	14 June 2029	13 December 2030
7	2100 MHz	12 October 2030	12 April 2031	11 October 2032

Source: ACMA and Optus

- 3.9 The ESL process clearly introduces significant risk for mobile operators such as the risk of higher prices for spectrum access through potential auction processes, the introduction of new spectrum licence conditions that may erode licence rights that have supported network investment to date as well as delays to planning and deployment as we await clarity on planning outcomes. Such impacts have downstream effects, as consumers and business potentially bear the brunt of higher prices for lower quality mobile services.

Effective risk management is crucial to the success of the ESL Process

- 3.10 The Government’s Statement of Expectations provides that the ACMA should be “risk based, and data driven” with a view to “manage risks proportionately”.⁵² Optus submit that a lack of certainty that ESLs will be renewed raises risks to Australia’s digital future that outweigh any perceived benefits of retaining discretion to re-allocate spectrum to new uses or to auction the spectrum.
- 3.11 In Optus’ view, mobile network planning and investment certainty must be the ACMA’s first priority in the ESL process. The ACMA should take clear steps, preferably via administrative or legislative instruments, to establish a strong expectation of renewal of spectrum licences used to provide mobile and WBB services.
- 3.12 Optus considers there are a range of mechanisms available to the ACMA to mitigate these risks, not least of which is proactive engagement with industry to develop an informed and considered position on the best ESL option. In terms of regulatory measures, Optus invites the ACMA and the Government to consider among other options:
- (a) Provide its “preferred view” or policy position in relation to *all ESL spectrum* sufficiently before the commencement of the 2-year application period for the 850 MHz and 1800 MHz – preferably by no later than March 2025, to enable stakeholders to effectively respond to the ACMA’s views concerning the 850 MHz and 1800 MHz spectrum.⁵³
 - (b) As part of its Stage 4 activities, issuing a spectrum access charge determination (under section 294 of the Act).

⁵² Government Statement of Expectations for the ACMA, December 2022

⁵³ As per the ACMA’s own planning arrangements in ACMA, Spectrum Planning Framework, Information Paper, August 2022

- (c) Where no alternative use has been expressed for the spectrum, issuance of a licence renewal notice (under section 77A(10) of the Act) on the first day of the allocation window, specifying the renewal price to be paid and the due date.
- (d) Or Ministerial Direction(s) comparable to the Class of Service Determination 2012 and the Radiocommunications (Spectrum Access Charge) Direction 2012,⁵⁴ to the effect that all ESL used to supply mobile and WBB is to be renewed at a nominal spectrum access charge.

3.13 In regard to the last point, Optus refers to similar approaches in Finland, Canada and the UK where the expectation of renewal of spectrum licences is near automatic or very strong, unless there has not been “productive use” of the spectrum or there are exceptional circumstances such as an overriding policy need.

Optus proposal for a revised ESL Process

3.14 Optus has concerns with the ACMA’s proposed Stage 3 – which the ACMA appears to indicate will occur in Q4 2024. However, the breadth of activities contemplated under this Stage suggest that this is simply not a realistic timeframe. Therefore, Optus recommends that many of these activities be brought forward to Stage 2 – with clear milestones provided for consultation and engagement on all aspects of the ESL process, including price, licensing arrangements and conditions, and technical matters via consultation papers, Tune-Ups or Technical Liaison Groups (TLGs).

3.15 Following feedback at Stage 3, the ACMA intends to publish a “preferred view” on the future arrangements for the ESL spectrum at Stage 4, which would also involve consultation on any band specific issues in the lead up to the expiry of that band(s).

3.16 The ACMA has stated that this “preferred view” would “serve as a policy, informing decision-making when deciding whether to renew licences” and that “this would mean that we could provide indication of our preferred views well in advance of the expiry of licences within most bands as we would need to consider holistic matters in advance of the renewal application period for 850 MHz and 1800 MHz licences”.⁵⁵

3.17 While Optus commends the ACMA’s general intention, Optus does not consider that the ACMA’s proposed process will enable operators to make informed valuations of the spectrum. This is particularly the case if the ACMA’s preferred view indicates an intention to refuse an application for renewal of these ESLs, in part or in full, and re-allocate the spectrum. In the case of 850 MHz and 1800 MHz, the time constraints would appear to lead to the conclusion that they must be renewed.

3.18 For this ESL process, it can be assumed that all existing bands will be re-farmed to 5G/6G during the life of the renewed spectrum licence and are therefore directly substitutable. No spectrum band can be valued in isolation and this requires the ACMA to provide significant certainty in the process about each of the spectrum bands at the same time. Optus proposes that the technical frameworks for all the bands need to be finalised and decisions on whether spectrum bands are to be renewed or not needs to occur prior to any spectrum valuations and any applications to renew are submitted.

3.19 The substitutable nature of certain ESL spectrum bands, such as 1800 MHz, 2100 MHz and 2600 MHz, means that operators will need clarity about the ACMA’s preferred view in relation to all ESL spectrum bands at the same time in order to plan their use of the bands and appropriately value the spectrum needed. Furthermore, until licence

⁵⁴ Respectively deeming the re-issue of spectrum licences used to supply mobile services as in the public and specifying the \$/MHz/pop formula to be used for calculating the spectrum access charge.

⁵⁵ ACMA, Consultation Paper, p.24

conditions for each of the bands have been confirmed no final valuations can be conducted or renewal application decisions made.

- 3.20 Due to the interdependent substitutability of certain bands and the impact that the ACMA's preferred approach to one band may have on an operator's decision to utilise another, Optus proposes that the ESL decision for all seven bands needs to occur simultaneously with a preliminary view published by Q4 2024 and a preferred view by March 2025. Ultimately, all stakeholders require sufficient time to prepare for either a renewal or an auction and any necessary TLG or planning activities to be carried out.
- 3.21 Optus notes that the ACMA's proposed process also does not appear to align with the ACMA's own spectrum planning arrangements, particularly for 850 MHz and 1800 MHz. To illustrate this point, should the ACMA's "preferred view" or policy be published within six months of the commencement of the consultation, that would leave approximately one year prior to the date that applications for renewal of 850 and 1800 MHz licences will open. A band and licence specific consultation (stage 4) will also need to be conducted during this time. If the ACMA were to decide to only partially renew or refuse an application for renewal, then there would be little time for operators to adjust network planning or for the ACMA to undertake its own replanning activities.
- 3.22 Optus notes that spectrum auctions typically take 18 months to two years to prepare for, including TLGs and consultation processes. Optus cautions against notions that the ESL process can adopt a "condensed version" of its usual planning and re-allocation processes, as a rushed approach raises inherent risk of unintended consequences, including unallocated spectrum.

The ESL Process must provide for greater industry engagement

- 3.23 Given the significant scope of work contemplated and the band specific considerations, provision must be made for close industry engagement. Optus suggests that the ACMA consider the following:
- (a) A combination of regular "Tune-Ups" to keep industry informed of the ACMA's views at key milestones as well as TLGs for band specific issues.
 - (b) Engagement on broader strategic initiatives that may support defragmentation and help maximise the efficient use of spectrum among mobile operators. This may entail discussion of any new licence conditions or technical framework governing use of the spectrum.
 - (c) Given the importance of pricing to the overall success of the ESL process, pricing should be dealt with as an individual work stream – this could involve issuing a separate pricing consultation paper on methodologies in Q4 2023, followed by a "preliminary view" consultation paper in Q2-2024. Given the to be noted that due to the interconnected nature of technical licence conditions and pricing that they should occur concurrently.
- 3.24 As a general comment, evidence-based decision making for ESLs will be supported by the publication of responses to consultations, including to ACMA requests for information about prospective demand (at proposed Stage 2) are published in full and in a timely manner (of course subject to any commercial in confidence redactions).
- 3.25 Optus welcome the estimated timing for each stage as supportive of forward planning. However, Optus consider that the proposed single consultation approach at each stage is overly ambitious and may benefit from additional consultation to better shape the outcomes at each stage. To this end, Optus sets out suggested individual steps and milestones that the ACMA may wish to consider in the design of its final ESL Process (**Appendix A**).

Section 4. BAND SPECIFIC ISSUES TO BE CONSIDERED AS PART OF THE ESL PROCESS

Question 3 – Are there any band-specific issues that we should consider as part of this ESL process?

4.1 Optus welcomes the ACMA's confirmation that it intends to undertake a "holistic assessment" of spectrum licensed spectrum bands, including spectrum that is not subject to expiry in the near term. Optus suggest that the ACMA consider the following band specific issues as part of the ESL process:

- (a) **700 MHz** – The 700 MHz band is crucial low band spectrum currently heavily utilised by all mobile operators. Given the propagation characteristics of this spectrum it will remain key spectrum to support the supply of 5G and 6G mobile and WBB services on a national basis in the future. Any changes to the use of this band or the core conditions of existing national spectrum licences will have potentially significant consequences for the costs of deployment and ultimately the quality and geographic scope of these services and therefore must be very carefully considered.

Furthermore, the very propagation characteristics that make this band so useful in supporting current and future wide-area service provision render it extremely difficult to coordinate across co-channel spectrum boundaries. The inter-site distances required to prevent harmful interference for licensees on either side of any mooted spectrum boundaries would be need extremely large, significantly undermining the efficiency and utilisation of the spectrum in this highly valuable band.

- (b) **1800 and 2100 MHz**: Optus considers that these bands are close functional substitutes, and both may be suitable candidates for band reform, including defragmentation. The efficient use of these bands is undermined by complex and inconsistent licence boundaries.

Existing concerns with the bands include the presence of multiple licence boundaries in regional areas, which has reduced the amount of usable spectrum at these boundaries (e.g. Canberra, Southern NSW and Regional Victoria). The need to coordinate and manage potential interference at multiple boundaries undermines the efficient utilisation of the spectrum, adding to operational complexity and cost.

The 1880-1920 MHz band is subject to a mix of apparatus and class licensing arrangements across Australia that creates significant complexity. In particular, point-to-point links in remote areas are undermining efficient use of this spectrum. For example, the 14MHz bandwidth links which have 15km protections up to the 2nd adjacent lot. This effectively prevents PTS registrations as it impacts up to 70 MHz of spectrum (i.e. 28 MHz +14 MHz +28 MHz). This lends strong support to the need for defragmentation of the band.

Optus has indicated previously that it does not oppose the expansion of the band arrangements in regard to the use of railway mobile radio (RMR) within 1900 MHz band. However, Optus has noted that the arrangements potentially introduce inefficiencies into the use of the spectrum through co-existence measures and interference mitigation measures. Ultimately, Optus considers

that the bands would be better utilised if RMR were relocated to another spectrum band and the 1800 band was harmonised for mobile operators.

In regard to the 2100 MHz band– Optus notes that the large number of PTS licences in use in regional/rural areas mean that there is significant administrative burden in effectively managing these types of licences for both mobile operators and the ACMA.

To address these inefficiencies, Optus consider that at least part of both these bands should be made into spectrum licences. This could be done under the guise of multi-band harmonisation of licence conditions (including geographically).

- (c) **2300 MHz** – Optus faces ongoing issues of managing interference with NBN Fixed Wireless access (“FWA”) services in this band. While we acknowledge that the current 98 MHz of spectrum available in the 2.3 GHz band is not optimised for this use, we welcome the ACMA’s position that an update will be provided in the next FYSO.
- (d) **3600 MHz** – the regional licences in the 3.6 GHz are still subject to a reallocation period which does not conclude until March 2025. This has delayed the use of this band for mobile services as it has prevented licence holders from switching on sites due to the risk of interference with incumbent services. This band serves as an example of the negative impact of disproportionately long re-allocation periods on spectrum utilisation.
- (e) Ongoing issues with the unresolved issue of interference management in the Urban Excise areas and its effect on adjacent (and co-) channel neighbours. Optus views on this are expanded on in response to question 4.

4.2 Optus notes that it intends to make further detailed comments in relation to band specific matters during further engagement with the ACMA through the ESL process.

Section 5. OTHER MATTERS THAT THE ACMA SHOULD CONSIDER IN DESIGNING THE ESL FRAMEWORK

Question 4 – Are there any other matters that we should consider in connection with the ESL process?

- 5.1 Optus considers that the ACMA’s proposed ESL process and assessment framework, particularly the matters raised under the “Approaches to examining use” section of the Consultation Paper, raises the following concerns in relation to the future use and ultimately the value of ESL spectrum:
- (a) The potential introduction of new or varied spectrum licence boundaries
 - (b) The potential reduction in the amount of spectrum available for current licensees to renew
 - (c) The potential revision of core conditions for coexistence and coordination
 - (d) The potential for changes to licence types
- 5.2 Optus cautions against an approach that would dilute the exclusivity and certainty of spectrum access that has been afforded to spectrum licences to date. If the intention is to accommodate a “diverse range of use cases” to address perceived unmet demand for localised connectivity, then Optus requests that the ACMA substantiate the decision to allocate this spectrum on the basis of highest value use and/or the public interest.
- 5.3 Optus notes that exclusive use of spectrum for mobile services has led to material economic growth, estimated to be worth around \$37 billion by 2030. Mobile services are essential to Australian businesses and consumers and mobile operators are providers of national critical infrastructure. It is incumbent on the ACMA to demonstrate that alternative uses produce greater public benefits.
- 5.4 If spectrum is allocated elsewhere and is not used or offered for sale, then spectrum may be stranded – particularly if it is not easily tradeable – or consolidated into one licensee, undermining competition in the market, and threatening substantial economic growth potential.

Introducing new or varied spectrum licence boundaries

- 5.5 Optus notes that most ESLs are held by national licensees, affording those licence holders the certainty to deploy and operate their national networks. These networks serve millions of Australian businesses and consumers on a daily basis. National spectrum licences allow mobile operators the flexibility to expand and enhance those networks efficiently and cost effectively.
- 5.6 The Australian mobile sector is characterised by high initial fixed cost investment but low marginal cost. Mobile networks are national networks with wide area coverage and large customer bases which leads to economies of scale and highly efficient use of spectrum. The introduction or variation of spectrum boundaries into national licences creates complexity and additional cost in terms of interference management, introduces inefficient spectrum use and fragments spectral and geographical holdings. This fragmentation undermines the value of spectrum licences in the secondary market if the spectrum products are inconsistent and can, in turn, undermine longer term investment in networks.

- 5.7 Optus suggests that any proposal to introduce or change licence conditions into national ESLs must be demonstrably in the public interest. If the ACMA is considering the geographical split of expiring spectrum and forming boundaries where the current and planned coverage or service offering from an incumbent licensee's ends, Optus advises extreme caution. This approach is not advisable as it neglects to consider the effects of co-channel interference in border regions on either side of any mooted spectrum licence boundary.
- 5.8 At any co-channel spectrum boundary, under the existing spectrum licence technical frameworks, the licensees are required to comply with the device boundary criterion set out in Section 145 of the Act. This is to ensure that the licensees are afforded the necessary protections to operate their network without harmful interference from their geographical neighbours. Previous decisions regarding the proposed and implemented boundaries in at least two bands should be at the forefront of the ACMA's thinking when deciding whether this course of action should be considered for any of the ESLs. Examples of Optus concerns are discussed in **Appendix B**.
- 5.9 If there is latent or unmet demand for spectrum currently held by spectrum licensees under national licences, Optus has not been made directly aware of this. At no time have aspirant licensees contacted Optus to propose arrangements to gain access to spectrum in the markets outside the current areas of operation of Optus' network coverage that are purported to be under-served. Furthermore, there is no evidence that this 'latent' demand results in public benefits greater than the provision of mobile and WBB services.

Reducing the amount of spectrum available for current licensees to renew

- 5.10 At the time of acquisition, spectrum licensees would have carefully considered the optimum amount of spectrum needed to meet their current and future capacity, quality and capability requirements to satisfy customer expectations and demand growth, based on the information available at the time. However, typically customer demand has been underestimated by operators and the need for additional spectrum has increased over time.
- 5.11 If the ACMA is contemplating a reduction of available bandwidth in one more of the ESL bands, the impact will be felt by the licensees and their customers in terms of service extent, quality and depth of coverage, speed and capacity. Given that licensees seek to differentiate their services on the basis of these features, any reduction in the amount of spectrum available will have the effect of blunting competition.
- 5.12 Furthermore, if the amount of spectrum for any given licensee is reduced, there may need to be increased deployment to support coverage/capacity driving additional costs into licensee networks as new site deployments are the only lever available in the absence of sufficient spectrum to meet CX and capacity demands.
- 5.13 If any carved-out spectrum is set aside for new use cases, it is incumbent up on the ACMA and the aspirant licensee or use case to demonstrate how this action has the effect of improving the efficiency of spectrum use in the band or bands in question – compared to allocating the spectrum to what the ACMA recognises as being an essential service. There are existing market-based mechanisms to facilitate secondary market trading and/or third-party authorisation that enable use of part of the licensed frequency band. Any proposal to change the core conditions of a licence relating to frequency must demonstrate the failure of these arrangements to meet demand.
- 5.14 Optus repeats that the provision of mobile services through the ESLs has resulted in billions of dollars of extra economic activity and public benefits. It is estimated the continual use of ESLs for mobile services in 2030 could add \$37 billion in public benefits each year. Mobile services are essential to Australian businesses and consumers and mobile operator are providers of national critical infrastructure. The burden lies with the

ACMA to demonstrate public benefits of reduced, or alternative, use results in greater public benefits.

Revised core conditions for coexistence and coordination

- 5.15 Imposing sharing requirements on spectrum licences, beyond how spectrum is allocated and shared across geographical boundaries will introduce many issues and is unproven as a viable option to provide additional utility and efficiency to spectrum that is already licenced and in use.
- 5.16 Any consideration of dynamic spectrum access (“DSA”) should pay very close attention to a number of critical elements, including who pays, who benefits, how interference is managed, how spectrum licence protections are measured and enforced and how is the success of such a scheme measured.
- 5.17 Optus has consistently opposed the introduction of any DSA or database-based sharing scheme as we consider them to be unfit for purpose under the spectrum licence regime that the ACMA adopts and we see no reason to alter either the spectrum licences or the sharing requirements associated with them. Optus considers that such a proposal introduces the following inefficiencies into the management of ESL spectrum:
- (a) Varying both or either of the s145 DBC or level of protection requirements for spectrum licensees (whether across licence boundaries or between frequency adjacent licensees) to accommodate alternative use cases that are unable to comply with existing 3GPP requirements constitutes inefficient allocation and use of the affected spectrum.
 - (b) For WBB use cases (the vastly predominant use case for ESLs), introducing protection and interference criteria that vary from 3GPP undermines the efficiencies of scale that a common global standard confers (i.e. interoperability and scale of production etc)
 - (c) Requiring local versions of equipment (whether at source or by retrofitting filters or other mitigations) drives costs into national service providers, making it more complex and challenging to deploy technology and services at scale. This is a poor outcome for licensees, customers and downstream markets alike.
- 5.18 A pertinent example of requiring varied protection levels would be the current state of the Urban Excise area in the 3.4 GHz band. Due to the boundaries that have been adopted and the protection and interference criteria required to ensure the ongoing operation of the NBN FWA network, the ACMA has, at the time of writing, been unable to determine the appropriate interference management techniques or how they may be implemented. This means that 75MHz of prime TDD spectrum is unavailable for use. This specific example is also addressed under licence boundary introduction and Optus’ opposition to this approach.
- 5.19 Regardless of the approach adopted to interference protection and emissions management, the ACMA should ensure that within any band, in its entirety, allocated to IMT or 3GPP use, should be consistent and aligned with 3GPP across the whole frequency range and all geographical areas and any boundaries for all licensees.
- 5.20 Optus repeats that the provision of mobile services through the ESLs has resulted in billions of dollars of extra economic activity and public benefits. It is estimated the continual use of ESLs for mobile services in 2030 could add \$37 billion in public benefits each year. Mobile services are essential to Australian businesses and consumers and mobile operators are providers of national critical infrastructure The burden lies with the

ACMA to demonstrate public benefits of reduced results as a result of DSA or database-based sharing scheme results in greater public benefits.

Changing Licence Types

- 5.21 The ACMA have adopted area-wide licences (AWLs) in recent years. If a change in licence type from spectrum licenced spectrum, this would seem to be the most logical variation that would be considered, however there are a number of reasons why this variation would not be appropriate, as discussed below.
- 5.22 It should be noted that the utility of AWL licences has previously been questioned, especially for use in mid-band spectrum as the LOP and emissions limits associated with AWLs may be very challenging to meet if the AWL areas are either too small or are likely to cause interference (due to their proximity) to spectrum licenced areas operating on the same or adjacent frequencies.
- 5.23 Optus is also of the view that, for bands where spectrum is scarce (typically low-band and some mid-band bands), the ACMA should not consider the use of AWLs. They are best suited where there is an abundance (>100MHz) of spectrum available to provide multiple licensees access to the band while maintain a viable channel bandwidth to support 3GPP services (typically 20MHz bandwidth or more).
- 5.24 This would therefore exclude any consideration of spectrum licenced FDD bands for AWL allocation. Given that these are a large part of the existing WBB networks providing service over the whole of Australia, this further reinforces Optus' position that the ACMA should offer all ESL bands for renewal, in their entirety, should a licensee wish to do so.
- 5.25 In order to change the licence type of any band, the ACMA would be required to change the geographical boundaries of current spectrum licences, reduce the amount of spectrum in a band, refuse to renew a band or a combination of these actions. Optus strongly opposes this.
- 5.26 In summary, Optus is of the opinion that one or more of the possible approaches to "freeing up" spectrum currently spectrum licenced to mobile operators is a risky proposition and may result in unintended outcomes such as consolidation of spectrum holdings resulting from third-party authorisations or sale of stranded spectrum assets to the dominant, poor spectrum efficiency, sub-optimal consumer and business customer outcomes and failure to deliver on regional connectivity and the economic benefit of 5G.
- 5.27 Optus notes the ACMA's recent announcement to use Area Wide Licences (AWLs) to assist rollout of localised wireless broadband including 5G and private networks in the 3.4-4.0 GHz band. This allocation reflects a good example of AWL use and Optus suggests that the ACMA should not seek to extend the use of AWLs below this spectrum band until it is proven to deliver the intended result and due to the risks of creating too much complexity in spectrum management thereby undermining utility.

Section 6. PRICING – APPROACHES TO VALUATION AND PAYMENT

Question 5 – What are your views on the proposed approaches to valuing spectrum and payment arrangements?

- 6.1 Optus welcomes the ACMA’s discussion of proposed approaches to valuing spectrum and payment arrangements. Optus stated in our Draft FYSO 2023-2028 submission, renewal pricing and allocation methods should be designed to enable the economic benefits of 5G and 6G to the Australian economy, by ensuring fair, reasonable and suitably certain long-term access to the required spectrum. The ACMA’s approach to valuing spectrum and payment arrangements must reflect its mandate to manage spectrum in the long-term public interest.
- 6.2 As discussed in response to question 2, Optus considers that an initial 2-month consultation on proposed approaches to spectrum access charging, including valuation methodologies and inputs be conducted in November this year, followed by a series of Tune-Ups in Q2 2024 and consultation on the ACMA’s preliminary view on pricing in October 2024.
- 6.3 The importance of both renewal and price certainty, ideally across all ESL bands, is crucial for any ESL spectrum valuation. The ACMA could then issue its “preferred” pricing option later in Stage 3 (March 2025) with any band specific refinements detailed during Stage 4.
- 6.4 Key points that Optus wishes to highlight for the ACMA to consider in its development of its approach to valuation and payment are:
- (a) There is no use case for ESL spectrum that provides greater public benefit than mobile services or WA WBB (i.e. there is no “higher value use”).
 - (b) High spectrum prices undermine sustainable competition and investment in 5G and 6G – any short-term benefit of higher renewal fees to public finances should not override broader long term economic benefits that will flow from increased network investment supported by lower renewal prices.
 - (c) Revenues per MHz are falling, so prices per MHz need to fall in order to ensure a sustainable mobile industry.
 - (d) The more capital spent on spectrum, the less remains available for network investment, undermining Government objectives for the sector.
 - (e) Market-based allocation mechanisms are only relevant to allow spectrum to be allocated to those who value it the highest (i.e. the most efficient use).
 - (f) Where allocations are already efficient, there is no role for market-based allocation mechanisms. For operators that require the spectrum they have now and if there is no change in use, any spectrum fee above administrative cost recovery is a tax that decreases the public benefit of use.
 - (g) An administrative based price for spectrum, reflecting the cost of administration, should be the default approach to pricing where ESL renewal is deemed to meet the public interest, is of HVU and there is little alternative interest expressed.

- (h) Spectrum pricing and allocation methods should be designed to enable the economic benefits of 5G and 6G to flow to the Australian economy by ensuring fair, reasonable and suitably certain long-term access to the required spectrum.
- 6.5 Optus considers that erring on the side of lower prices is consistent with the Act, given the long-term economic benefits that will flow from greater spectrum utilisation. In view of the long-term socio-economic benefits of lower spectrum prices, such as significantly increased network quality and usage, there is a strong case for the ACMA to renew ESL spectrum for a fee that recovers the administrative costs of ESL spectrum management to the ACMA.
- 6.6 Spectrum pricing based on the recovery of the administrative cost of spectrum management activities by the ACMA is justified on the basis of the long-term economic and social benefits that would flow from the greater levels of investment. As noted above, the continual use of mobile services is estimated to result in \$37 billion in public benefits each year by 2030. These public benefits assume that mobile operators can continue to invest to deliver the network services needed to drive digitalisation of Australia. High spectrum fees undermine this and threatens the realisation of these public benefits.
- 6.7 As noted, mobile and WA WBB have delivered enormous public benefit to Australia and its economy. On this basis alone, there is no higher value use case for ESL spectrum. Any erosion of the scope of the rights afforded to spectrum licensees to accommodate new use cases must be justified on the basis that such alternative use cases will deliver greater public benefit.
- 6.8 Where this is not established, or there is no expression of alternative demand or use for ESL spectrum, the ACMA should renew the spectrum at a nominal price. To charge more than this may amount to a tax on incumbent licensees. Such charging is implicitly discouraged under the Act.⁵⁶ The GSMA note that: "While auctions can work well for initial spectrum assignments, they are almost always inappropriate in the case of renewing mobile spectrum licences that are expiring".⁵⁷

The negative impact of high renewal fees on investment

- 6.9 Mobile operators fund spectrum renewal fees and network investment from the same investment pool. High spectrum prices reduce the funds available to invest in network customer experience. As the GSMA has observed, "countries that persist with excessive pricing... risk experiencing a widening gap in quality and pricing of the mobile services available".⁵⁸
- 6.10 On the other hand, lower spectrum renewal pricing enables mobile operators to fund investment in 5G and future 6G infrastructure and deliver digital transformation. If the price of spectrum is "ineffective", then there is a risk that the spectrum will not be allocated. In a competitive market, low spectrum prices can be passed onto consumers through lower prices and superior networks.⁵⁹
- 6.11 Spectrum licence fees are a significant cost for mobile operators and the cost, including the cost of capital for the initial investment, has to be recovered over time for a sustainable industry. Absent retail price increase for services – which may be

⁵⁶ section 297 of the Act

⁵⁷ GSMA, Auction Best Practice, p.5

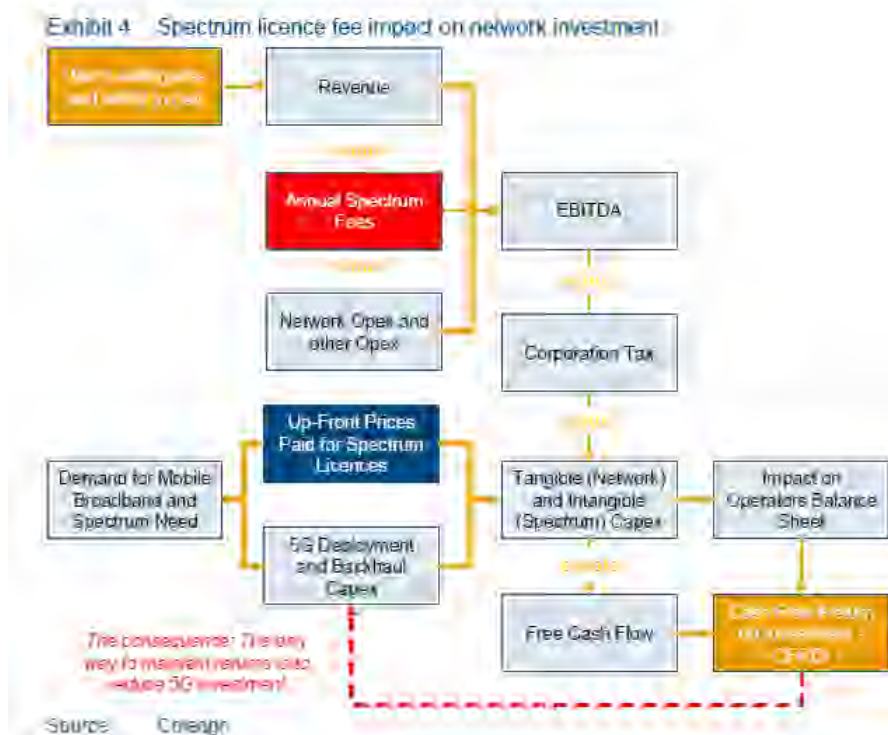
⁵⁸ NERA, Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, Report for the GSMA, February 2017, p.13

⁵⁹ Ibid, p.15

competitively difficult or have a knock-on effect on usage – operators have limited options to reduce tangible capital expenditure.

- 6.12 In short, high spectrum prices make the business case for future investment in 5G and beyond less viable. Renewal fees should be set at a level that provides appropriate incentives for operators to continue to invest in providing services. Figure 4 below illustrates the mobile operator business model with the tangible (network) /intangible (spectrum) capex coming from the same investment pool and directly impacting cashflow.

Figure 4 Spectrum licence fee impact on network investment



The financial state of the mobile sector and the need for a long-term view on pricing

- 6.13 Revenue generation from existing mobile broadband services has become more challenging worldwide, over the last 10 or 15 years. Average mobile data usage and mobile broadband speeds continue to increase substantially and are being boosted further by 5G⁶⁰, while consumers have a lower willingness to pay much more for monthly mobile subscriptions⁶¹.
- 6.14 The capacity for mobile operators to generate an appropriate return⁶² on invested capital when revenue has stalled. The need for spectrum is driven by the sharp increase in mobile data traffic. A recent Tefficient study has demonstrated that mobile data usage per SIM has increased more than 40% in Australia over the last year, resulting in average revenue per GB in Australia plummeting 27%.
- 6.15 The spectrum is used to increase capacity and reduce the cost per bit. A lower cost per bit allows operators to pass on the benefit of additional spectrum to mobile users in the

⁶⁰ ACMA, Draft FYSO 2023-28, p.14

⁶¹ <https://www.ericsson.com/en/reports-and-papers/mobility-report/articles/5g-driving-revenue-growth-in-top-20-markets>

form of lower prices per bit and higher data speeds. Lower prices per bit reflect the dramatic increases in average usage have allowed more efficient spectrum utilisation.

- 6.16 As a result, additional spectrum delivers socio-economic value, far more than private value to operators and far more than revenue to government. A range of academic papers support the view that the benefit from spectrum allocation is derived from its use and not the revenue raised at allocation. A report from NERA Consulting demonstrated that in 2016, lower spectrum fees in Australia would forego \$18USD/pop but would result in \$83USD/pop increase in consumer welfare.⁶³ While numbers vary over time, the available evidence demonstrates that the welfare impact of releasing spectrum to the market at lower cost will outweigh any foregone government revenue.⁶⁴
- 6.17 Optus submits that to promote the public benefit, spectrum renewal fees should reflect that mobile service revenue per MHz of spectrum used has declined sharply over recent years. The attached Venture Insights report highlights that there is a growing digital investment gap resulting from the increasing divergence between the capital costs to build operator revenues. If left unaddressed, this investment gap threatens Australia's digital future.
- 6.18 One consequence of this trend has been significant decline in ROIC in the telecommunications industry over the last five years (Figure 5), which is an indicator of reduced capacity to invest in the infrastructure that delivers services.

Figure 5 Decline in telecommunications industry ROIC



Source: Venture Insights

Optus response to ACMA pricing discussion

- 6.19 Optus welcomes the opportunity to comment on the ACMA's high level outline of the possible approaches it may take to pricing ESL spectrum. In addition to the public interest criteria discussed in response to Question 1, Optus notes that its response to questions 3, 4 and 6 are relevant to its view in relation to the other proposed approaches. As stated elsewhere, the nature and scope of changes to licence conditions, as well as restrictions on the use of spectrum licences, either in the lead up

⁶³ NERA, Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, Report for the GSMA, February 2017, p.35

⁶⁴ Hazlett & Munoz, 2009, A welfare analysis of spectrum allocation policies, RAND Journal of Economics, Vol. 40, No. 3, pp. 424-454

to the expiry or as a requirement of renewal, will clearly impact on the value of ESL spectrum to operators. Optus notes that spectrum licences have to date been afforded a relatively high degree of exclusivity and certainty – that, if eroded, may undermine long term investment in critical communications networks and services.

- 6.20 Optus looks forward to providing more detailed feedback as the ACMA develops its preliminary view, preferably through an advanced pricing consultation paper in Stage 2. Specifically, we consider that the pricing paper should:
- (a) Recognise that mobile infrastructure is nationally critical infrastructure, that mobile services are an essential service, and consider spectrum pricing as a means to support long term industry sustainability and the ongoing supply of essential services.
 - (b) Reject the consideration that an auction avoidance price is appropriate for spectrum renewal. Licensees should not have to face a premium price to retain existing spectrum, at the expense of continued investment incentives and future innovation opportunities, to ensure service continuity of existing services and network reach can be maintained.
 - (c) Reject the use of market-based allocation methods for renewals of ESLs that are already in use and are deemed to be efficiently used.
 - (d) Recognise there are different pricing methodologies that can be considered for spectrum renewal. Each offers different investment incentives, which may support different policy outcomes, and will have different downstream implications for end-users. A high spectrum renewal cost must be balanced against other public interest criteria, to ensure that the socioeconomic benefits (direct and indirect) of efficient spectrum allocation are not compromised.
- 6.21 More broadly, all spectrum pricing decisions should also be accompanied by a statement of reasons to outline the rationale for the pricing arrangement to be adopted for the relevant band. This will ensure greater transparency in the decision-making process, while not limiting the ACMA's powers to review the allocation decision for any available, or expiring, spectrum when the time arises.

Pricing considerations for spectrum renewal

- 6.22 There is a direct trade-off between the amount of spectrum allocated to an operator, the cost of deploying network assets, and the available capacity on the network. In practice no operator would incur the significant costs associated with network investment when there is any doubt over the ongoing control of critical spectrum assets. Unlike the previous renewals process where spectrum bands still remained relatively separate, this concern is exacerbated in the current ESL process given the increasingly multi-band spectrum strategy adopted by mobile operators to support current downstream uses.
- 6.23 A failure to re-issue existing spectrum licences, particularly where the spectrum asset forms a core network input into the business, would have negative consequences for infrastructure investment – and threaten the billions of dollars of economic activity that is dependent on mobile networks. Given the significance of spectrum as a key underlying network input for the provision of a mobile service, any significant reduction in an operator's core spectrum holding could result in customers losing access to the service.
- 6.24 Optus discusses some of the pricing methodologies below, with further detailed comments to be provided once the pricing paper is released.

Auction avoidance pricing can carry significant risks to the economy

- 6.25 Optus strongly rejects the premise that spectrum renewal prices should be set at a premium based on avoiding the uncertainty and potential costs of an auction. This is also akin to setting the spectrum access charge at a price point above the lower bound of any estimated price range for a spectrum band. Operators do not inherently place any value on avoiding an auction, as auction participation will always carry the risk of higher auction prices to the broader economy. It seems counter-intuitive to recognise that auctions have negative economic impacts, such as disruption to investment financing due to uncertainty over future spectrum holdings and potential delays, and that this could be avoided by setting spectrum renewal prices at a premium.
- 6.26 The 900 MHz spectrum auction held in 2021 adopted the use of set-asides, as a form of auction avoidance pricing. The purpose of the set aside was to ensure continuity of service, which was broadly accepted on public interest grounds. However, Optus strongly objected to the premium set aside price on the reserve price. TPG was similarly offered and did not accept the set-aside offer. In fact, no mobile operator supported the concept of a premium price being set for an “auction avoidance uplift”. Spectrum allocation, including setting related price terms for spectrum renewals should support the Government’s policy objectives rather than used as a means of maximising Government revenue.

Administrative cost pricing

- 6.27 Optus consider it would be appropriate for the ACMA to take a conservative approach to setting spectrum access charges (that is an approach which errs on the side of low charges). For example, an administrative based price for spectrum, reflecting the cost of administration, should be the default approach to pricing where ESL renewal is deemed to meet the public interest, is of HVU and there is little alternative interest expressed.

Section 7. APPROACHES TO EXAMINING SPECTRUM USE UNDER ESLs

Question 6 – What are your views on the proposed approach to examining use under existing spectrum licences?

- 7.1 As a finite national resource, the efficient utilisation of spectrum is central to maximising the public benefit derived from the spectrum. Mobile networks and services are, and will continue to be, highly efficient users of spectrum as a necessary characteristic of their network design and operation. While competing demand for access to spectrum is set to increase, mobile operators will need all existing spectrum and more to meet future demand. In Optus' view, there is little evidence that re-allocating or auctioning the spectrum is likely to increase the public benefit from spectrum use.
- 7.2 The ACMA has stated that it intends to examine use of spectrum under existing spectrum arrangements as part of its assessment of ESL options. The Consultation Paper discusses the following “dimensions” of use that the ACMA may consider:
- (a) Service coverage
 - (b) (Overall) spectrum utilisation
 - (c) Investment and innovation
 - (d) Use-cases
 - (e) End-users
- 7.3 The ACMA has indicated that it intends to consider incumbent and prospective use of the spectrum “across all spectrum licences, including those not due to expire”. The ACMA proposes to gather data to inform its assessment via information requests during Stage 2. As set out in our response to Question 2, Optus is keen to engage with the ACMA throughout the ESL Process, to address any identified inefficiencies in spectrum utility, including those that flow from existing technical frameworks and licensing arrangements, such as cause the fragmentation of spectrum bands.
- 7.4 Optus submit that if the ACMA decide to hold an auction of ESL and the net result is that the existing spectrum holders retain the spectrum, albeit some consolidation with dominant operators acquiring more of the spectrum, this would indicate that the ESL process had failed, because the auction would have caused unnecessary disruption and uncertainty to the industry with no higher value use identified and no public gain. The ESL process should correctly identify whether there is a higher value use prior to any decision to hold an auction.
- 7.5 Optus provides high level feedback on its principal concerns relating to the ACMA's proposed approach. Optus then provides comments on the proposed approaches to examining use below.

Efficient utilisation of spectrum is an essential objective of the ESL process

- 7.6 The ACMA has indicated that it intends to consider incumbent and prospective use of the spectrum “across all spectrum licences, including those not due to expire”. The ACMA proposes to gather data to inform its assessment via information requests during Stage 2.

- 7.7 Optus accepts that spectrum use is highly relevant to the ACMA's assessment of ESL options, including with respect to several of the public interest criteria, most notably efficiency. Optus recognises that promoting the efficient use of the spectrum is an essential objective of the ACMA spectrum management role and will be relevant to considering whether to renew an ESL. However, the degree to which past use will be a determinant of future utility must be carefully weighed.
- 7.8 Mobile services are efficient users of spectrum from both a technical and economic sense. Using traffic delivered over spectrum as a proxy for socio-economic benefit, there is no more publicly beneficial use case for existing ESL spectrum than mobile and WBB services. Multiple economic studies have demonstrated the many billions of dollars of national economic output that is dependent on mobile services.
- 7.9 Optus and the other operators have strong incentives to use their spectrum efficiently to serve their customers, to avoid the need to spend more on deploying sites, which will always be more costly and time consuming than deploying unused spectrum (assuming spectrum prices reflect economic cost).
- 7.10 As set out in our response to Question 2, Optus is keen to engage with the ACMA throughout the ESL Process, to address any identified inefficiencies in spectrum utility, including those that flow from existing technical frameworks and licensing arrangements.

Assessment of use must be proportionate, transparent and based on substantiated need

- 7.11 Optus understands that there is a perception of growing demand for spectrum currently used by mobile operators, including from local area private network operators.⁶⁵ Optus notes that it has not been approached by any smaller operators or non-mobile operators seeking access to our spectrum and therefore question the degree to which there is in fact unmet demand. Optus notes that a localised granular analysis of spectrum use in a particular area may reveal a comparatively low level of existing and planned use by operator customers relative to the planned use of a prospective private network operator.
- 7.12 In this context, Optus is concerned about a number of potential unintended consequences of the ACMA's proposed approaches to examining use. For example, the level of granularity to which the ACMA intends to examine use must be reasonable and reflect the context of the services being analysed or otherwise risk an unfair comparison.
- 7.13 Further, the evidence of use must be carefully balanced against other objectives, such as continuity of service, and the impact of "cherry picking" on industry sustainability. The ACMA must also be mindful of the extent to which its analysis may unreasonably call into question the rationality of business investment decisions – particularly if the results are to be publicised.
- 7.14 To this end, the ACMA must compare "apples with apples" in assessing the degree of spectrum efficiency achievable by a particular use case. The collection of significant amounts of data related to spectrum usage will also impose an administrative burden on operators.
- 7.15 Optus is also concerned by the example cited by the ACMA that "re-allocating spectrum could enable us to retest and optimise productive and allocative efficiency for the spectrum, while renewal may have limited utility in addressing allocative inefficiencies".

⁶⁵ Ofcom report, p.50

- 7.16 Optus appreciates that renewal will not “test” the market demand for the spectrum in the same way that an auction does. The ACMA has more than 20 years of data on testing the market for mobile services – there is little if any genuine interest outside the large mobile operators. However, Optus notes that “testing demand” is not an appropriate approach to maximising utility or promoting the public interest. The ACMA would appreciate that a decision to proceed to auction ESL will have significant operational and business impacts for incumbents that cannot be easily unwound if the auction fails. Further, the desire to ‘test demand’ appears at odds with the ACMA’s view that mobile services are essential services and should be ‘regulated’ as such.⁶⁶ Optus submits the ACMA should reflect on the extent to which this is consistent with its views over the essential nature of mobile services.
- 7.17 The ACMA should have very clear reasons and evidence for re-allocating spectrum, based on the public interest criteria, before it makes any decision to proceed to auction. In Optus’ view this requires transparency about all prospective new use of ESL spectrum that may be submitted to the ACMA through its data collection processes. Incumbents should be afforded the opportunity to assess the validity of such claims and provide submissions in response.
- 7.18 Optus proposes that if the ACMA decide to hold an auction of ESL and the net result is that the existing spectrum holders retain the spectrum, albeit some consolidation with dominant operators acquiring more of the spectrum, this would indicate that the ESL process had failed. This is because the auction would have caused unnecessary disruption and uncertainty to the industry with no higher value use identified and no public gain. The ESL process should correctly identify whether there is a higher value use prior to any decision to hold an auction.
- 7.19 Optus comments on the proposed approaches to examining use below.

Service coverage – the ACMA must compare “apples with apples”

- 7.20 Optus suggest that, in the interests of efficiency, the ACMA seek access to information relevant to service coverage provided by carriers to the ACCC under the Infrastructure Record Keeping Rules (RKR) of the CCA.
- 7.21 Coverage predictions involve complex propagation modelling parameters, site configuration data as well as terrain, clutter and population data. Coverage plot generation is a resource intensive exercise which is heavily dependent on data integrity. The large datasets combined with different input assumptions can result in outputs which may be wildly inaccurate in specific local areas, should there be any errors in the input data.
- 7.22 The ACMA states that “service coverage is an important dimension of use as it can indicate the overall utility derived from the spectrum, geographic utilisation, and the potential public impact of any options under consideration”.⁶⁷ The ACMA then proposes a number of analytical tools to assist in assessing service coverage, including propagation modelling, noting the need for a standardised set of assumptions to facilitate useful comparison.
- 7.23 While the use of network coverage (both current and planned) can assist in determining the presence of service to customers, Optus agrees that it is not appropriate to rely upon coverage predictions as the sole arbiter of where spectrum can be considered “utilised.”

⁶⁶ Speech by Nerida O’Loughlin PSM, ACMA Chair, CommsDay Summit 2023, <https://www.acma.gov.au/publications/2023-05/speech/speech-nerida-oloughlin-psm-acma-chair-commsday-summit-2023>

⁶⁷ ACMA, Consultation Paper, p.29

Coverage maps should not be relied upon to determine spectrum usage as they are normally provided for current networks and forecasts of up to only three years in advance of network build, whereas intended build programs (where no coverage is published) will run up to five years into the future. This means that the outer two years of planned network build and spectrum use will not be captured using coverage plots. In addition, spectrum licences can last up to 20 years. There is no accurate planned use at a site, cluster, town area or other geographical extent this far into the future.

- 7.24 Similarly, if determining the availability of spectrum for some other use, the absence of coverage is invalid as the measure by which this is decided. Sufficient radiated energy to cause harmful interference can and does persist many kilometres beyond the published or measured coverage provided by a cellular network. This is why the DBC under Section 145 of the Act exists and that geographically adjacent co-channel spectrum licensees take such great pains to coordinate and manage interference to acceptable levels between their respective networks.
- 7.25 If the ACMA is insistent on using coverage or a proxy for coverage as a determinant of spectrum utilisation, the only reasonable approach would be to perform a Section 145 DBC assessment on each current and future site for every sector and band in used for all mobile operator networks. This is clearly impractical on computational, complexity and duration grounds. It is also reliant on consistent and accurate data from all mobile operators and prospective licensees. Optus therefore considers coverage predictions or their proxy, regardless of the uniformity of their parameters, terrain and clutter used, to be insufficient and not useful for this purpose.

Spectrum utilisation – granularity of analysis must reflect specific use case

- 7.26 The ACMA describes examination of “overall spectrum utilisation” as “considering different dimensions of how licensed spectrum is used over the relevant licensed geographic area, including more specific breakdowns in particular geographic areas, such as urban, regional and remote areas”.⁶⁸
- 7.27 More specifically, the ACMA states that “a dimension of use is, therefore, to examine in which geographic areas the licensee is using the spectrum, and whether the licensee is making full use of the licensed bandwidth”⁶⁹
- 7.28 Optus agrees that as a general principle, analysis of spectrum utilisation may assist with information that can be gathered via service coverage analysis. However, Optus is very concerned about the potential complexity and ultimately the resources required, to undertake the analysis contemplated under the proposed approach to examining spectrum utilisation. It is also unclear to Optus as to how the ACMA would go about gathering the data required for its analysis.
- 7.29 If overall spectrum utilisation is to be employed as an analytical tool, it will be important to articulate standardised relatively simple methodology that does not lead to unnecessarily complicated outputs. The analysis must be transparent and robust and based on objective universally applicable units of measure.
- 7.30 Using the Australian Spectrum Map Grid (ASMG) and HCIS cells as the unit of analysis appears intuitively correct. However, as the ACMA notes, the HCIS does not necessarily reflect demographic or geographical realities – there would be low levels of usage in a particular coverage area because it is in an unpopulated or infrequently visited area (national park etc). Also, site locations are not necessarily in the same HCIS and the key

⁶⁸ Ibid, p.28

⁶⁹ Ibid, p.28

area of coverage. For example, a single site may provide full coverage to a regional town but be situated outside the HCIS block containing the town. Such a finding would not in and of itself be indicative of inefficient spectrum utilisation and Optus would reject any suggestion that the analysis be used to critique of the rationality or reasonableness of investment decisions.

- 7.31 Consistent with our view on the importance of transparency in this process, Optus considers that the ACMA should publish its findings on spectrum utilisation for incumbent licensees, along with the reasons for the findings and how the tests influenced the outcome. The same rigour should be applied to aspirant licensees with plans for spectrum, in order that stakeholders may test the claimed efficiency gains and outcomes.
- 7.32 An absence of current use (whether by geography or bandwidth) cannot be taken as an absence of need to access spectrum in the future. Adequately capturing plans for use will be critical in determining spectrum utilisation and the ACMA should consider appropriate means for determining this. Optus endorses the ACMA's comment that
- "holding unused spectrum can also potentially provide licensees utility by providing greater flexibility to deploy or adjust services on a needs basis in the future, particularly in bands where significant new releases of spectrum are not expected over the term of a licence. In such cases, the length of time that the spectrum has not been used, or underused, would need to be considered in connection with technology and investment cycles, and anticipated future use of the spectrum".⁷⁰
- 7.33 An example of where erroneous conclusions for spectrum utilisation may be drawn would be for the 3.6GHz band, where an excessive reallocation period for incumbent WISPs has hamstrung Optus' ability to deploy in some regional towns. Similarly, a slowly developing network or device ecosystem may stymie a licensee's desire to utilise spectrum efficiently or in a manner it desires, for example the lack of available iPhone mmWave devices currently available.
- 7.34 Furthermore, intended use of spectrum should be considered until the end of the existing licence period as licensees will continue to make investment decisions on the assumption of ongoing access to a band, unless the ACMA clearly indicates otherwise.

Levels of previous and planned investment in use of spectrum and deployments

- 7.35 Optus welcomes the ACMA's proposal to have regard to historic as well as planned and anticipated investment and innovation in assessing the efficiency of spectrum use. However, given the highly commercially sensitive nature of the information that may be involved in this assessment, Optus seeks clarification on the manner and form of the data upon which the ACMA proposes to conduct its analysis.
- 7.36 Optus notes that most ESLs are national licences and afford licence holders the certainty to deploy national networks. This certainty has helped support the deployment of national mobile networks that serve millions of Australian businesses and consumers on a daily basis.
- 7.37 The deployment of national network involves vast capital expenditure. Licensees with nation-wide licences have and will continue to invest in Australian telecommunications infrastructure and services. Over the past 30 years, Optus has provided Australians with a choice for their telecommunications needs, a competitive alternative to the monopoly

⁷⁰ Ibid, p.20

provider that had been to that point the nation's only option. During this period Optus has invested some \$45 billion in Australian infrastructure, which in turn allows other companies to connect, sell, and thrive in today's digitalised economy

- 7.38 Optus also invests very heavily in spectrum, having acquired and renewed licences worth a combined \$1.9bn in the last five years alone and nearly \$4bn since 2013, including the recent 900 MHz and 26 GHz acquisitions. Investments of this magnitude are made on the basis of the spectrum licences providing sufficient certainty and exclusivity of spectrum access to support network and services deployment that meet the customer experience expectations of Australians.
- 7.39 As a national carrier, Optus enjoys significant economies of scale relative to smaller operators. This means that network deployments can be delivered more cost effectively.
- 7.40 The investment required for network densification and 6G will be significant. The benefits of scale efficiencies afforded to a national network operator in the deployment of infrastructure should not be underestimated.
- 7.41 Whilst Optus has current investment plans, these can often change quickly to accommodate changes in priorities. National Spectrum licences provide Optus with the ability to deliver services anywhere in Australia given the right commercial and strategic conditions. This includes programs such as government blackspot initiatives, potential private enterprise or business customers, whether within, adjacent to or remote from existing deployments, and responding to special events. Maintaining the ability of national carriers to expand coverage anywhere and everywhere is important so that customers within remote areas not only have coverage but also have the many additional services major mobile operators provide such as the Optus Living Network.

Different spectrum use cases

- 7.42 The use of spectrum for mobile and WBB services in Australia is often heavily influenced by international processes and the associated network equipment and device ecosystems. Any new use-cases for these spectrum bands would need to be adequately supported by international equipment and device manufacturers.
- 7.43 To Optus' knowledge, no other use cases are more efficient or deliver the same commercial or social outcomes. We welcome the ACMA to present evidence that an alternative use case would result in more than the estimated \$37 billion in economic value in 2030. If Optus believed that other, more efficient use cases were available then they would be pursued and implemented by Optus or Optus would have been approached to sell the spectrum on the secondary market for a premium on the Optus value can derive from the spectrum. This has not occurred.
- 7.44 Optus is also unclear how the ACMA would interrogate the veracity of claims by new entrants for "planned levels of use" that may be used to compare the utility of existing use cases with potential alternatives. Optus suggests that new entrants be required to provide evidence that they have the financial resources to support the significant investment required for their plans to be relied upon and that any such planned use will not cause harmful or service-affecting interference to existing networks. Optus looks forward to engaging with the ACMA through future consultation processes to ensure that such comparisons are fair and reasonable.

Subscribers and end-users

- 7.45 Optus does not support the use of this metric in determining spectrum utilisation. The SIO argument has been considered on multiple occasions with limited success. Given the fundamentals of the existing market have not changed since the last round of

arguments on this issue, it is unlikely that a review of the SIO argument will yield a different conclusion.

Proposed approach to gathering information and data analysis

- 7.46 Optus wishes to highlight when reviewing site data that a number of factors should be considered including deployment efficiency, deployment regulation interference issues, reallocation periods, energy efficiency, regulation, customer needs and future growth.
- 7.47 For example, in regard to deployment efficiency, Optus notes that the deployment layering strategy for low, mid and high band spectrum is highly differentiated. Low band spectrum (700/850/850e/900) provides a coverage layer and tends to be deployed ubiquitously and this can also apply for mid band spectrum when there is no low band coverage layer e.g., Optus deployed 1800MHz as the coverage layer for 4G prior to the deployment of 700MHz and 3.4-3.6GHz was the coverage layer for 5G prior to 900MHz spectrum being available. However, if a low band spectrum layer is available by technology, and mid band spectrum is being deployed for capacity, it will not be required ubiquitously, as additional capacity may only be required in specific locations over time depending on demand, but not on every site and not immediately.
- 7.48 In regard to interference considerations for deployment, Optus is not able to switch on all sectors on every site for every band, due to the need to comply with co-channel boundary interference licence requirements. For example, in the 2300MHz band, often only one sector on a site can be switched on to meet the interference coordination procedures with the NBN network. This results in “dead zones” across co-channel spectrum boundaries whereby no deployments can be made, denying services and /or reducing network capabilities to local customers.
- 7.49 Optus also encourages the ACMA to interrogate all expressions of interest in ESL spectrum received via information requests issued under section 78 of the Act (proposed for Stage 2). Similarly, claims of planned usage must be carefully tested. Optus proposes that the information requests in Stage 2 of the process should include “proof of use” data as per the previous renewal process, as proof of utilisation of spectrum and proposes that the data should focus on the deployment of existing active sites. For new entrants, planned use should be supported with evidence of the ability to deliver the planned use including financial backing, commitments and prior investment.
- 7.50 The mobile operator’s role is to provide the mobile network where customers need it and the customers choose to use the available network in a particular location (registering usage on a particular site deployed) or in the future. With the key issue being that the site is available for customers to use if they choose to. And therefore usage on a particular site is under the customers’ control and not under the control of the mobile operator. mobile operators deploy their expensive spectrum assets in line with their customers’ needs and their network deployment strategy to provide capacity and coverage to their customers unless there are regulations that prevent them from doing so (e.g. reallocation periods, interference issues).
- 7.51 In relation to the proposed approach to collecting information via data requests issued under the Radiocommunications Act, Optus reiterates that data requests must be justified based on the relevant purpose and regulatory power. They must be clearly articulated and understandable by the recipient.
- 7.52 In terms of the reliability of external sources of data, Optus agrees with the ACMA’s statement that “device registrations do not provide sufficient detail about how the spectrum is being put to use, and for what purpose, and that more detailed analysis of use is required. “Optus encourages the ACMA to have regard to the information collected by the ACCC via its RKR. For example, the annual Infrastructure RKR provides site ID, RFNSA ID, site name, site type (inbuilding etc), latitude/longitude,

Technical Units on each site by technology (3G,4G, 5G) by band and technology by band for handheld and external antenna, as well as coverage maps.

- 7.53 Optus proposes that the non-mobile operators who hold spectrum licences e.g., NBN, State Rail etc, who do not contribute to the ACCC Annual Infrastructure RKR” could be asked to provide same data for comparison.

Obstacles to efficient deployment

- 7.54 Optus notes that there are also numerous obstacles to efficient deployment presented by inconsistent State and territory planning laws, and the administrative burden, inefficiencies and high costs of land access under Schedule 3 of the Telecommunications Act. The Optus mobile network is designated critical infrastructure and as such is affected by numerous security requirements that are not applied to smaller operators. Further the consultation and approvals processes faced by national carriers cause significant delays in rollout. Optus refers the ACMA to the Australian Mobile Telecommunications Associations (AMTAs) recent submission to the Inquiry into Regional Mobile Infrastructure for further information on this matter.⁷¹

⁷¹ AMTA Submission to ACCC Regional Mobile Infrastructure Inquiry Report on Preliminary Findings 2023

Appendix A. SUGGESTED AMENDMENTS TO THE ACMA'S PROPOSED ESL PROCESS

ACMA proposed ESL Process	ACMA timeframe	Suggested amendments to ESL Process	Suggested timeframes
<p><u>Stage 1: Consultation on process</u></p> <p>Stage 1 aims to:</p> <ol style="list-style-type: none"> 1. initiate stakeholder engagement with the ESL process 2. develop and consult on proposals for: <ul style="list-style-type: none"> ➤ the new ESL process ➤ proposed public interest criteria ➤ approaches to considering use under ESLs. 	Q2/Q3 2023	<ol style="list-style-type: none"> 1. ACMA issues draft guidelines on ESL Process, public interest criteria and assessment framework 2. ACMA conducts Tune-up on ACMA's preferred approach to pricing and valuation 3. ACMA conducts Tune-up for interested stakeholders on preferred approach to "examining use" 	<p>Nov 2023</p> <p>Nov 2023</p> <p>Dec 2023</p>
<p><u>Stage 2: finalise process and gather information</u></p> <p>Stage 2 aims to refine and communicate the steps of the ESL process and confirm the assessment framework, including the public interest criteria.</p> <p>ACMA may also request information from incumbent licensees and other stakeholders on a range of issues, in particular:</p> <ul style="list-style-type: none"> ➤ incumbent levels of use and alternative use-cases ➤ demand for the spectrum 	Q1-4 2024	<ol style="list-style-type: none"> 1. Publish outcomes paper along with final version of ESL guidelines setting out <ul style="list-style-type: none"> ➤ the ESL Process ➤ public interest criteria ➤ preferred approach to examining use 2. ACMA issues s.78 notices inviting expressions of interest and/or requests for relevant information from stakeholders 	<p>Early Feb 2024</p> <p>March-May 2024</p>

<ul style="list-style-type: none"> ➤ identifying any band specific issues or inefficiencies (for example, fragmentation of existing holdings) ➤ market and competition issues ➤ the public interest. 		<ol style="list-style-type: none"> 3. ACMA issues consultation paper relating to pricing and valuation options for all ESL bands (2 months) 4. ACMA conducts series of Tune-ups for interested stakeholders on licensing arrangements, including licence conditions, and allocation options for ESLs 5. ACMA coordinate series of Technical Liaison Groups (TLGs) to identify and address technical issues undermining efficient use of ESL spectrum bands 	<p>April – June 2024</p> <p>April – June 2024</p> <p>May –Sept 2024</p>
<p><u>Stage 3: preliminary views</u></p> <p>In Stage 3, we will provide a preliminary view about the proposed future arrangements for spectrum subject to ESLs for each band for licences expiring between 2028 and 2032.</p> <p>During Stage 3, we are proposing to consider and form preliminary views on the appropriate arrangements for the spectrum. ACMA will examine:</p> <ul style="list-style-type: none"> ➤ Use-cases and users for the spectrum ➤ The appropriate licence arrangements ➤ Licence conditions and technical framework to facilitate efficient use and co-existence and to support relevant objectives, including the public interest. ➤ The value of the spectrum and payment terms should licences ultimately be renewed. 	<p>Q4 2024</p>	<ol style="list-style-type: none"> 1. ACMA issue consultation paper setting out <u>preliminary view</u> relating to <ul style="list-style-type: none"> ➤ whether it will renew, partially renew or refuse to renew ESLs in each band. ➤ Its comparative assessment of use cases against public interest criteria. ➤ pricing and valuation methodologies of spectrum for each ESL band 2. ACMA issues <u>preferred view</u> (and Outcomes Paper following 	<p>October – Dec 2024</p> <p>March 2025</p>

<ul style="list-style-type: none"> ➤ Allocation options – renewal, refusal or partial renewal – with associated re-allocation processes <p>ACMA expect to consult on options if any substantive change is contemplated for how the spectrum is planned, licensed or allocated.</p>		<p>preliminary views consultation) setting out administrative policy on:</p> <ul style="list-style-type: none"> ➤ whether it will renew, partially renew or refuse to renew ESLs in each band ➤ its approach to pricing spectrum in each band 	
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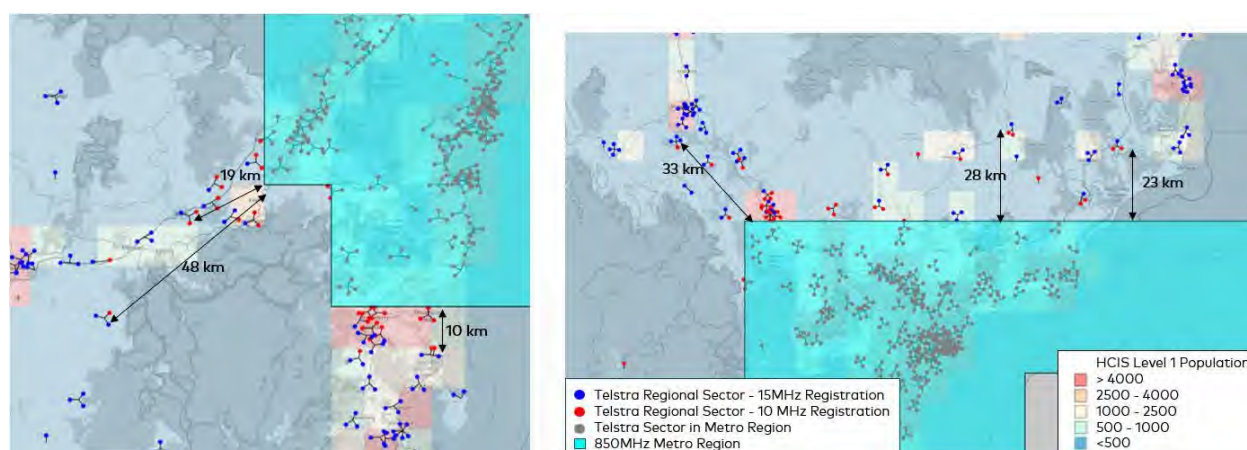
<p><u>Stage 4: renewal application and decision-making periods</u></p> <p>During 2025, we would release a response to submissions to the preliminary views' consultation in Stage 3. This would outline our preferred views and policy on planning, licensing and pricing relating to the relevant spectrum and licences.</p> <p>Following this, in the period preceding the renewal application period for the relevant licences, we would (on a band-by-band basis):</p> <ul style="list-style-type: none"> ➤ review if any changes are required to the established policy ➤ prepare draft sample licences and draft spectrum access charge determinations so that the general terms of renewal may be known (should the licence be renewed) ➤ prepare draft allocation instruments (for potential re-allocation) ➤ finalise any changes to the technical framework for the relevant band ➤ publish application forms and specify information and documents that must accompany a renewal application. <p>This will facilitate a licensee being able to apply for the renewal of their licence from the first day of the relevant renewal application period, identifying the terms and conditions of any potential renewal. Upon receiving an application, we would then begin considering whether to renew that licence, taking into consideration the application, our preferred views and any relevant objectives.</p>		<ol style="list-style-type: none"> 1. Issue spectrum access charges determination (under section 294(1) of the Act) for each ESL spectrum band 12 months prior to the opening of the renewal application window 2. Issue a licence renewal notice (under section 77B(10)(a) of the Act) to incumbent spectrum licensee on first day of application window specifying a date for final payment (e.g. 6 months) 3. Prioritise decisions relating to any ESL renewal applications submitted during the renewal application period and avoid undue extensions of time for requests for further information under section 77B 	
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Appendix B. LICENCE BOUNDARIES DEVALUE SPECTRUM

The proposed boundaries for the 2021 low band auction were not fit for purpose. While the objectives of the ACMA in carving up the proposed national licenses in the 900 MHz and 850 MHz extension bands were clear, the effect on services at a substantial distance from those proposed boundaries would have been extremely detrimental to co-channel geographical neighbours if the auction had resulted in different licensees in the metro and regional licence lots.

In July 2021, Optus presented analysis to the ACMA detailing exactly this scenario and the associated issues that it would cause. Figures 4 and 5 below are excerpts from that analysis. As can be seen in Figure 6, Telstra has been prevented deploying 5MHz of its 800 MHz spectrum on sites due to S145 Delivery Boundary Criterion “DBC” failures. This is occurring at substantial distances from the co-channel spectrum between Telstra (regional areas) and TPG (metro areas). This creates large “dead zones” where one or both co-channel licensees suffer as a result of not being able to use this spectrum. This represents an inefficient use of spectrum.

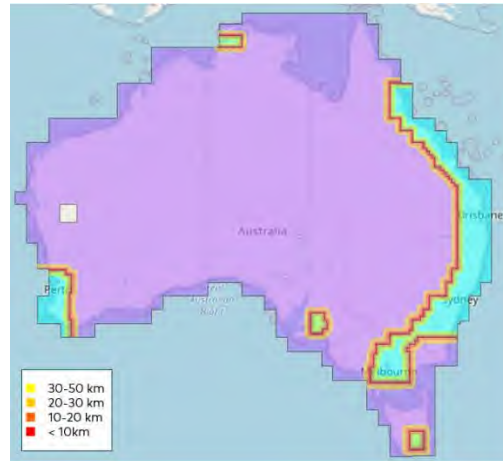
Figure 6 800 MHz co-channel constraints at spectrum licence boundary



Source: Optus

Optus then applied approximate buffer zones to the 2021 low band auction boundaries to show the impact that a similar outcome would have on the 900 MHz band and Optus' network (see Figure 7). The ACMA should therefore avoid this outcome and take extreme care when determining whether or where to draw spectrum licence boundaries to avoid this possibility.

Figure 7 2019 Low-band spectrum auction boundary areas of reduced spectrum utility

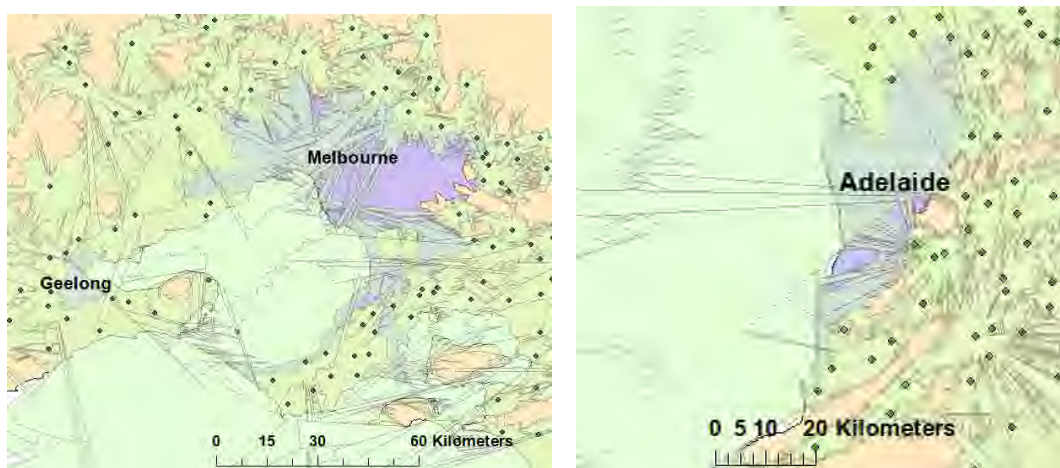


Source: Optus

Similarly, the ACMA conducted their own analysis of unnaturally placed spectrum boundaries as part of *IFC-12-2019-Options-Optimising arrangements for the 3400–3575 MHz band* and concluded, as part of the formation of the Urban Excision areas, that existing s145 DBC is insufficient to provide the necessary protections to users and requires a varied approach to harmful interference mitigation.

As a result of this study, the ACMA has not included this spectrum in the October 3.4/3.7 GHz spectrum auction due to the difficulties in defining an acceptable alternative to the current s145 DBC that allows for efficient and effective use of spectrum. Figure 8 below sets out excerpts from that paper and show the extent to which the DBC restricts the use of spectrum inside the Urban Excise areas, rendering the spectrum unusable for WBB or other traditional, high value uses. It is evident that inefficiencies will inevitably be introduced by implementing co-channel licence boundaries. They should therefore be avoided at all costs when considering ESLs.

Figure 8 S145 DBC predictions for Urban Excise Areas in the 3.5 GHz band



Source: ACMA: *IFC-12-2019-Options-Optimising arrangements for the 3400–3575 MHz band*

This outcome (the introduction of new spectrum boundaries for existing licences), for ESL, would not be acceptable to Optus as it would represent a significant erosion of spectrum licence rights and protections and result in reduced spectrum efficiency for spectrum users on both sides of any mooted boundary.

State of the Australian Telecommunications Industry

Building a stronger industry for Australia's future

June 2023



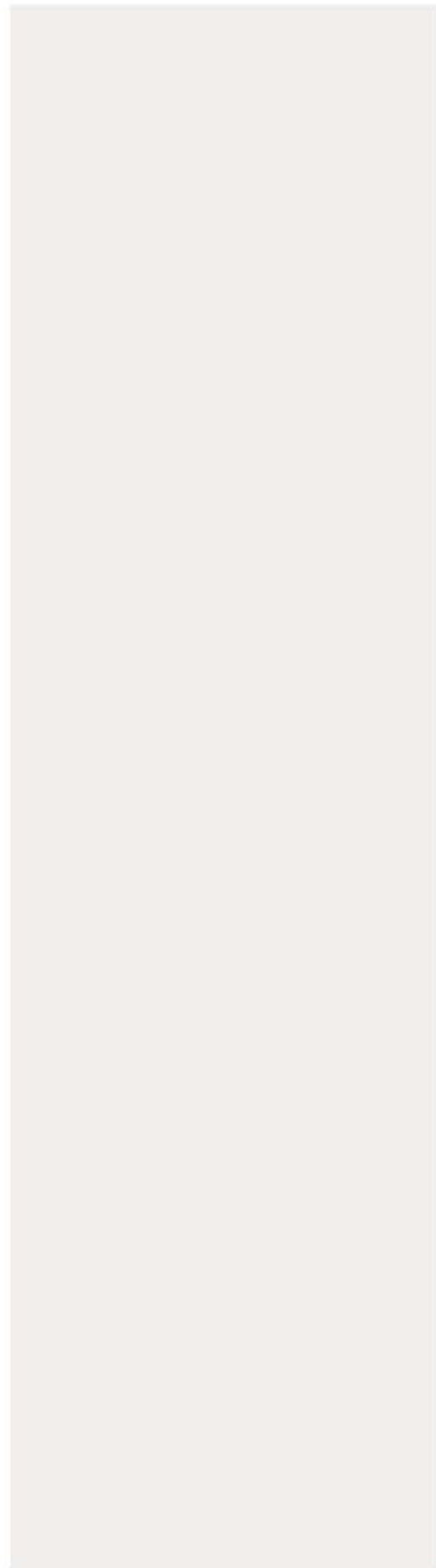


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Executive Summary



The telecommunications industry is the backbone of the digital economy. It enables constant digital activity across supply chains and into businesses and homes. It is the platform for future growth of digital applications that drive productivity improvements across the Australian economy.

The state of the telecommunications industry, and the gap between industry revenue and the capital investment required to meet rapid data usage growth, is therefore a key determinant of the overall health of the digital economy.

The telecommunications industry's delivery of these benefits is reflected in data usage growth and in the proliferation of new digital applications in the enterprise and consumer markets. And despite this dramatic uplift of capacity, the CPI sub-index for 'Telecommunications Hardware and Services' fell 24.6% since June 2012, while the overall CPI index rose 32.6% over the same period.¹

At the same time, the industry is more productive. Wider coverage and faster data networks have been achieved despite declines in industry revenue. These productivity benefits are being passed on to end users, driving overall economic performance and improving social access to communications.

These benefits have largely spilled over to society. Telecommunications industry revenues have been flat as these gains have not been monetised through higher pricing. But ongoing telecommunications investment is needed to support this growing usage. The current capex slowdown risks the emergence of a digital investment gap. This is not solely an Australian problem; Vodafone has argued that a similar gap is opening in Europe.

There are some promising signs of revenue recovery from the pandemic in certain product lines, though others remain under pressure. But this occurs against a backdrop of long-term decline in returns on invested capital (ROIC) in the Australian telecommunications industry since the Global Financial Crisis (GFC).



The rising cost of capital exacerbates this ROIC challenge. The cost of capital had been at historic lows in the wake of the GFC and fell further during the pandemic. But the post-pandemic boom coupled with global supply constraints has catapulted economies into high inflation with rising interest rates.

We are now in a fundamentally new economic environment. While interest rates are expected to ease in 2024, they are not forecast to fall back to the levels of 2020. The cost of capital has risen, and this will impose new discipline on investment in all industries. This has happened in all advanced markets and is not confined to Australia. But as an island continent with a dispersed population, Australia has high demand for telecommunications infrastructure.

This new environment has important implications for investment in telecommunications infrastructure. The 1997 telecommunications reforms represented a national commitment to facilitating private investment in telecommunications, through the emergence of new, privately funded competitors and the privatization of incumbent Telstra.

In many ways, the last decade has been a reversal of this program. A new wholly government-owned incumbent now dominates fixed telecommunications. Grant support for regional mobile is also significant. The private sector share of industry profit is falling, along with industry capex. This is worrying because significant investment demands in the Australian market still exist: fibre upgrade, expanded mobile coverage, and the spread of new technologies like 5G. The history of telecommunications over the last decade shows that private companies make an indispensable contribution to the efficiency of such investments. This requires a healthy industry that can achieve commercial returns on capital invested.

This is a policy challenge as well as an industry challenge, and regulation is an important determinant of investment attractiveness. The telecommunications industry is subject to:

- A regulatory regime of exceptional complexity, covering consumer protection, privacy, wholesale prices and access, service standards and complaints procedures, advertising standards, spectrum access, local council planning, universal service obligation, and national security.
- High costs from spectrum allocation policies that inflate spectrum unit prices, even as demand for spectrum to support wireless communications is surging.
- A fixed wholesale pricing structure based on traffic capacity that has increased uncertainty for retail service providers while benefitting the publicly owned wholesale operator.
- Inability of mobile operators to easily monetise data growth and therefore keep pace with investment demands.

These issues must be addressed to create the investment environment that will attract the capital Australia needs. In a global economy where capital is mobile, private capital investment cannot be sustained unless returns meet industry benchmarks.

Nations that create attractive investment environments for telecommunications investors will reap the benefits of better digital infrastructure and a stronger digital economy. Nations that do not will be laggards, forced to rely on public injections of capital that will inevitably be constrained as governments work to reduce the fiscal damage caused by the pandemic.

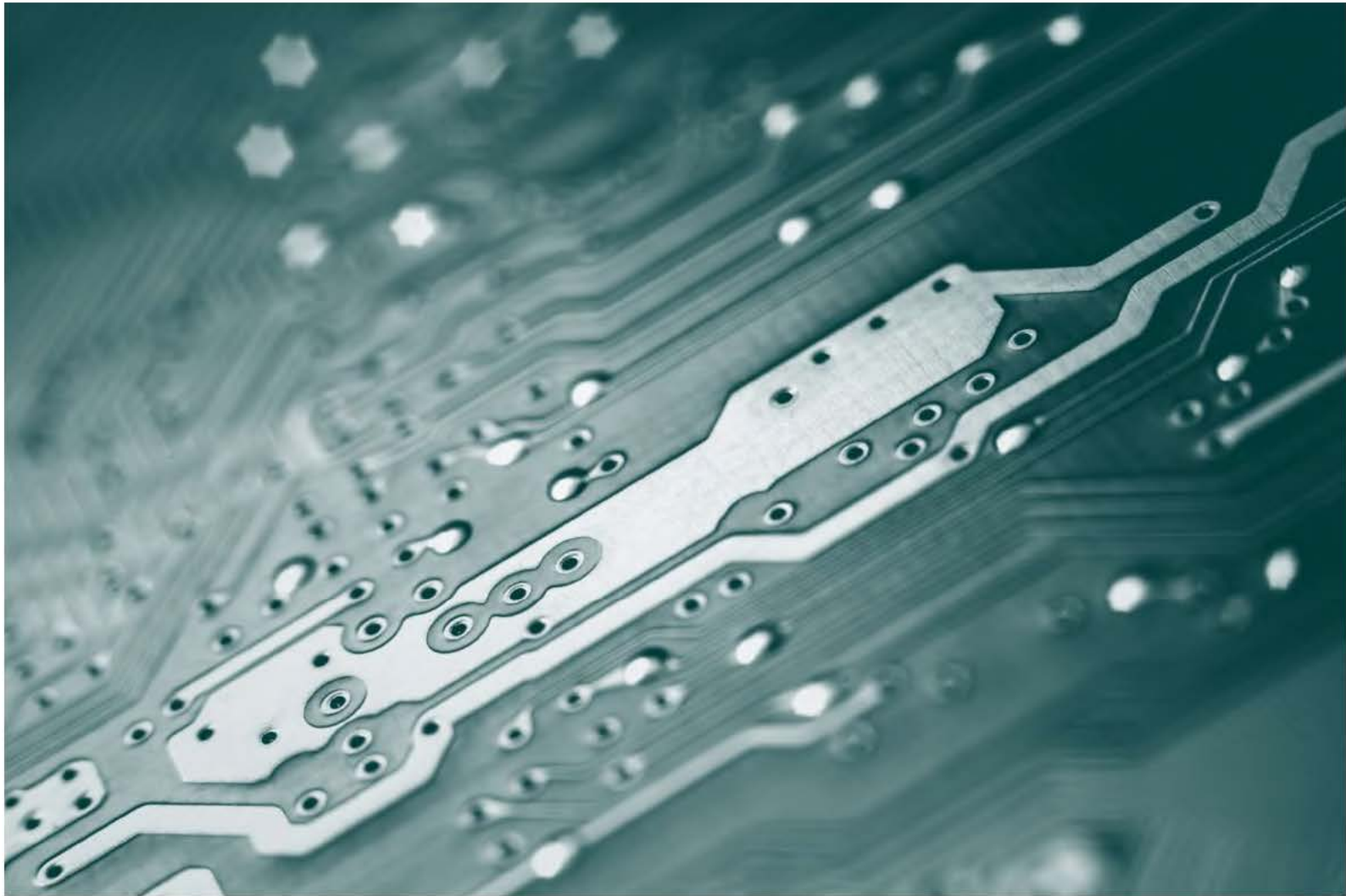
Introduction

Australia’s economic performance has always depended on improvements in multifactor productivity that have delivered progressively more economic output from our capital and labour inputs.

For this reason, the slowing of productivity growth since the 1990s is a concern. In Australia, labour and capital growth generally have not slackened. The key to unlocking faster productivity growth in Australia therefore lies in boosting the sources of multifactor productivity growth: new technology and associated innovations in business practices and industry organisation.

Telecommunications is a key enabler for the digital transformation offered by new technology. It is no exaggeration to call it the backbone of the digital economy. For this reason, the state of the telecommunications industry is an economic and policy priority.

This report is designed to provide a snapshot of the state of health of the telecommunications industry in Australia, and to identify obstacles to its greater contribution to economic development. It has been prepared by Venture Insights. The report was commissioned by Optus and is being made available to the public thanks to their support.

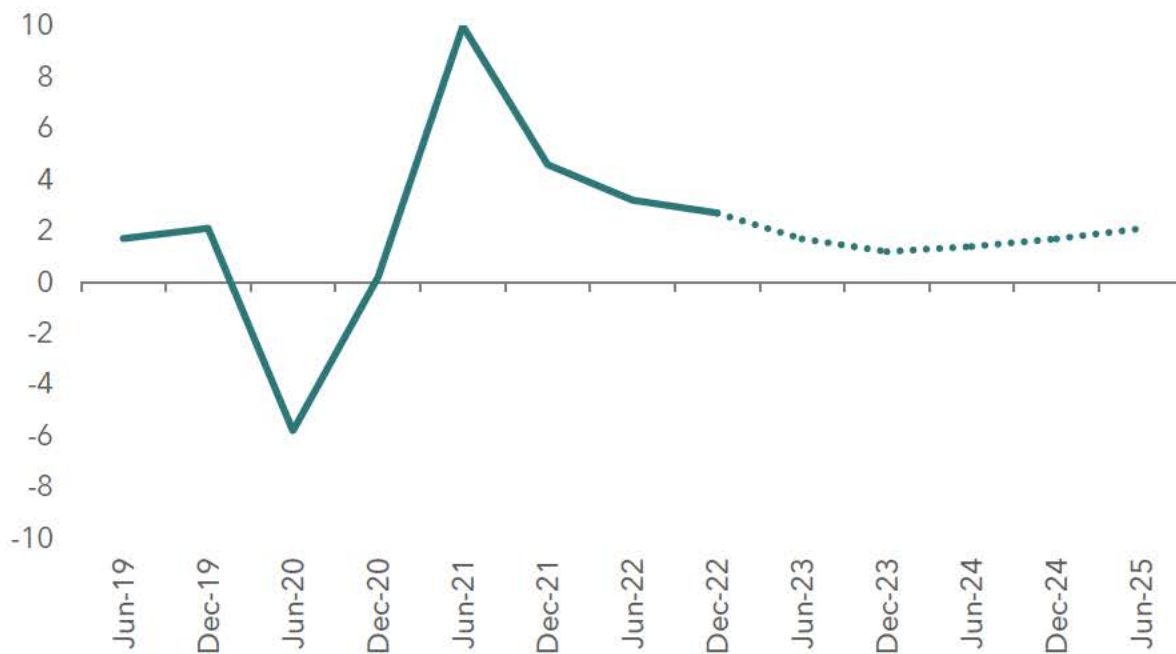


The economic environment

The telecommunications industry, like any other, is affected by the broader macroeconomic environment. This environment is now challenging, and has some specific implications for the telecommunications industries, particularly reduced economic growth, a return to population growth, and the rising cost of capital.

Following a period of contraction during the COVID19 pandemic, the Australian economy returned to growth following the wind back of pandemic-related restrictions. However, growth has been moderating over the last eighteen months. The Reserve Bank of Australia (RBA) expects a period of below trend growth, with annualised growth rates below 2% until June 2025.²

Figure 1: GDP Growth (%), historic and forecast



Source: RBA

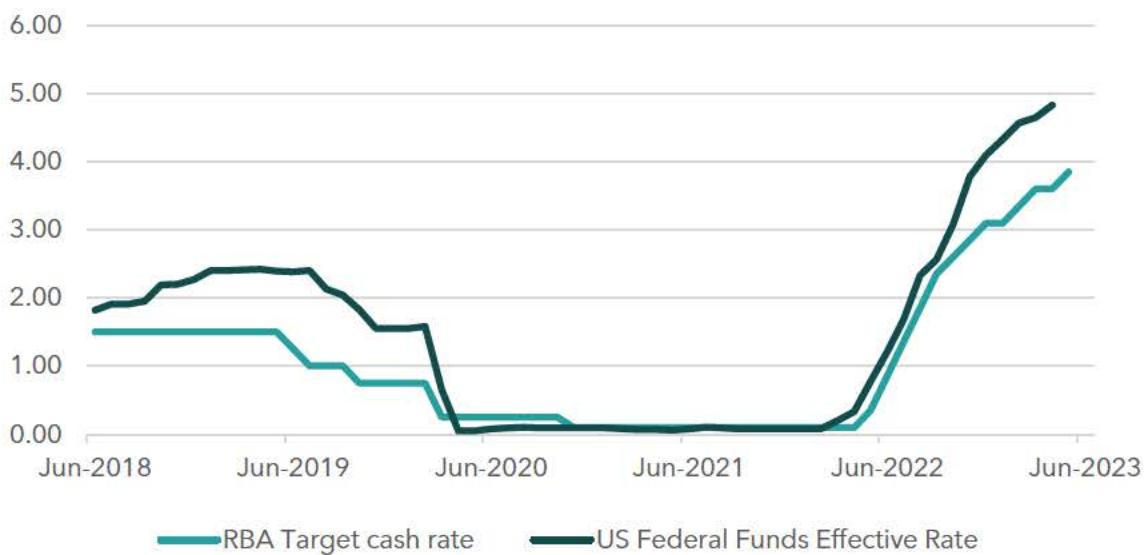
After a decade of relatively benign inflation rates during the 2010s and the acute phase of the pandemic, Australian households are currently experiencing the highest rates of inflation since the early 1990s. In December 2022, the annual inflation rate reached 7.8%, surpassing the spike in prices caused by the introduction of the GST. For the twelve months to the March 2023 quarter, the consumer price index (CPI) rose 7%.³

Inflation is expected to moderate over the next two years and is forecast to return to 3% by June 2025.⁴ During this time though, some households will find themselves under significant pressure. People who are renting their home and those aged 25-44 years old are expected to face greater cost of living pressure than the national average.⁵ Inflation is a major contributor to recent falls in household disposable income.⁶

At the same time, the RBA has lifted official interest rates to suppress inflation. This is a global phenomenon that reverses a decline in cost of capital that has lasted since the 2008 Global Financial Crisis. Rising cost of capital has already claimed several banks and is placing pressure on capital intensive businesses globally. The global telecommunications and technology sectors have both seen significant jobs cuts as the capacity to carry debt has reduced.

As a result, consumer confidence is currently experiencing an extended period of weakness. According to Roy Morgan research, the March 2023 quarter was the fifth successive quarter of negative sentiment, the longest run of negative quarters in the last twenty years.⁷ Consumer confidence has now experienced a longer period of negativity than the GFC of the late 2000s, when the index recorded four quarters of negative sentiment. Sentiment is arguably closer to the of the 1990-91 recession.

Figure 2: Movements in official interest rates (%)



Source: RBA

Businesses confidence is also negative, though less so than for consumers. Roy Morgan’s Business Confidence index was at 90.2 (neutral = 100) for April 2023.⁸

On the positive side, Australia is currently experiencing strong growth in net overseas migration as overseas students, skilled migrants and working holiday makers return to Australia. Migration will account for approximately two thirds of Australia’s population growth over the next five years, a period which will see Australia’s population grow by over 2 million people.⁹

At the same time as this increase in migration is occurring, new housing construction is expected to

fall. Housing approvals have fallen to their lowest levels since 2011-2012¹⁰ and the Housing Industry Association recently observed that, “Despite record levels of migration, the number of new homes commencing construction is set to slow for at least the next 12 months.”¹¹

During the pandemic, average household size fell as people sought additional space. However, the RBA has observed that average household size has now begun to increase.¹² If dwelling construction remains constrained as the population grows, average household size is likely to increase further.

Implications for the telecommunications industry

Online and telecommunications services are an increasingly important to the way in which people work, relax, and stay connected with friends and family.

A growing population underpins demand for the sector's services, and the strong migration expected in the near term should be a positive for mobile services. Over time, increases in the average household size may also contribute to demand for higher broadband speeds, though it has a negative effect on services connected. This has different implications for wholesale and retail providers, with the nbn Co benefiting more from higher traffic levels than retail service providers under the current wholesale pricing constructs.

But there are several factors weighing against the effect of population growth. Broadband and mobile services have become an essential part of many people's lives. But faced with rising cost of living and falling disposable incomes, some people and businesses may be encouraged to seek out cheaper alternatives, switching to more affordable plans (including fixed wireless) or switching to mobile plans in place of their home broadband connection.

Low consumer and business confidence will constrain the telecommunications industry's capacity to monetise further increases in data usage. In many cases, households and businesses will delay new purchases, and may review existing commitments (e.g. number of SVOD services) that may lead to slower migration of users to new and higher capacity services.

Mobile phone users may decide they can extend the life of their current handset, further increasing handset refresh cycles and reducing the opportunity to grow revenue through new

handset sales. In the broadband market, convincing users to spend more for higher speed broadband plans may also become more challenging, especially if weaker consumer confidence leads to less spending on connected devices such as TVs, gaming consoles, smart home systems and virtual reality hardware.

Perhaps most importantly, the rising cost of capital brings renewed scrutiny of ROIC in the telecommunications industry. Industry ROIC performance is discussed below, but the implication of rising cost of capital is that higher ROIC is needed, all things being equal. In reality, the industry's ROIC performance has been weak in recent years and will require a return to revenue growth to attract more capital to the industry.



The Australian telecoms environment

The Australian telecommunication industry generated an estimated \$28 billion of retail revenue in FY22 and provided 34 million services across fixed and mobile networks, connecting Australians at home, on the go, and in their places of work.

Competitive evolution

The last decade has seen significant change in the industry. The rollout of the nbn ushered in a period of disruption for operators with existing DSL and HFC based networks. The rollout changed the competitive dynamics in many regional areas as some consumers could now access equivalent pricing and speeds to metro. The nbn largely brought an end to the practice of Retail Service Providers (RSPs) offering faster “on-net” product in areas where they had their own DSLAMs and could purchase cheap access to Unbundled Local Loops (ULL), significantly eroding fixed service margins.

The rollout of the nbn has also coincided with a period of both consolidation and, more recently, the emergence of new retail competitors. The 2010s saw several independent RSPs acquired and eventually consolidated into what is today TPG.

TPG itself then merged with Vodafone in 2020. In the fixed broadband market, Uniti’s acquisition of Opticomm and LBN Co bought together several alternate fixed line providers together into a single entity to compete with the nbn in greenfields rollouts.

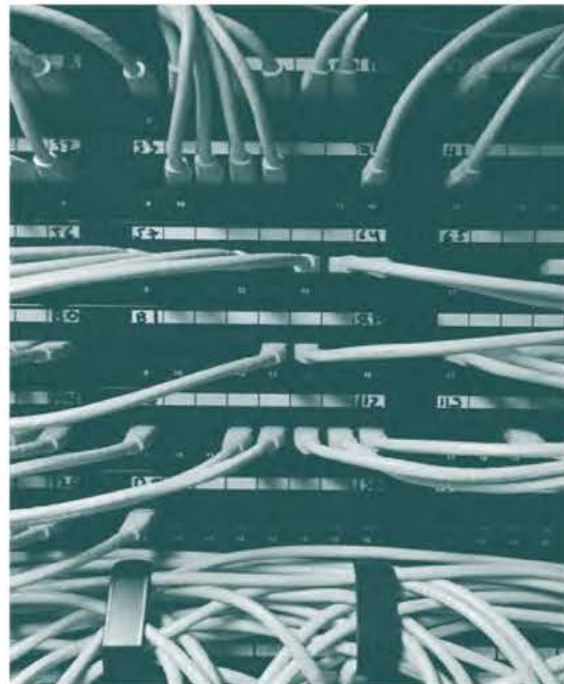
Retail subscriber market share is now concentrated with the three largest Mobile Network Operators (MNOs) - Telstra, Optus and TPG Telecom. In the mobile market, we estimate these operators account for approximately 90% of subscribers through their primary brand and sub-brands, with the remaining 10% distributed amongst Mobile Virtual Network Operations (MVNOs) who re-sell capacity on these networks. In fixed broadband, the big three account for 80% of the market, with Vocus and Aussie

Broadband the largest challengers, and smaller RSPs accounting for around 6% of subscribers.

Competition to the nbn is geographically based, rather than widespread. Nbn is the largest fixed broadband network, but it faces targeted competition from alternative fibre providers (now mainly under the Uniti umbrella) and fixed wireless products offered by the three mobile operators (and increasingly their wholesale customers). Fixed-mobile substitution will be a key challenge for the nbn.

In the enterprise market, nbn Co is enabling challenger brands to compete in the business market through nbn’s enterprise ethernet and rollout out of business fibre zones.

Finally, LEO satellite is disrupting rural communications, and has the potential to go further. Satellite has traditionally been a last resort solution, but it is now becoming more competitive. It is not yet a metro fixed line equivalent but will still place some competitive pressure on nbn and terrestrial fixed wireless operators.

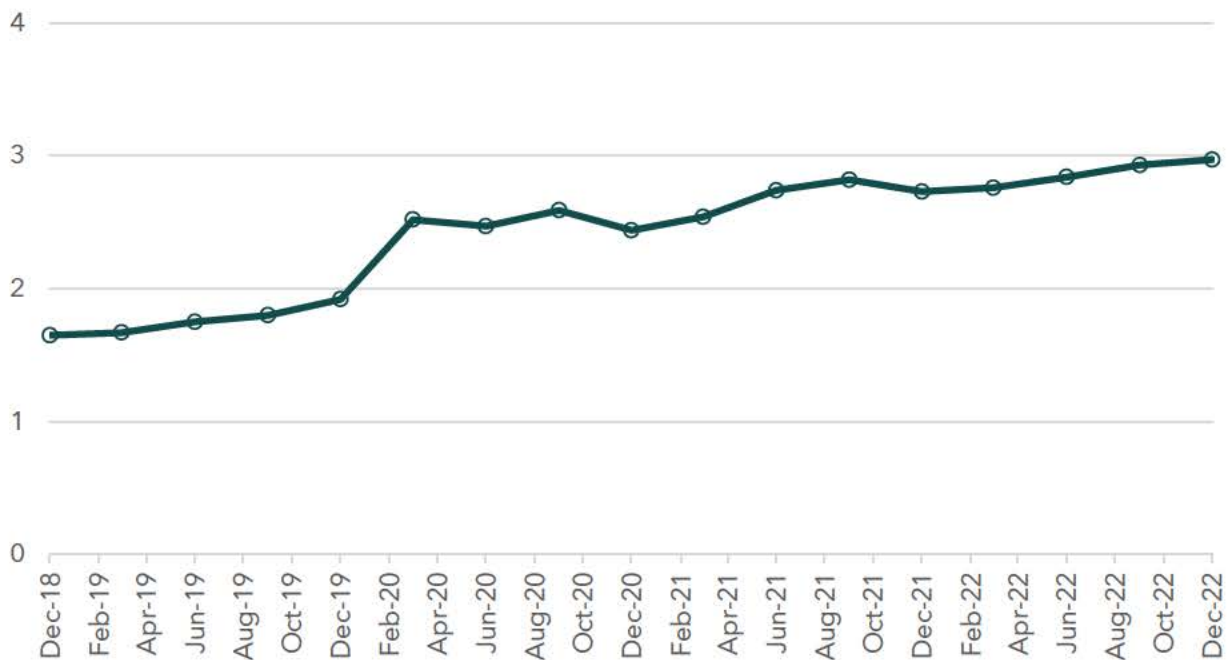


Data usage growth

The global COVID-19 pandemic both broadened and intensified many digital behaviours, causing a surge in global internet traffic. Australia also saw

data usage accelerate during the pandemic. The nbn reported that during the first two weeks of the pandemic, evening busy hour traffic increased 25% versus pre-COVID levels¹³ (despite some OTT players shifting to lower bit rates). Other network operators saw similar growth in traffic.

Figure 3: Average CVC allocated capacity per access line (Mbps)



Source: ACCC

This is also reflected in the volume of wholesale capacity purchased per user. Capacity allocated per user rose 31% in the March 2020 quarter.¹⁴ This capacity increase was heavily discounted initially, but as required capacity has grown that discount has been withdrawn and higher capacity costs are now borne by RSPs.

Australia's fixed line and mobile networks have therefore accommodated significant growth in data traffic over the last decade. During this time, data speeds have also increased. In December 2012, just 14% of broadband users were on speeds of 24Mbps or higher. This contrasts with today, where 76% of nbn users are on speeds of 50 Mbps+, and 21% are on speeds of 100 Mbps or greater.¹⁵

Mobile data speeds have also risen as the industry has moved from 3G, to 4G and now 5G mobile data services, delivering median mobile data speeds of 79.7 Mbps.¹⁶

These improvements in speeds and data usage reflect the significant investments made by the industry. Ensuring future growth will require balancing the goal of consumer affordability with the need to ensure operators are able to make sufficient returns to ensure continued investment. Although beyond the scope of this paper, it may also require Australia, as is currently happening in Europe, to revisit the debate around the role of over-the-top application and service providers in contributing to network investment.¹⁷

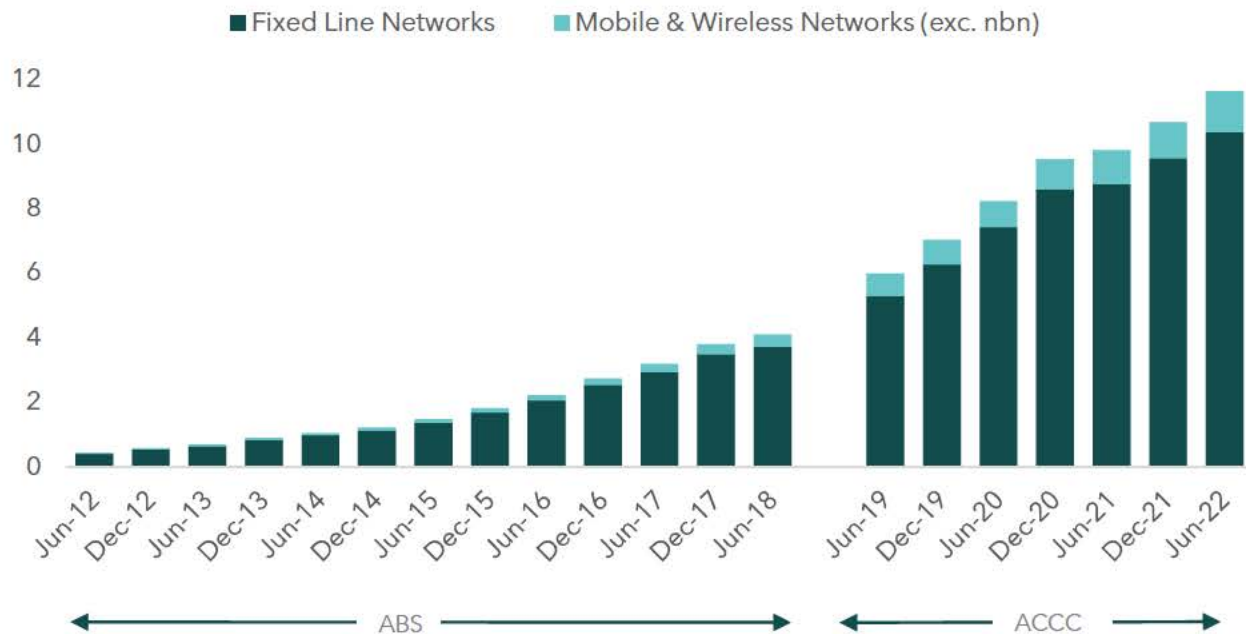
Australian industry performance and trends

Value for end users

Data usage by Australian households has expanded dramatically over the last decade. Based on ACCC and ABS data, Venture Insights estimates¹⁸ that mobile handset usage has grown from less than 1GB per month in June 2012, to approximately 10GB per month in June 2022. Over the same period, home broadband usage has grown from less than 25GB per month to approximately 425GB per month.

This growth is reflected in overall traffic levels. Fixed data traffic grew 26 times over last decade, while mobile data traffic has grown 36 times. Over-the-top (OTT) entertainment media services drove much of this increase.

Figure 4: Australia broadband traffic 2012 – 2022 (millions of TB[^])



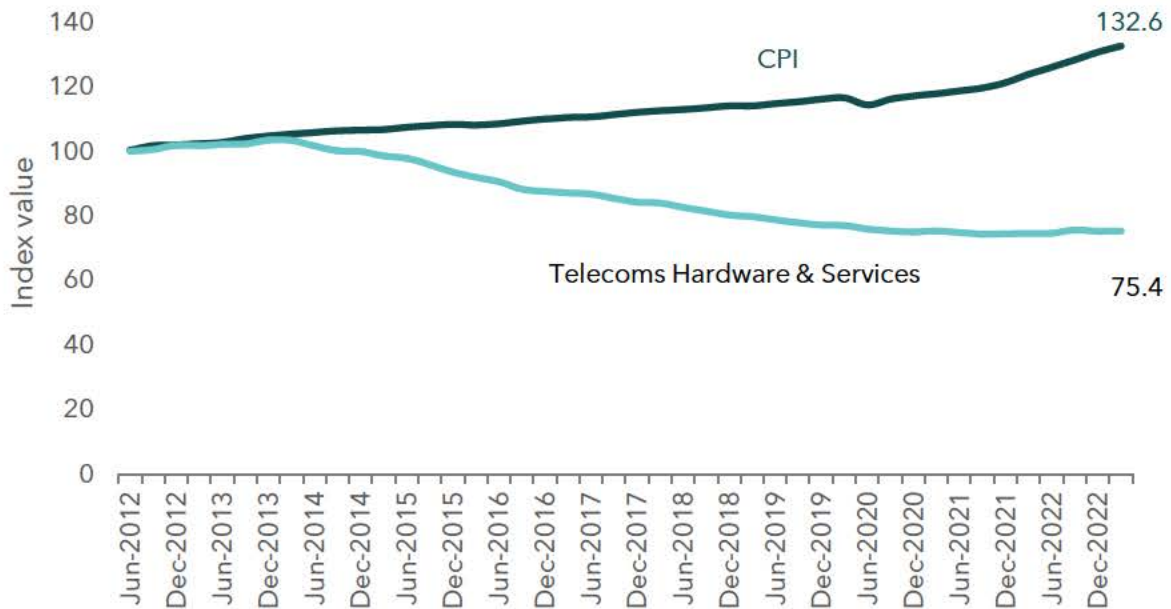
Source: ABS, ACCC, Venture Insights analysis. ^ As per ABS and ACCC reporting, volumes are data downloaded for the three months preceding the end of the reporting period.

Despite this dramatic improvement in capacity, the CPI index for 'Telecommunications Hardware and Services' fell 24.6% since June 2012, while the overall CPI index rose 32.6% over the same period.¹⁹

This largely reflects the significant increase in data capacity that end users have enjoyed over that period, unaccompanied by significant price increases. Over the last decade, these qualitative features of consumer telecommunications services have improved dramatically. Households moved from

legacy broadband services onto faster nbn plans and other superfast broadband services. Mobile handsets and tablets have become more powerful. Data allowances, especially for mobile services, have substantially increased. For example, the data allowances for an Optus SIM-only plan in 2013 were 200MB, 1GB and 2GB. Ten years later the corresponding figures are 30GB, 100GB and 220GB.²⁰

Figure 5: Telecoms Deflation vs Consumer Inflation (FY12 = Index 100)



Source: ABS

Apart from the direct benefits of higher data capacity, this has also had a significant and material benefit across the economy. The OECD analysis of a panel of OECD countries showed that broadband has added an average of 0.30% of GDP growth to these countries since 2002.²¹ This reflects cost reductions and increases in output that broadband enables across the economy.

Retail revenue

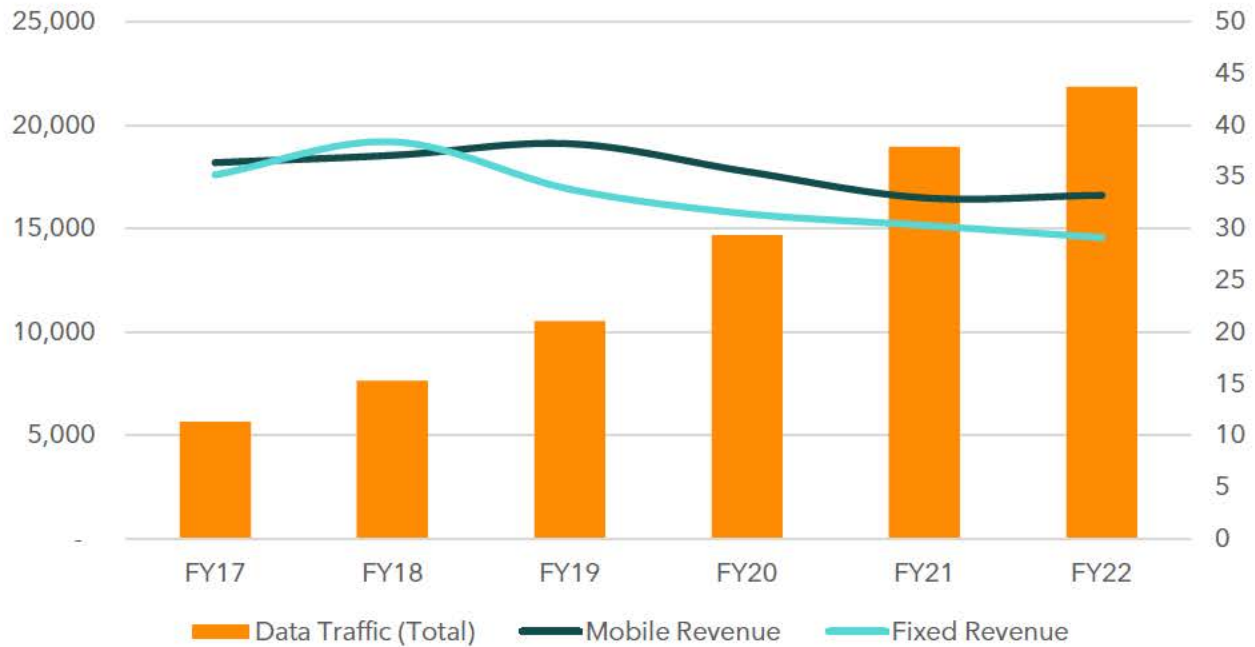
The telecommunications industry has consistently delivered dramatic performance gains to its customers. But despite this uplift of capacity, telecommunications industry revenues have declined in recent years.

In the lead up to the pandemic, the mobile telecommunications industry saw steep declines in messaging revenue due to OTT competition and

tougher mobile termination regulation. Growth in mobile connections was offset by declining hardware sales. ARPU erosion was significant. Venture Insights estimates that average retail ARPU fell from around \$35 in FY17 to only \$30 in FY22. Mobile was then hard hit by the effect of pandemic lockdowns, which reduced personal mobility, decreased visitor SIM sales, and virtually eliminated international roaming.

Fixed revenue also declined due to a complex mix of factors that predate the pandemic. Positive broadband revenue growth was partly offset by the decline of legacy voice, but mostly by nbn-led disruption in the enterprise connectivity market which reduced (and continues to reduce) enterprise connectivity prices. The decline in legacy voice connections and enterprise prices was significant because these services have historically been significant contributors to industry profit.

Figure 6: Telecommunications retail revenue and annual data traffic, FY17 to FY22 (AU\$m, TB millions)



Source: Operator results, ABS and ACCC traffic data, Venture Insights analysis

Despite this decline in industry revenue, volumes of telecommunications services have grown. Total broadband data traffic (fixed and mobile) has almost quadrupled between FY17 and FY22²², and ABS chain volume data for the last few years shows that economic output (removing the effect of price movements) has also risen steadily at 4.3% CAGR over FY18 to FY22.²³

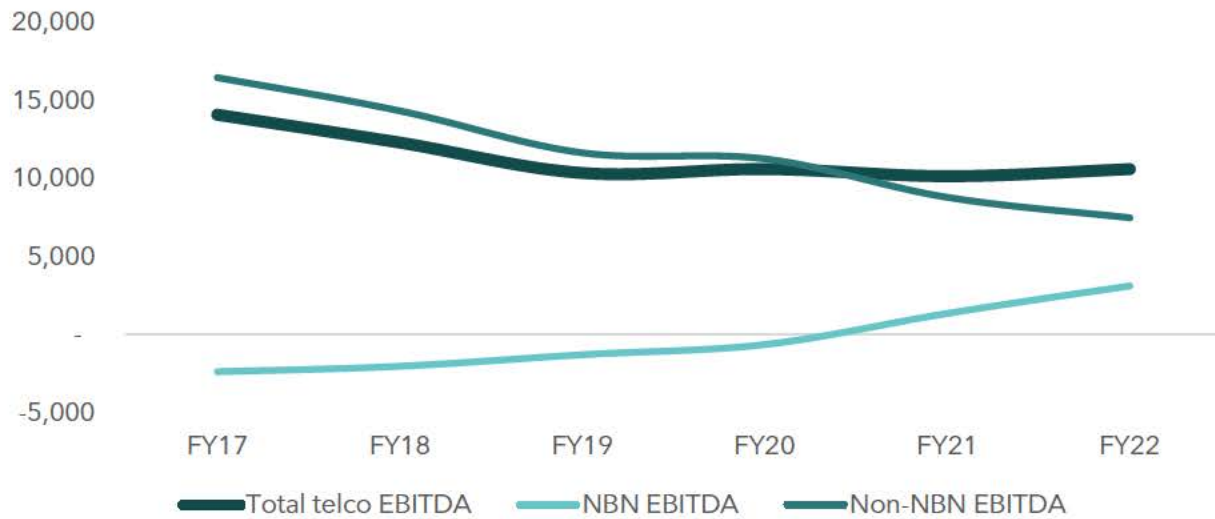
Profitability

Despite the decline in revenue, EBITDA has been stable over the last four years. This stability is due to strenuous and sustained cost-cutting efforts

across the industry. All operators have reduced headcount and undergone structural changes (including the sale of assets) to improve operational and capital efficiency. This has been reflected in significant labour reductions and asset spinoffs to improve operational and capital efficiency.

Over the last year, operational costs have risen as skilled labour cost has gone up and materials prices have inflated. Global supply chain disruptions have also added to costs. This required further cost cutting action.

Figure 7: Telecommunications EBITDA (top three operators), FY17 to FY22 (AU\$m)



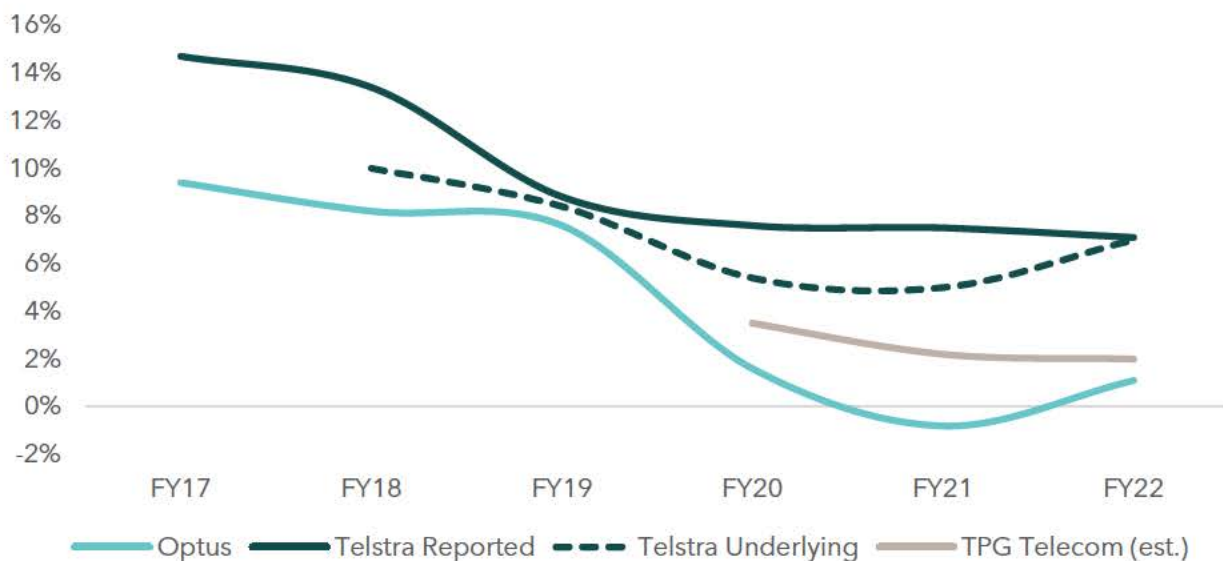
Source: Operator results, Venture Insights analysis

However, the apparent stability of overall industry EBITDA belies the reality of a major profit shift, away from the private sector and towards the publicly owned fixed wholesale provider nbn Co. The private sector has been winning a declining share of industry profit; nbn Co's EBITDA grew rapidly as its network rolled out, while the industry total EBITDA has been flat. This reflects current wholesale pricing constructs that capture for nbn Co most of the benefits of traffic growth, eroding

the RSPs' returns in the fixed market.

One consequence of this trend has been significant decline in ROIC in the telecommunications industry over the last five years. In telecommunications, ROIC is a major driver of long-term profitability. The decline in ROIC is therefore an indicator of reduced capacity to invest in the infrastructure that delivers services.

Figure 8: Telecommunications industry return on invested capital (ROIC,%)

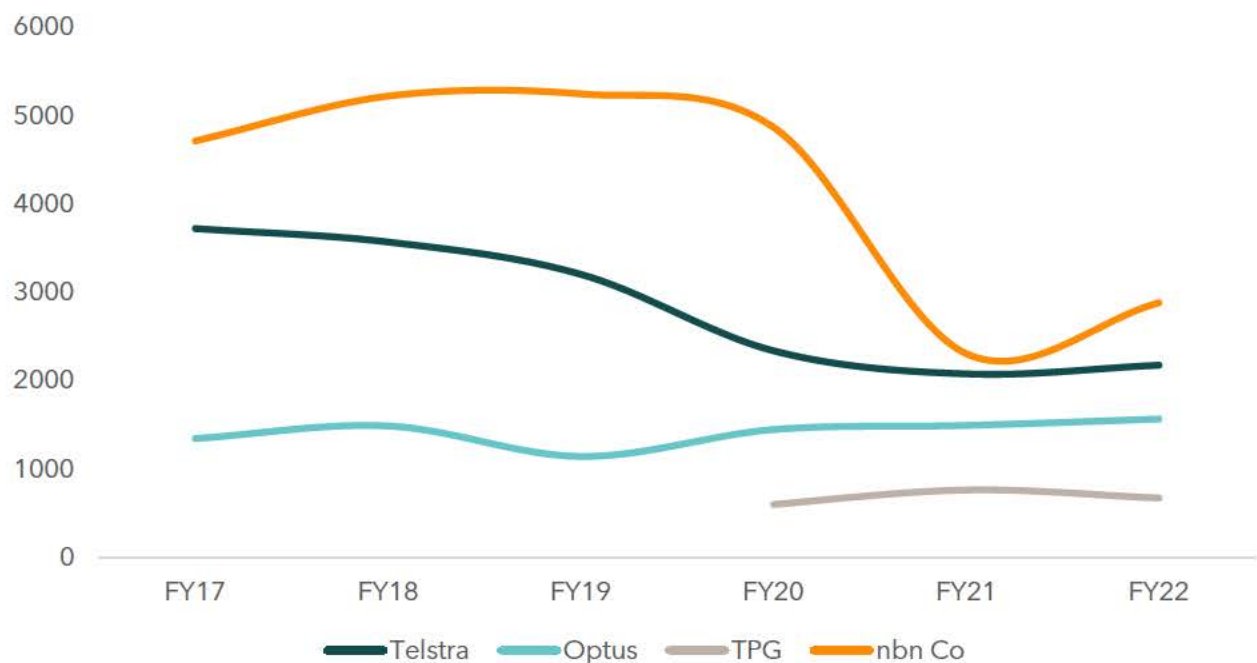


Source: Operator results, finance industry estimates

Across the industry, capex has fallen significantly even if we ignore nbn Co's investment slowdown as it completed its initial rollout. But there are still significant needs in our telecommunications market such as fibre upgrade, expanded mobile

coverage, and the spread of new technologies like 5G. A capex slowdown risks the emergence of a digital investment gap. This is not solely an Australian problem; Vodafone has argued that a similar gap is opening in Europe.²⁴

Figure 9: Telecommunications capex, FY17 to FY22 (A\$m)



Source: Operator results, Venture Insights analysis. Excludes intangibles and spectrum

Part of the solution has been to call on public investment. But this has significant disadvantages as governments are increasingly fiscally constrained in the wake of large pandemic expenditures. New Zealand and Singapore are a useful contrast: using public grants strategically to support private investment saw fast broadband rollout and the earlier achievement of a stable wholesale regulatory regime.

There are now early signs of revenue recovery in the private sector of the industry. Mobile usage has

bounced back post-pandemic as lockdowns have lifted and immigration has boomed. Mobile ARPUs have begun to rise (though not as fast as inflation). While broadband revenues also continue to rise, most of the legacy voice and mobile equipment sale losses have now been absorbed. Finally, we expect enterprise connectivity ARPUs to gradually stabilize over the next two to three years.

But this positive trend is dawning on a smaller industry that has weathered five years of revenue decline across its most profitable product lines.

Policy implications

The overall picture for the telecommunications industry over the last five years is a combination of revenue decline and cost-cutting leading to stable industry EBITDA, despite dramatic increases in data capacity. These are the signs of an industry that delivers significant value to its end-users and to the economy in general.

But this overall picture conceals some dramatic underlying movements in the location of revenue and profit that threaten the legacy of the 1997 telecommunications reforms and place a question mark over the industry's capacity to invest to meet future needs.

Pressure on private sector investment

The 1997 reforms confirmed a national commitment to facilitating private investment in telecommunications, through the emergence of new, privately funded competitors and the privatization of incumbent Telstra.

In many ways, the last decade has been a reversal of this program. Fixed telecommunications is now dominated by a new wholly government-owned incumbent that benefits from the certainty of a regulated rate of return, in contrast to privately-owned RSPs that are exposed to end-user markets. More ominously, the private sector share of industry profit is falling, along with industry capex. This is ominous because there are still significant investment demands in the Australian market: fibre upgrade, expanded mobile coverage, and the spread of new technologies like 5G.

All of these require a healthy industry that can achieve commercial returns on capital invested. This is becoming more pressing as the cost of capital rises; and not just the cost of capital but other operational costs such as labour and materials which also weigh on other sectors of the economy.

In comparison to other industries, telecommunications does not achieve high returns on capital invested. Despite this, the

telecommunications industry underpins the rest of the economy and will be an increasingly important infrastructure as the digitalisation of economic and social activity progresses. In the small business sector especially, telcos have always been important vectors of ICT technology diffusion. But this can only continue if telcos – and their shareholders – have the wherewithal to invest in new technologies.

The industry's current scenario generates the risk that Government will be called upon to contribute investment funds to cover rising demand for reliable, up-to-date telecommunications. To some extent this is already the case; the nbn is the prime example, but extensive spending at federal and State levels on mobile infrastructure also demonstrates the limits of private capacity to invest under the current framework of incentives. And the history of telecommunications policy shows that private companies are needed to ensure the efficiency of capital investment.

The alternative to higher government spending is to expand private capacity to invest. This will happen naturally to some extent as prices are being lifted in mobile and fixed markets to reflect underlying costs. But a range of impediments weigh on the industry and could be reduced with changes to the framework of industry regulation.

The next reform agenda

The largest issue is the sheer complexity of telecommunications regulation. The industry is subject to a dizzying range of overlapping policy frameworks that cover areas as diverse as consumer protection, privacy, wholesale prices and access, service standards and complaints procedures, advertising standards, spectrum access, local council planning, universal service obligation, and national security. These frameworks are implemented by multiple regulators with little coordination. The industry is subject to more than 300 separate legislative instruments. In addition, the Government-owned nbn Co is also subject to Ministerial direction.

This complexity has been exacerbated by a general retreat from the industry self-regulation approach established in 1997. A hands-on approach to regulation is now more common, adding to the risk and cost of regulatory intervention.

No other industry is subject to regulation of this complexity; notably, the OTT players who benefit most from telecommunications infrastructure are much more lightly regulated.

The telecommunications industry expects to be regulated, but its high and rising level of regulation leads to overlapping and occasionally contradictory requirements that add significantly to the industry's costs. Key current areas of friction include:

- **Planning:** Planning is a significant constraint on the rollout of networks, particularly mobile networks. A balance must be struck between local amenity and service availability that ensures that increasingly essential communications services are accessible by all. Streamlining of approval processes will reduce service blackspots by accelerating network investment.
- **Privacy:** Telecommunications industry is subject both to general privacy protection laws and to industry-specific laws. There are opportunities to coordinate these laws better to clarify accountability and reduce overlapping jurisdictions.

Beyond this, there are also structural imbalances that have disadvantaged private investment in telecommunications, despite its contribution to industry efficiency.

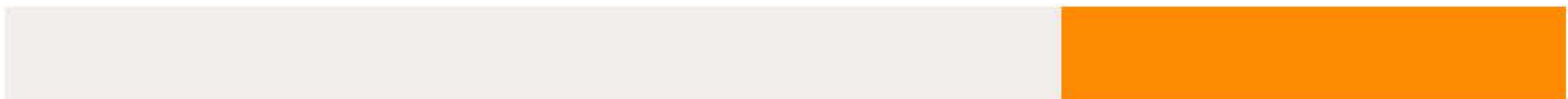
Australian spectrum management practices strongly focus on maximising revenues through auctions, but the principle is applied inconsistently as some other industries have concessional access to spectrum to reflect their social value. Moreover, the volume of spectrum required to support data intensive mobile applications pushes up the total annual spectrum costs without a commensurate increase in revenue, effectively becoming a tax on data usage. No other industry faces a comparable burden. Less focus on revenue raising and more focus on boosting service availability would free more telecommunications

capital for the infrastructure investment that improves coverage and performance and help to reduce digital divides.

Finally, the current regulation of wholesale pricing, particularly in fixed telecommunications, needs major reform. The issue centres on the connectivity virtual circuit (CVC). The very existence of a capacity charge shifts the risks of rising data usage away from nbn Co and onto its retail service provider customers because rising usage drives up RSP wholesale costs. This has reduced the RSPs' incentives to drive usage, and digitalisation more broadly.

A shift away from volume pricing will transfer that risk to the nbn Co, which is in a better position to manage it. A successful (and prompt) conclusion to the ACCC's SAU process, with a shift to flat pricing is therefore required. This shift needs to be reinforced by a regime of price and/or revenue controls that provides RSPs with wholesale price certainty and leaves the challenge of driving usage in RSP hands.

In the mobile sector, the European debate around the funding of mobile capex has already drawn in other value chain players. New thinking around pricing may be required to ensure that MNOs are able to monetise rapidly growing data traffic and sustain investment in 5G and other new mobile technologies like small cells.



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The logo for Optus, consisting of the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA Consultation Paper

**Expiring spectrum
licences: stage 2**

**Information gathering, and
views on uses of
frequency bands and
alternative licence
conditions**

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Section 1. EXECUTIVE SUMMARY

- 1.1 Optus welcomes the opportunity to provide feedback to the Australian Communication and Media Authority's (ACMA) consultation paper on its *Expiring spectrum licences: stage 2 Information gathering, and views on uses of frequency bands and alternative licence conditions* (the Consultation Paper).
- 1.2 The purpose of this consultation is for the ACMA to gather information from stakeholders that will inform its preliminary view on whether arrangements governing the use of spectrum under expiring spectrum licences (ESLs) remain fit for purpose as well as to inform advice to the Minister on alternative licence conditions and network resilience and disaster response objectives in the context of ESLs.¹
- 1.3 Mobiles services are essential services, and mobile infrastructure is critical national infrastructure. Many vital services rely on mobile networks, including emergency services, banking, and everyday work. While the Government and the ACMA recognises telecommunications as an essential service, no reference is made to the essential nature of mobile services in the context of ESLs; and there remains no presumption of renewal for ESLs. This jeopardises the safety and security of our communities and is the single largest risk to the predicted economic and job growth.
- 1.4 Existing arrangements for access to spectrum under ESLs have delivered unrivalled public benefit for the Australian economy and broader society. The annual economic uplift due to 5G mobile services amounts to \$30-60 billion in 2030.² Ongoing access to ESL spectrum is required for mobile network operators (MNOs) to continue to deliver the economic, social and public safety benefits of mobile services.
- 1.5 Access to ESL spectrum has resulted in Australia being a leader in 5G, with MNOs having deployed over 9000 5G base stations that supply data throughputs that rank among the best in the world.³ Optus 5G network now reaches 80.5% of the population across 4000 sites.⁴ Optus' 5G service performance consistently leads the market in terms of speed and customer experience.⁵ Since the last ESL process, Optus rapidly deployed its 4G mobile network across regional and into remote parts of Australia.⁶
- 1.6 ESL renewal will be in the era of IMT-2030 or "6G" and "ubiquitous connectivity", when mobile and satellite are able to seamlessly connect – making early certainty of renewal at a nominal price essential to ensure Australia realises these benefits.
- 1.7 Renewal of ESLs will enable MNOs to continue to supply essential public communications services and deploy networks and equipment to respond to ongoing increases in demand for data. It will enable Optus to continue to innovate in services and invest in critical infrastructure that underpins our future economy and security.

¹ Michelle Rowland MP to ACMA Chair Nerida O'Loughlin PSM; 14 December 2023

² AMTA, 2021, 5G Unleashed; Optus, 2021, 5G Impact; PwC, 2020 Global Impact of 5G; CSIRO, 2018; BCAR, 2018, Impacts of 5G on productivity and economic growth.

³ ACCC Mobile Infrastructure Report 2023, p.3

⁴ [Optus reports stable earnings and mobile growth in FY24](#)

⁵ [Australia, April 2024, Mobile Network Experience Report | Opensignal](#)

⁶ [Network \(optus.com.au\)](https://www.optus.com.au)

Existing ESL arrangements will continue to deliver public benefit to Australia

1.8 The use of ESL spectrum for mobile services will remain central to meeting the communications needs of all Australians. Optus' planned use of ESL spectrum promotes the long-term public interest and:

- (a) **Facilitates efficient use of the spectrum** – ESL spectrum is already efficiently allocated and mobile technologies are the optimal users of spectrum. There is no evidence that alternative uses produce greater public benefits. Mobile services deliver unparalleled economic uplift, access to essential services, and support broader investment and innovation across the Australian economy.
- (b) **Promotes investment and innovation** – Optus has invested billions in acquiring spectrum to support the deployment of its national multi-billion-dollar mobile networks and services.

Optus is highly innovative in its use of spectrum – our recent agreement with SpaceX promotes the use of our national FDD spectrum in previously unserved areas and hints at the potential of a “single network future” of seamless connectivity between terrestrial and non-terrestrial networks. A decision to not renew or only partially renew Optus' national FDD ESL spectrum would undermine our ability to deliver this innovative solution to Australia's remote connectivity needs.

Our regional Multi-Operator Core Network (MOCN) agreement with TPG Telecom (TPG) involves sharing spectrum to enable the delivery of enhanced capacity, speed and service quality to TPG and Optus customers and accelerate the rollout of 5G services in regional Australia.

- (c) **Enhances competition** – Optus is the only mobile network challenger to Telstra outside metro areas of Australia. The past thirty (30) years of mobile competition has delivered new and innovative services to millions of Australians, driving productivity improvements across the economy. A decision to not renew or only partially renew Optus' ESL spectrum would undermine our ability to compete with Telstra in the national mobile market. Carving up our spectrum holdings for new entrants would undermine regional network sharing agreements, lessen competition and disrupt the supply and quality of Optus mobile services.
- (d) **Balances public benefits and impacts** – mobile services are essential services delivering Australians more than just economic benefit by facilitating social connections and broader societal benefits including access to other essential services. Ongoing access to spectrum is crucial to ensuring continuity of supply of mobile services and network resilience, particularly critical during emergencies and in parts of Australia where there may be limited alternatives. The potential disruption of essential services that may result from a change to existing arrangements, weighs heavily in favour of offering MNOs the opportunity to renew ESLs.
- (e) **supports relevant policy objectives** – including those set out under the final Ministerial Policy Statement (MPS) Instrument.⁷ In particular, renewal of our ESL spectrum will support service continuity, facilitate opportunities to collaborate with LEO satellite (LEOSat) service providers to deliver

⁷ Radiocommunications (Ministerial Policy Statement – Expiring Spectrum Licences) Instrument 2024

connectivity across the country, helping to Close the Gap and deliver improved services in regional areas. It will also promote competition and provide the certainty of long-term spectrum access necessary for sustained investment in critical national infrastructure.

Uncertainty of ESL renewal undermines investment in Australia’s digital future

- 1.9 Optus welcomes the ACMA’s statements that continued support for wireless broadband (WBB) use of ESL spectrum bands is “likely conducive to promoting the long-term public interest” and that the ESL process is not a “greenfields” or “from the ground up” exercise in spectrum planning but “should instead review whether existing uses promote the long-term arrangements” (public interest).⁸ Optus also welcomes the recognition of continuity of service and the need to support sustained investment as key considerations in the ACMA’s decision-making.⁹
- 1.10 Despite this, there remains significant uncertainty as to whether the spectrum licensing arrangements that have underpinned billions of dollars in network investment, and the delivery of key safety and essential services will remain the same following their expiry.
- 1.11 This submission demonstrates that there is overwhelming evidence that existing uses of ESL spectrum do and will continue to promote the long-term public interest. The essential nature of spectrum to essential mobile networks and services means that the ACMA should adopt a highly cautious approach to any calls for intervention into ESL spectrum space. Any change risks the ongoing supply of essential services and access to emergency services, banking and everyday economic activity.
- 1.12 Optus is concerned that the ACMA is adopting far too low a threshold for change to existing arrangements. In particular, Optus disagrees with the view that “an absence of submission from (prospective licensees) would not necessarily lead to preliminary or preferred views favouring renewal of ESLs”.¹⁰ The ACMA’s approach raises the prospect of changes to existing arrangements without clear evidence of unmet demand for the spectrum, risking regulatory failure. This is particularly so given that the existing secondary market for spectrum access continues to enable efficient outcomes. Rather, we consider that a lack of submission from a prospective licensee must weigh in favour of ESL renewal.
- 1.13 Optus reiterates its request that the ACMA issue a very clear and robust preliminary view (Stage 3) on whether or not it is disposed to renew all ESLs and on what terms, particularly in relation to price and licensing, at its earliest opportunity. The ACMA’s preferred view (Stage 4) should give as close to certain a position as possible on what the ACMA’s decision on a renewal application may be. To this end, Optus urges the ACMA to consider how its new administrative powers may enable the ACMA to reduce uncertainty in the lead up to the application window.¹¹

⁸ Consultation Paper; p.2

⁹ [New Ministerial Policy Statement for expiring spectrum licences | Ministers for the Department of Infrastructure](#)

¹⁰ Consultation Paper; p.14

¹¹ For example, the issuance of spectrum access charges determination for each ESL well in advance of the application window (section 294 of the Act); issuing a licence renewal notice to spectrum licensees well in advance of the application window, which would result in a deemed application on payment of the renewal fee (section 77C(10)). While these steps do not in and of themselves guarantee renewal, they reduce the uncertainty that the ACMA will not renew.

Approaches to examining use must reflect the realities of mobile network deployment

- 1.14 Optus raised a number of concerns about the general approaches to examining spectrum use set out in the ACMA's "Stage 1" consultation paper.¹² We cautioned that too granular an assessment runs the risk of being meaningless given national network deployment considerations. We recommended that levels of previous and planned investment be given considerable weight in decision making and suggested that the ACMA have recourse to existing information to reduce administrative burden.
- 1.15 Optus welcomes the ACMA's confirmation that it intends to examine use based largely on publicly available information – including the coverage maps that Optus and other MNOs are required to supply to the ACCC under its Infrastructure RKR. However, we note that the ACMA has also identified a number of perceived deficiencies which "limit the extent to which coverage maps alone may inform the design of potential changes to licence conditions, such as licence boundaries".¹³
- 1.16 To support the ACMA's examination of use, Optus refers the ACMA to the Radiofrequency National Site Archive (RFNSA) administered by AMTA. The RFNSA shows where a base station has been deployed and activated. In other words, where the spectrum is being used to make mobile services available to Optus customers. The RFNSA also provides the user with detail on the progress of base station deployment over time. Optus submit that RFNSA data, in combination with coverage maps, should be sufficient to demonstrate current and planned (near-term) use of ESL spectrum.
- 1.17 Conversely, Optus submits that a lack of uptake or evidence of site data in a particular area should not determine that the spectrum is not being used, or certainly that it will not be used in the future, by an ESL holder. Such an approach fails to reflect the dynamic nature of mobile usage by end-users and the importance of "unused" spectrum to the cost-effective deployment of network infrastructure.
- 1.18 Optus notes the ACMA's reservations about the utility of coverage maps, however, we maintain that a granular assessment of use will not be a fair representation of the use of spectrum in network planning decision-making. We encourage the ACMA to adopt an approach to examining spectrum use that reflects the realities of mobile network deployment.
- 1.19 Optus considers that too granular an examination of use may constitute an unreasonable new condition on our use of ESL spectrum, imposed after ESLs were issued. When applied to ESLs, the effect may be akin to a "specified circumstances" renewal statement, enabling the ACMA to refuse to renew ESL spectrum due to "insufficient" use. We submit any retrospective assessment of "sufficiency" or "adequacy" of the use to which a licensee made of its ESL spectrum is not within the scope of the ESL process. We also note that "renewal statements" only apply to spectrum licences issued after the Modernisation Act.¹⁴

¹² ACMA, Stage 1 Consultation Paper, p.28

¹³ Consultation Paper, p.17; in summary the ACMA states that coverage maps (a) are modelled on "predicted coverage" rather than a representation of "actual coverage" (b) "do not directly indicate spectrum utilisation or interference potential considerations" (c) "based on a variety of inputs that may vary between operators and years, limiting direct comparison" (d) "Do not indicate total bandwidth used but do generally indicate which frequency bands have been used" (e) "Do not generally indicate where coverage is planned, or where there may be difficulties providing coverage"

¹⁴ See further section 65A(1) and section 65A(5) of the Act – Optus submit that this restriction must extend to any implied condition on renewal of a licence issued prior to the commencement of section 65A.

The unintended consequences of carving up ESL spectrum will outweigh any benefits

- 1.20 The spectrum licenced to MNOs is deployed to service a wide variety of users, use cases, and applications with a limited amount of spectrum. There is no other comparable use of spectrum serving such a diverse range of use cases. MNOs economies of scale also reduce the cost for alternative users wishing to utilise our networks to innovate and solve “local” problems. Existing ESL arrangements provide the investment certainty required to support the deployment of 5G advanced and 6G that will enable even greater levels of public network utility.
- 1.21 Partial re-allocation of spectrum will create new licence boundaries, introducing cost and complexity into interference management, resulting in permanent underuse of spectrum. These new boundaries will create new “dead zones” where there is no service within the spectrum space, undermining licensees ability to use their spectrum. In other words, partial re-allocation would risk the delivery of essential services, including emergency calling, to the affected area.
- 1.22 Existing mechanisms of access to spectrum via the secondary market remain fit for the purpose of promoting efficient use of ESL spectrum, while minimising the risk of harmful interference. Any reduction in the geographic extent and amount of spectrum available to MNOs will limit options to innovate. For example, fragmentation of national FDD spectrum licences would undermine the potential of LEOSat direct to mobile services.¹⁵ Optus has prepared a number of case studies highlighting the inefficiencies of fragmenting ESL spectrum – see Section 7.
- 1.23 The “out-sized” impact of carving up spectrum space is most clearly illustrated by low-band spectrum. Cost effective network deployment in regional areas depends on access to suitable low band spectrum. Fragmenting MNOs low band holdings to enable local entry in regional Australia will only serve to undermine existing and future coverage and performance of public mobile services. As the ACMA noted in its submission to the Senate Committee:
- “there are constraints on increasing the number of operators using low-band spectrum: Any approach to increase the number of operators using this spectrum is challenging as the ‘wide area’ benefits of the band can be lost by disaggregation into smaller frequency blocks of spectrum. ...Therefore, minimising the number of boundaries and avoiding boundaries through or near population centres is important to maximising the overall utility of the spectrum.”¹⁶
- 1.24 The introduction of new ‘alternative’ licence conditions, such as rollout obligations and “Use-it-or-lose-it” (UIOLI) and “Use-it-or-share-it” (UIOSI) provisions, will dramatically change the investment environment that has underpinned the billions of dollars of network investment Optus has made to date. There is no market failure that would justify such an intervention. Existing ESL arrangements have delivered Australia world leading levels of population coverage and existing mechanisms of spectrum access underpin our regional MOCN services agreement and our collaboration with SpaceX on direct to

¹⁵ The fact that geographically fragmented spectrum is not suitable for LEO satellite deployment is recognised by the FCC in its report and order and further notice of proposed rulemaking of March 2024 stating that it will enable the Supplemental Coverage Services (SCS) “only where a single terrestrial licensee holds all the spectrum access rights in a given channel in an entire geographically independent area.” (Source FCC 24-28 p. 3)

¹⁶ “Connecting the country: Mission critical”; Inquiry into co-investment in multi-carrier regional mobile infrastructure; House of Representatives Standing Committee on Communications and the Arts; para 2.24; p.17

mobile services. These arrangements promise to help deliver improved connectivity services for end users in regional and remote Australia.

The ESL process can support a number of Government policy objectives

- 1.25 Renewal of Optus' ESL spectrum will enable Optus to provide essential services across metro and regional Australia; to continue to innovate and to deploy new networks and services that in turn will help the Government deliver on communications policy objectives. Certainty of renewal will enable Optus to help Close the Gap via satellite direct to mobile services and to deliver improved regional connectivity services via our regional MOCN services agreement.
- 1.26 The ACMA is considering how it can use the ESL process to deliver a range of communications policy objectives. However, adjusting spectrum licence arrangements is not the best way, or the only way, to address policy concerns.
- 1.27 For example, to promote regional connectivity, rather than intervene to re-allocate ESL spectrum to new use cases, the Government should prioritise reform of the Mobile Blackspot Program and the Regional Connectivity Program. These reforms should be designed to level the playing field for all MNOs to receive Government funding and/or mandate access to all publicly funded sites.
- 1.28 Other communications policy objectives that Optus considers are not directly relevant to the ESL process are network resilience and temporary disaster roaming which are being dealt with via other avenues.¹⁷ Of course, the renewal of ESLs will support these objectives by ensuring ongoing delivery of national mobile networks and essential services. Renewal of ESLs will support our MOCN services agreement, which will deliver a second regional 5G mobile network and preserve separate core networks for TPG and Optus, thereby promoting network resilience.

ESL spectrum should be renewed at a nominal price rather than re-auctioned

- 1.29 The ACMA has reiterated its preference for spectrum auctions to resolve "rivalrous demand".¹⁸ Optus is concerned that the ACMA appears to suggest that in such cases, allocation exercises (price-based or administrative) are the "optimal way to expose and test demand".¹⁹ Optus submits that auctions are not appropriate for ESL renewal.
- 1.30 There is a fundamental difference between awards of new spectrum and reallocating ESLs – ESL renewal fees do not need to be set to encourage efficiency, because the spectrum has already been efficiently allocated. Further, the availability of a secondary market means that incentives to maintain and improve efficient spectrum use already exist. The attached expert report prepared for Optus by Dr Chris Doyle explains that there is no need to re-auction ESLs to promote efficiency.
- 1.31 The annual cost²⁰ of spectrum to industry has grown from \$241 million in 2015 to \$818 million in 2024. This has a material negative impact on the ability to invest in mobile infrastructure. Few if any industry sectors pay such sizeable upfront licence fees, with no link to future revenue or profits generated from use of those licences. In the broader context of the sector's financial health and in the interests of sustainable market

¹⁷ E.g. the Government's Network Hardening program and Disaster Resilience Innovation Program as well as its response to the ACCC's recommendations on temporary roaming

¹⁸ Consultation Paper; p.15

¹⁹ Consultation Paper; p.15

²⁰ Amortisation of spectrum licence payments

competition and investment, high spectrum costs are unjustifiable and is directly counter to government policy.

- 1.32 High renewal prices, while attractive to Government revenue, undermine investment in 5G and 6G networks and limit downstream innovation. It is without doubt that the broader economic benefits of mobile use from low spectrum fees far exceed the benefits of increased Government revenue from higher spectrum fees.²¹ Seeking short-term revenue gains is inconsistent with the objectives of the Act. Optus urges the ACMA to eschew the short-term benefit of higher renewal fees to public finances in favour of supporting the broader long term economic benefits that will flow from lower renewal prices²².
- 1.33 Optus maintains that ESLs should be offered for renewal at a nominal price given that ESL spectrum is used to supply critical and essential services. We recognise that the ACMA has indicated that it “would not normally consider that cost recovery-based pricing promotes efficient use of the spectrum”.²³ It follows that where the spectrum is already efficiently used, a cost recovery price may be justified.
- 1.34 Any price above a nominal level could be regarded as an inefficient tax that will need to be recouped through lower spending/investment or higher end user prices. The attached expert report from Coleago Consulting clearly sets out the public benefits of nominal pricing for ESL renewal relative to other pricing methodologies.

Optus’ approach to responding to the Consultation Paper

- 1.35 Optus sets out its response to the ACMA’s Consultation Paper below, guided by the information provided by the ACMA. Our responses are structured to address the individual sections of the Consultation Paper as well as to highlight general themes and considerations relevant to the ACMA forming its preliminary view. Certain points are repeated for emphasis and to highlight the interdependencies of the considerations raised by the ACMA’s questions.

²¹ Hazlett & Munoz, 2009, A welfare analysis of spectrum allocation policies, RAND Journal of Economics, Vol. 40, No. 3, pp. 424–454

²² Optus submission in response to ACMA’s draft Five-year spectrum outlook 2023-28 and 2023-24 work program Public Version May 2023

²³ ACMA’s Final framework document, December 2023

Section 2. ESLs ENABLE OUR DIGITAL FUTURE

- Providing mobile network operators (MNOs) with sufficient certainty that ESLs can be renewed will promote the long-term public interest to be derived from ESL spectrum.
- There is no need to change existing arrangements governing ESLs – national mobile networks will deliver up to \$94 billion uplift to Australia’s GDP by 2030 and are relied upon to deliver critical services like emergency calling services.
- MNOs need ESL spectrum to continue to supply essential services, meet demand for 5G and to deploy digital infrastructure and services critical to Australia’s future.
- Geographic segmentation of ESL holdings will create coverage “dead zones” which will prevent supply of essential services and prevent Australians from calling for help in times of need.
- There is no evidence to support any change to existing licencing arrangements for ESL spectrum. Any change will cause material public detriment and is not consistent with Act.

Use of ESL spectrum for essential mobile services delivers long term public benefits

- 2.1 The GSMA has observed that “the core objective of spectrum management is...to enable spectrum to be used in a manner that will bring the greatest benefits to society”.²⁴ The link between effective spectrum management and the realisation of public policy goals is increasingly acknowledged, with the US National Spectrum Strategy recognising the importance of a comprehensive and collaborative strategy to make the “most efficient use possible of this vital national resource”.²⁵
- 2.2 Mobile networks supply essential communications services to Australians across the country, providing access to emergency, education, banking, health, social, commercial and government services.²⁶ Mobile services keep us connected with work, family and friends, providing convenience and improving productivity. Mobile networks are a critical component of Australia’s digital infrastructure, connecting government, businesses and consumers, enabling new vertical industries and supporting the realisation of key Government policy objectives for an inclusive, secure and prosperous Australia.²⁷
- 2.3 Mobile networks are national networks with wide area coverage and large customer bases which leads to economies of scale and highly efficient use of spectrum. There were 28.7 million prepaid and postpaid mobile plans across Australia in December 2022, up 1.4 million from the previous year.²⁸ The role of spectrum in a network is to connect user devices and equipment to network equipment and enable data transmission.

²⁴ Maximising the socio-economic value of spectrum – a best practice guide for the cost-benefit analysis of 5G spectrum assignments; January 2022; p.4

²⁵ The White House, National Spectrum Strategy; 13 November 2023; p.1

²⁶ [Albanese Government to improve safeguards for telco consumers experiencing financial hardship | Ministers for the Department of Infrastructure](#)

²⁷ The broader socio-economic benefits of mobile networks and services are well documented. GSMA research “Mobile technology: two decades driving economic growth”, 2020, shows that the baseline economic impact of mobile services increases when upgrading from one generation of mobile technology to the next (15% from 2G to 3G and 25% from 2G to 4G).

²⁸ [Trends and developments in telecommunications 2022-23 \(acma.gov.au\)](#), p.5 where the ACMA notes that “there were 39.6 million mobile services in operation...2.8 million more than June 2022. It includes prepaid and postpaid mobile plans, mobile broadband services and machine-to-machine connections”.

Therefore, spectrum is essential to the function of a mobile network and the supply of essential mobile services to end-users.

- 2.4 In terms of the economic benefits of 5G, the GSMA predicts the continued use of low band spectrum for 5G mobile networks will contribute \$130 billion to global economic growth in 2030.²⁹ BCG predicts that by 2030, 5G will have contributed from US\$1.4 to US\$1.7 trillion in US economic growth.³⁰ Deloitte calculates that 5G will increase Australia's GDP by \$67 billion in 2022 dollars by 2030 and further accelerating 5G adoption could uplift this forecast by \$27 billion.³¹
- 2.5 Realising the broader public benefits of mobile networks requires a regulatory framework governing access to spectrum for mobile services that is sufficiently supportive of the investment required to deploy infrastructure, densify networks and deliver sufficient bandwidth at a competitive price. National mobile operators benefit from economies of scale and scope that mean they are best placed to support these industry policy objectives and boost productivity, as long as they have the spectrum needed to do so.
- 2.6 The radiocommunications sector remains highly dynamic, with new equipment and devices continuing to deliver improvements in speed, performance and user experience. New commercial opportunities created by the arrival of LEOSats present the opportunity of a "single network future". Future innovation should not be hindered by regulatory changes to the spectrum licence arrangements that have supported the rapid deployment of networks and services to date.
- 2.7 While there may be calls for regulated access to ESL spectrum from some prospective licensees now, intervening to facilitate this access would be short-sighted, undermine the innovative potential of public networks and disproportionately impact MNOs long term network planning and deployment. MNOs must be assured of sufficient access to spectrum of sufficient quantity and quality to support the ongoing supply of essential services, deployment of critical digital infrastructure and more readily enable the benefits of Australia's digital future.

MNOs will need ESL spectrum to meet accelerating demand for 5G data services

- 2.8 Global demand for data continues and the uptake of 5G is accelerating.³² Global 5G subscriptions jumped approximately 600 million (1 to 1.6 billion) between December 2022-23.³³ Over 300 operators in 113 countries have launched commercial 3GPP-compatible 5G services and there are at least 1964 commercially available devices, with 5G devices increasing by 39% from Dec 2022.³⁴ By 2029, 5G networks will carry 76% of the world's mobile data traffic and cover 85% of the world's population.³⁵
- 2.9 Australians were early adopters of 5G and the ACMA reports that 5G services are now available to more than 85% of the Australian population.³⁶ Australia maintains leading

²⁹ GSMA, 2023, Socio-Economic Benefits of 5G – The importance of low-band spectrum

³⁰ Val Elbert et al of BCG; Accelerating the 5G economy in the US; 17 April 2023

<https://www.bcg.com/publications/2023/accelerating-the-5g-economy-in-the-us>

³¹ Deloitte Access Economics, March 2022, 5G Unleashed, available here: https://amta.org.au/wp-content/uploads/2022/03/5G-Unleashed-Final-Report_combined-v2.pdf

³² ACMA draft FYSO 2024-29, p.18

³³ Ericsson Mobility Report, November 2023; available here: [Ericsson Mobility Report | Read the latest edition](#)

³⁴ GSA, January 2024, 5G Ecosystem January 2024 Summary, available here:

<https://gsacom.com/paper/5g-ecosystem-january-2024-summary/>

³⁵ Ericsson, November 2022, *Ericsson Mobility Report* cited at p.16 of FYSO 2023-28; latest Ericsson Mobility Report November 2023 is available here: [Ericsson Mobility Report | Read the latest edition](#); p.12

³⁶ [Trends and developments in telecommunications 2022-23 \(acma.gov.au\)](#); p.16

subscriber penetration rates, with GSMA reporting over 35% of Australians use 5G capable devices that access 5G networks – the second highest “5G availability” rate in selected Asia Pacific and European markets.³⁷ Australia remains a leader in 5G deployment (deploying over 9000 5G base stations by early 2023).³⁸

- 2.10 Optus continues to deploy its 5G network across Australia. As at March 2024, Optus has a total of 4273 5G enabled sites, with 3511 of these being macro sites. Under our MOCN deal with TPG, we will accelerate our 5G deployment by fast-tracking the number of 5G sites in the regional MOCN area (which covers approx. 17% of the population – from 81.5% to 98.4%) to 1500 sites by 2028 and 2444 sites by the end of 2030.³⁹ We remain the leader for recorded download speeds (208.7 Mbps) and overall user experience.⁴⁰
- 2.11 To date, the deployment of 5G networks has largely been focused on the consumer market with the pace of deployment assisted by the fact that it has largely been “non-standalone” deployment, using the existing 4G core network. The deployment of 5G standalone, with a dedicated 5G core network, is underway, and offering increased performance potential via “network slicing”, which allows a single physical network to deliver multiple networks, with specified levels of reliability, capacity and security. In effect, MNO networks will become highly efficient spectrum sharing platforms for a wide variety of use cases, including massive machine type communication, smart city, virtual mobile private networks and more.
- 2.12 Dedicated private wireless networks have been identified as having an emerging role to play in realising the public benefits of 5G and ushering in “Industry 4.0”.⁴¹ The GSMA has identified three broad categories of private 5G networks, reflecting different levels of customisation, control and cost factors⁴²:

Figure 1 Private 5G network deployment scenarios

Standalone enterprise-led	Standalone operator-led	Hybrid (based on operator's public 5G network)
<ul style="list-style-type: none"> Can be built by enterprises or mobile operators Uses allocated new 5G spectrum Meets stringent reliability, security, availability and latency requirements Costly and requires dedicated operational personnel 	<ul style="list-style-type: none"> Built by mobile operators on behalf of enterprises Uses the operator's licensed 5G spectrum Meets stringent reliability, security, availability and latency requirements Benefits from the operator's long-standing experience in network management 	<ul style="list-style-type: none"> Based on a 'slice' of an operator's public network Uses the operator's licensed spectrum Shares use of the operator's public 5G resources (e.g. RAN, core, cloud) to varying levels Quicker and easier to set up and manage than standalone variants

Source: GSMA

³⁷ [GSMA | 5G in Asia Pacific: Deployment Momentum Continues - Membership](#) under “South Korea sets the pace as 5G networks expand across the region”

³⁸ ACCC, Mobile Infrastructure Report 2023; p.12

³⁹ [TPG Telecom and Optus sign network sharing agreement marking new era of mobile services for regional Australia](#)

⁴⁰ OpenSignal's latest Mobile Network Enterprise report; CommsDay 30 April 2024, p.8

⁴¹ ACMA Market Analysis; Private wireless networks using 4G or 5G in Australia, market study; September 2023; p.5

⁴² GSMA Intelligence; Exploring 5G private network opportunities in Asia Pacific; February 2023; p.10

- 2.13 The ACMA states that there are approximately 50 private wireless networks in Australia largely seeking to address the same market as public mobile network hybrid solutions. As the ACMA has observed “*from an equipment and technology perspective, there is no difference between a public and a private wireless network. The crucial difference is exclusive access to spectrum and complete control over network performance*”.⁴³ It is the capability to provide dedicated network capacity that is considered the main point of differentiation to attract applications that demand high levels of network reliability.⁴⁴
- 2.14 The ACMA has also observed that while the market for private wireless networks will grow nearly 30% annually to be worth \$695 million by 2027 (from \$130 million), the public mobile network services market is expected to grow from \$12.4 to \$14.7 billion – twenty times the estimated benefit of private wireless networks.⁴⁵ Put simply, private wireless networks do not promote the public interest to the same degree as national public mobile networks. Spectrum allocated to a private user can only be used by that private user. By contrast, MNO 5G networks are effectively sharing platforms that enable multiple downstream use cases and applications via the public network, including access to essential services.
- 2.15 Network slicing of public network spectrum further promotes efficient use of that spectrum compared to carving it up into new licences for dedicated use in private networks. Slicing also represents a more viable means of achieving the spectrum efficiency objectives sought by the proposed alternative licence conditions. This is because the MNO is best placed to manage the risk of interference to our networks.

Allocation to local area WBB services risk stranding valuable low band spectrum

- 2.16 Optus is aware that some prospective licensees argue that the use of national/regional spectrum licensing for low-band spectrum is a major barrier to the cost-effective deployment of local area WBB and private wireless networks with mid-band deployments becoming unviable to provide the target coverage area, particularly in regional Australia.⁴⁶
- 2.17 However, as the ACMA states “while spectrum licensing or a single Australia-wide apparatus licensing arrangement is generally not suitable for the use cases of localised providers there is the possibility of third-party access to spectrum licence bands through agreement with the spectrum licensees”.⁴⁷ We reiterate that none of these prospective local area or private wireless network stakeholders have approached Optus seeking commercial access to our spectrum via the secondary market. While there may be some public benefit to be served by supporting local area WBB use cases and/or private wireless networks this should be done via 3.8GHz AWLs or similar dedicated apparatus licences, rather than at the expense of public mobile networks access to ESL spectrum.
- 2.18 Optus will need ongoing access to its ESL spectrum to supply 5G services and to enable cost effective deployment, including under our MOCN agreement. For bands not planned for 5G use in the medium term, such as 700MHz and 1800MHz, Optus will need to retain access to enable ongoing supply of 4G/LTE services. The criticality of our low band spectrum, particularly 900MHz, to the cost-effective supply of affordable and competitive national 5G mobile services across a sparsely populated country like

⁴³ ACMA Market Analysis; Private wireless networks using 4G or 5G in Australia, market study; September 2023; p.5

⁴⁴ GSMA Intelligence; Exploring 5G private network opportunities in Asia Pacific; February 2023; p.10

⁴⁵ ACMA Market Analysis; Private wireless networks using 4G or 5G in Australia, market study; September 2023; p.5

⁴⁶ Pivotal submission to ACMA’s draft FYSO 2023-28; p.3

⁴⁷ Spectrum options optimised for local area wireless broadband services; Information paper; August 2023; p.5

Australia means that the interference potential created by carving up low-band holdings will disproportionately affect Optus' ability to supply essential public mobile services. This interference risk outweighs the need to adjust existing ESL arrangements to accommodate prospective WBB licensees.⁴⁶

MNOs will need all ESL spectrum and more to deliver advanced 5G and IMT-2030 (6G)

2.19 The development from 4G (LTE) to 5G (IMT-2020) already saw an expansion of requirements to cover a wide range of use cases and applications. While 4G can be thought of as a best effort mobile data service for smartphones, 5G addresses a wide range of use cases and with new capabilities such as low-latency, network slicing, and ultra reliability. The following diagram illustrates the expansion of use cases with 5G:

Figure 2. The evolution of 4G to 5G Use Cases



Source: Coleago

2.20 The ACMA already anticipates "that growing demand for data will drive spectrum demand for 5G uses" and is assessing the need for additional spectrum bands for mobile to ensure future 5G demand can be served.⁴⁹ If additional spectrum is not made available, particularly in denser urban areas of high demand, delivering 5G capabilities may require levels of cell site density that may be cost prohibitive. For example, the *AMTA Policy Position Paper: Spectrum for 5G and Beyond* identified the need to set a target for an additional 8GHz in total spectrum for mobile services by 2030.⁵⁰ Such forecasts highlight that, over the longer term, MNOs will need additional spectrum beyond their existing ESL spectrum to meet future demand.

2.21 Demand for data will extend beyond 5G and come from new use cases, including critical technologies such as quantum computing, autonomous systems and robotics, Artificial Intelligence (AI) and advanced manufacturing. "Mature" 5G and then eventually 6G networks and services will need to deliver a fibre-like experience with 100 Mbit/s

⁴⁶ See ACMA FYSO 2024-29, where ACMA states at page 17 that "Reviewing arrangements for access to bands already licensed for WBB is important to ensure existing allocations are efficient and can cater for new technology developments, such as 5G. This has to be balanced with the need to manage interference with other licensed services" (emphasis added).

⁴⁹ For example, the draft FYSO 2023-28 p.19, notes objectives to progress arrangements for 3.4-4.0GHz across various parts of Australia, and determining whether replanning the 40GHz and 47GHz bands for possible 5G is appropriate. In the draft FYSO 2024-29, the ACMA has indicated that it intends to consult on the future approach to the upper 6GHz band identified for potential IMT use at WRC-23

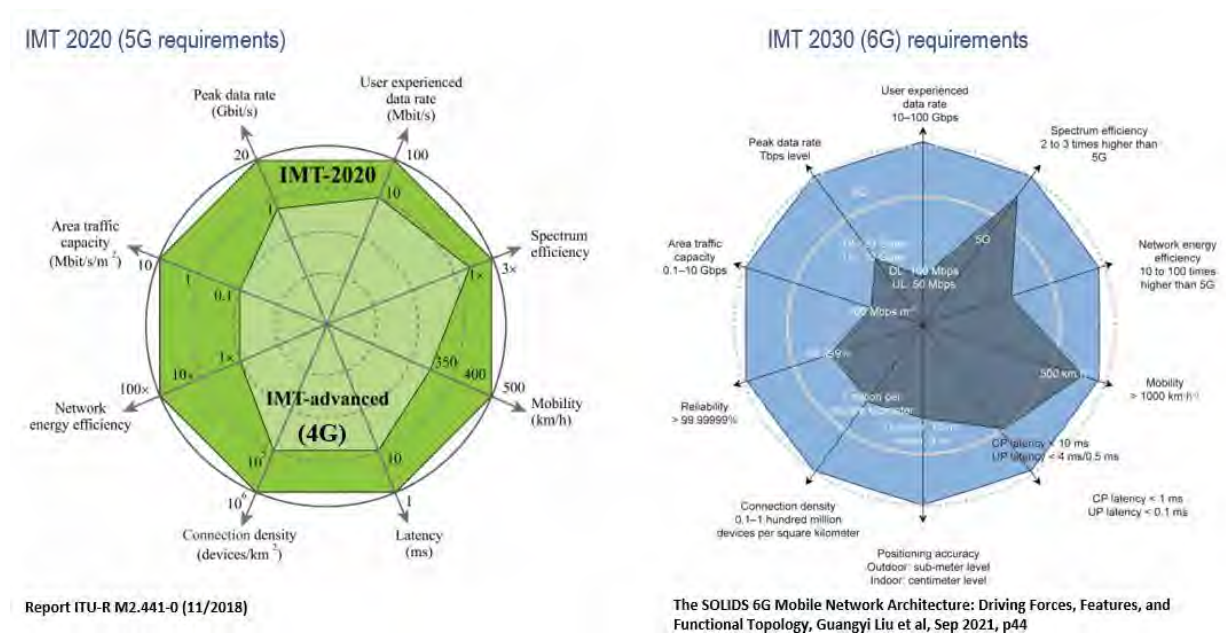
⁵⁰ AMTA, 2021, 5G Unleashed; p.29 Analysis undertaken by Coleago for AMTA has found that in Sydney, Melbourne and Brisbane there is expected demand for mid band spectrum out to 2030 that exceeds what is currently available for MNOs.

downlink as well as low latency, catering for higher traffic densities.⁵¹ Looking at user and application trends, the ITU notes that:

“Applications and services enabled by IMT-2030 are expected to connect humans, machines and various other things together...it is expected that IMT-2030 provides a wide range of use cases while continuing to provide, inter alia, direct voice support as an essential communication...IMT-2030 technology is expected to drive the next wave of digital economic growth, as well as sustainable far-reaching societal changes, digital equality and universal connectivity...further enhance security and resilience.”⁵²

2.22 This graphic from an ITU_R report compares the requirements of 4G, 5G and 6G:

Figure 3 Comparison of 4G, 5G and 6G requirements



Source: ITU_R

2.23 The ITU observes that “no single frequency range satisfies all the criteria required to deploy IMT systems and the same is expected to apply for IMT-2030” adding that:

“New generations of IMT may expect new spectrum for increasing data rates, capacity, new applications and to provide for new capabilities. IMT-2030 is envisaged to utilize a wide range of frequency bands ranging from sub-1GHz up to frequency bands above 100GHz. Low bands will continue to be crucial to enable nationwide coverage, in particular addressing the digital divide and expanding deep indoor coverage. Mid bands provide a balance between wide area coverage and capacity.”⁵³

2.24 The shutdown of 3G networks will enable the refarming of spectrum to support further 5G deployment. However, the capacity and quality of service demanded of mobile networks under 5G will only accelerate with 6G. To be able to cater for higher traffic

⁵¹ In essence, a mature 5G network is a platform which addresses all present use cases. 6G further develops the capability of mobile networks to service increasing demand and new use cases, taking into account anticipated developments over the next decade and beyond.

⁵² Recommendation ITU-R M.2160-0; p.6

⁵³ Envisaged frequency bands, Recommendation ITU-R M.2160-0; p.11

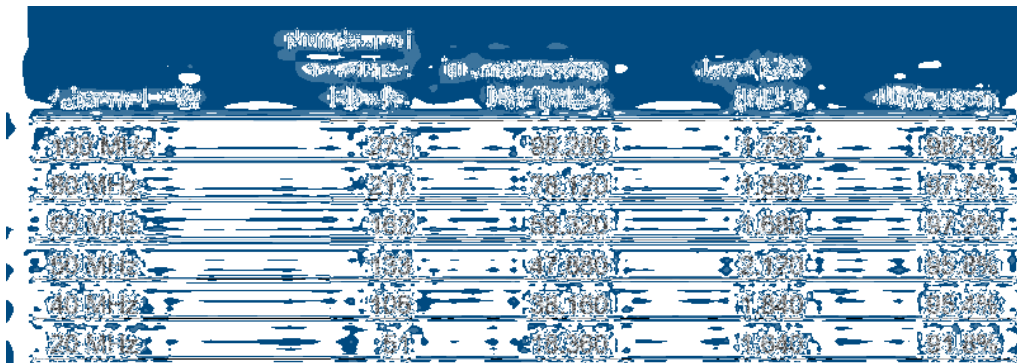
densities and deliver standalone 5G, and the commercialisation of 6G, mobile operators will need access to the right type and amounts of spectrum, operating under the right licence conditions.

- 2.25 Optus submits that even a conservative assessment of the potential future demand means that MNOs must, at the very least, be able to retain all existing ESL spectrum for the foreseeable future. We believe that all the ESLs currently held by Optus should be offered for renewal to allow the continued provision of WBB services. A reduction in the spectrum currently allocated to IMT would compromise 4G and 5G service delivery and hamper the development of 6G services into the future.

Increasing capacity demands means access to contiguous spectrum blocks is crucial

- 2.26 The bandwidth requirements of 5G and then 6G mean that contiguous blocks of spectrum will be crucial to promoting efficiency. “Contiguous” blocks of spectrum enable better network performance by delivering a greater overall bandwidth for transmission of data from a base station to an end-user. The wider the band in which 5G and then 6G services are deployed, the higher the spectral efficiency.
- 2.27 For example, deploying 5G in a 100MHz wide channel in upper mid-band spectrum delivers a 7% higher spectral efficiency compared to deploying it in only 20MHz. Spectrum utilisation is less than 100% for all 5G NR channel bandwidth options because the resource blocks do not fully occupy the channel bandwidth. Not renewing all spectrum in a band where an operator already has 100MHz or close to it, reduces overall efficiency as shown below.⁵⁴

Figure 4 Spectral Efficiency of Differing 5G Channel Bandwidth



Source: ECC Report 287

- 2.28 In turn, quality and quantity of spectrum have a direct impact on the cost efficiency profile of an MNO’s network deployment. Augmenting mobile base-station sites with more spectrum, particularly contiguous spectrum, is the most efficient way to add capacity to public mobile networks.⁵⁵ The following graphic compares a “spectrum rich” and a “spectrum poor” MNO, highlighting that spectrum is a key ingredient for MNOs to control site numbers:

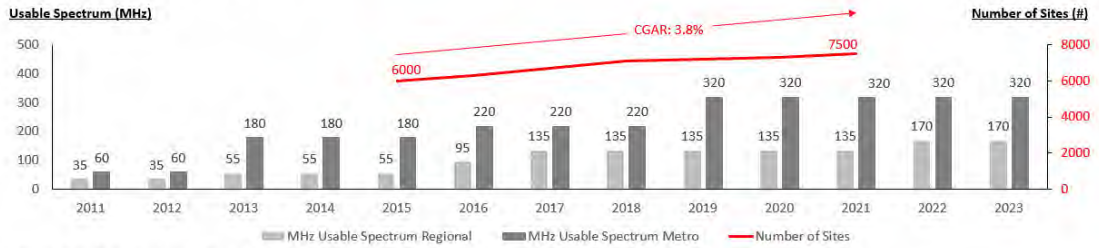
⁵⁴ As cited by Coleago: ECC Report 287, Guidance on defragmentation of the frequency band 3400-3800 MHz, October 2018, p.41

⁵⁵ [Optus \(Statement of Steven Turner\) - 20.10.22 - PR VERSION - MA1000021 Telstra TPG.pdf \(acc.gov.au\)](#)

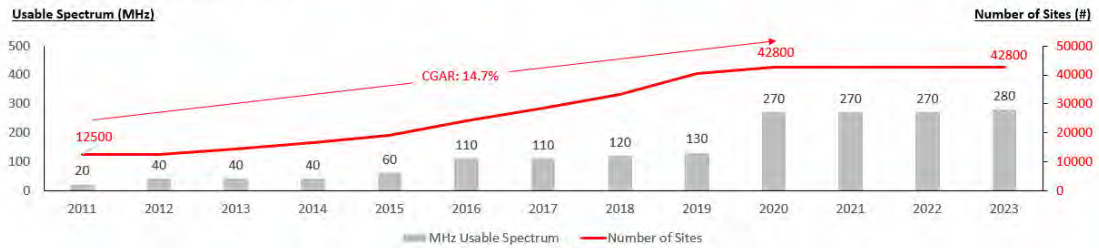
Figure 5 The Effect of Spectrum Resources on Site Counts

Spectrum is the most important ingredient for MNO to control site numbers.

Example of a Spectrum Rich MNO



Example of a Spectrum Poor MNO



Source: Telco-Economics for Optus

Optus will need its ESL spectrum to help deliver the “single network future”

- 2.29 Satellite services are an increasingly important complement to terrestrial mobile networks with advances in satellite technology and improved interoperability between terrestrial and non-terrestrial networks (NTN) offering the potential for seamless connectivity and a “single network future”.
- 2.30 To deliver the “ubiquitous connectivity” envisaged by IMT-2030, MNOs will need spectrum access across the entire Australian landmass. However, given that there will always be large parts of Australia’s land mass that will not get terrestrial based mobile coverage,⁵⁶ non-terrestrial deployment is really the only economically feasible solution by which Australian MNOs can deliver ubiquitous coverage. As recognised by the ITU:

“The interworking of IMT-2030 terrestrial network with its non-terrestrial networks (NTN), including satellite communications, high altitude platform stations as IMT base stations (HIBS), is expected to enhance achieving required connectivity objective.”⁵⁷

- 2.31 The potential socio-economic benefits of extending mobile network coverage are significant and the redundancy afforded by a fallback satellite based mobile service could be game changing during disasters. The Government, through the LEOSat working group, has recognised that advances in LEO satellite technology offer an

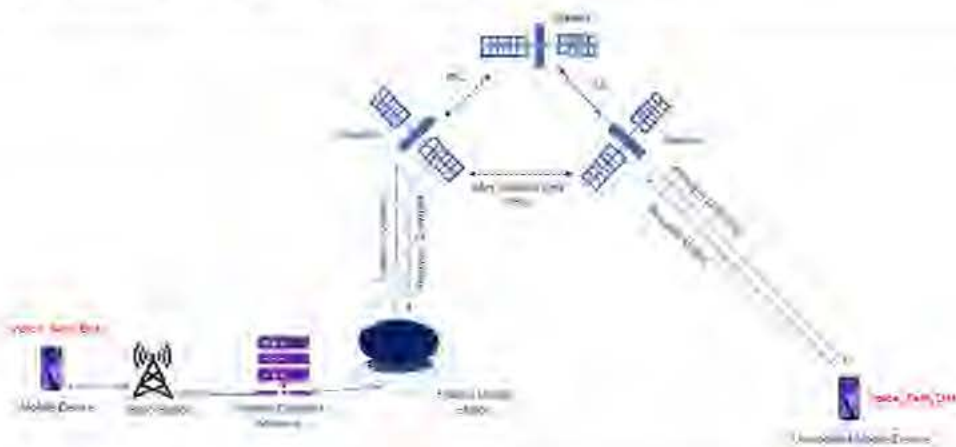
⁵⁶ Consultation Paper, p.42, footnote 44 where ACMA cites Telstra submission to the 2021 Regional Telecommunications Review. Optus has calculated that Telstra network covers approximately 28% of Australian land – Telstra’s 4G network (external antenna) covers approx 2,179,182 million km2 of geographic area (ACCC Infrastructure Report 2023) and Australia is 7,688,287 km2

⁵⁷ Recommendation ITU-R M.2160-0 states that key objective of IMT-2030 (or 6G) is “ubiquitous connectivity”; p.10

opportunity to bridge the Digital Divide and deliver essential connectivity services to previously underserved or unserved areas of Australia.⁵⁸

- 2.32 These benefits can start to be realised in the near future via IMT satellite DTM services.⁵⁹ Mobile handsets are nearly ubiquitous, which means the time to (mass) market for IMT satellite DTM services is shorter than alternative MSS options that do not have such a well-established device ecosystem. Optus collaboration with SpaceX will deliver mobile services direct to Optus 4G compatible devices across Australia using Optus <<CIC begins>><<CIC ends>> ESL spectrum licence. Optus plan to launch SMS from late 2024 and voice services in late 2025.⁶⁰
- 2.33 IMT satellite DTM services can only be effectively delivered via FDD spectrum due to the need to maintain sufficient frequency separation between uplink and downlink. The following illustrates the general configuration of an IMT satellite DTM service:

Figure 6 Mobile coverage using LEOsats



Source: Coleago

- 2.34 An IMT satellite DTM service can, when designed correctly, promote the efficient utilisation of FDD spectrum, particularly in areas outside the existing public mobile network footprint. This development means that Australian MNOs will be able to use their nationally licenced spectrum across the entire Australian landmass to effectively “supplement” or extend mobile coverage across the entire country using LEOsats.⁶¹
- 2.35 On 14 March, 2024, the US Federal Communications Commission (FCC) issued a Report and Order and Further Notice of Proposed Rulemaking (Order) adopting world first rules governing “supplemental coverage from space,” or “SCS”.⁶² The FCC intends that the new SCS regulatory framework will facilitate a “single network future”, fostering collaboration between satellite operators and terrestrial service providers to provide ubiquitous connectivity directly to consumer handsets using spectrum previously allocated only to terrestrial services.⁶³

⁵⁸ [Low Earth Orbit Satellite Working Group—2023 Chair’s Report—February 2024 \(infrastructure.gov.au\)](https://www.infrastructure.gov.au/infrastructure/infrastructure-reports/2023-chair-report)

p.7

⁵⁹ See further 3GPP Releases 17 and 18

⁶⁰ [Optus | SpaceX](https://www.optus.com.au/newsroom/optus-space)

⁶¹ other than excluded geographic areas such as the Radio Quiet Zone (RQZ) in WA

⁶² Single Network Future: Supplemental Coverage from Space; Report and Order and Further Notice of Proposed Rulemaking GN Docket No. 23-65 and IB Docket No. 22-271; [DOC-400678A1.pdf \(fcc.gov\)](https://www.fcc.gov/document/DOC-400678A1.pdf).

p.2

⁶³ [DOC-400678A1.pdf \(fcc.gov\)](https://www.fcc.gov/document/DOC-400678A1.pdf); p.3

- 2.36 In the Order, the FCC expressed several public interest goals for the SCS framework, including expanding “the reach of communications services, particularly emergency services,” into more rural areas, positioning the United States as a global leader in space-based technology, and continuing to “promote the innovative and efficient use” of the spectrum.⁶⁴
- 2.37 In the near future, direct to device technology may be operable across all mobile devices, with new technical standards establishing network architectures that facilitate seamless connectivity between terrestrial and non-terrestrial networks. In such a scenario, MNOs are best placed to manage the service end-to-end, via nationally licenced spectrum. A future “universal infrastructure/service provider” may more effectively coordinate the supply of the end-user service with the satellite station operator and limit the potential of harmful interference.
- 2.38 In the future, Optus’ collaboration with SpaceX offers the potential of nationwide mobile coverage via our national FDD ESL spectrum. This collaboration is the first of its kind in Australia and presents the real opportunity to deliver connectivity to areas without terrestrial coverage and to Close the Gap.

Geographic segmentation of ESL holdings will undermine the potential of FDD DTM services

- 2.39 An MNO can only provide a seamless DTM service via FDD spectrum that is assigned and available nationally. Changing the geographic scope of a spectrum licence increases (co-channel) interference risk due to the increase in licence boundaries. Interference can result in coverage loss beyond the carved-out area. Carving out spectrum licences at a regional or local level would create significant problems and may even render some spectrum useless for IMT satellite DTM deployment.
- 2.40 The unsuitability of geographically fragmented spectrum for supplemental (mobile) coverage from space via LEOSat deployment was recognised by the FCC, stating that it will “*enable SCS only where a single terrestrial licensee holds all the spectrum access rights in a given channel in an entire geographically independent area.*”⁶⁵

New technologies complement established practice in future spectrum management

- 2.41 In its recent draft Five Year Spectrum Outlook 2024-29 (FYSO) the ACMA expresses openness to supporting industry-led trials of Dynamic Spectrum Access (DSA) or other non-traditional spectrum sharing methods.⁶⁶ Similarly, in its October 2023 discussion paper “Spectrum management for next generation wireless broadband”, OfCom expresses the view that “flexibility and spectrum sharing will be required to support Next Generation Wireless Broadband (NGWB) network demand and deployment”, noting that:

“Technical developments offer the potential to move beyond simple sharing arrangements based on geographic separation, signal to interference thresholds and conservative coverage /propagation models. A toolkit of technologies can be used to improve service quality and spectrum efficiency. These include spectrum sensing and machine learning to characterise spectrum use and autonomous and cooperative algorithms to dynamically assign spectrum resources.”⁶⁷

⁶⁴ [DOC-400678A1.pdf \(fcc.gov\)](#); p.2

⁶⁵ On March 14, 2024, the US Federal Communications Commission (FCC) adopted a Report and Order and Further Notice of Proposed Rulemaking (Order) adopting world first rules governing “supplemental coverage from space,” or “SCS”; [docs.fcc.gov/public/attachments/DOC-400678A1.pdf](#); p. 3

⁶⁶ Draft FYSO 2024-29; p.62

⁶⁷ [Spectrum management for next generation wireless broadband: a discussion paper - Ofcom](#); p.5

- 2.42 Optus recognises that increasing demands on spectrum from new entrants/use cases mean there may be increased interest for spectrum sharing and flexible access arrangements. However, support for new sharing/flexible access technologies, such as DSA, needs to be approached with caution and should avoid undermining the certainty of access required to support network investment. Optus also considers that the adoption of such technologies may lead to less dynamic forms of sharing such as contemplated under proposed “Use-it-or-lose-it” (UIOLI) and “Use-it-or-share-it” (UIOSI) alternative licence conditions being canvassed by the ACMA in this Consultation paper.
- 2.43 Optus also notes that many of the new sharing technologies, including DSA, remain unproven in real world scenarios. In this context, Optus generally considers that dynamic shared access or similar schemes will not provide a workable solution as segmentation of spectrum between use cases will cause inefficient fragmentation.
- 2.44 Further, while the FCC’s “Citizen Broadband Radio Service” (CBRS) has been lauded by some as a success of spectrum sharing, in reality, significantly low power levels, higher site counts, and small licence sizes limit use cases. There is also complexity in spectrum coordination and planning as capacity is not guaranteed when incumbents require use of the frequency and radio channel assignments can vary. Applying CBRS to other bands and in different contexts is at “best a complicated and uncertain project”.⁶⁸
- 2.45 We reiterate that, from a public interest perspective, MNOs are highly efficient spectrum sharing “engines” with 5G stand-alone and future 6G mobile networks offering the ability to service all use cases and applications and ubiquitous delivery of essential services. In this way, public 5G and 6G networks offer the opportunity to promote efficient spectrum use at the edge of the public network.

Existing market mechanisms facilitate efficient spectrum use

- 2.46 Optus notes the ACMA’s comment in its recent FYSO that “spectrum sharing in its traditional form is a core component of managing access to spectrum – all users ‘share’ the spectrum either through coordinated access (by working around other users on a time, frequency and/or spatial separation basis) or uncoordinated access, where interference potential is understood and accepted and/or mitigated by technology (for example, under the LIPD class licence).”⁶⁹
- 2.47 Optus consider that the objectives of spectrum sharing/flexibility, namely the promotion of efficient spectrum use, can be delivered via existing market mechanisms rather than regulatory intervention. Secondary market trading, spectrum leasing and geographical licence separation currently provide traditional sharing opportunities to meet existing needs, while allowing the incumbent licensees to control and determine additional uses within their spectrum licence areas. These arrangements can better deliver the efficiency objectives of proposed new “alternative” licence conditions, by not increasing the interference risk and avoiding costly unnecessary disputation.
- 2.48 For example, it is increasingly common for network operators to conclude network sharing agreements to improve the cost efficiencies of network deployment. In a MOCN arrangement, the whole of the radio access network (antennas, transmitters, receivers,

⁶⁸ [Lessons learned from the CBRS spectrum experiment — Rysavy | Fierce Network \(fierce-network.com\)](#); 28 April 2022

⁶⁹ Draft FYSO 2024-29; p.62

baseband signal processors etc) is shared, as well as the spectrum deployed. The carriers connect their own separate core network to the common RAN.⁷⁰

- 2.49 Our MOCN deal with TPG includes an agreement to share regional spectrum that will enable Optus and TPG to deliver improved mobile coverage and service performance to their customers in regional Australia. This arrangement will deliver increased spectral efficiency and promote competition against a spectrum rich Telstra by enabling Optus to accelerate our 5G deployment to deliver 2,444 5G sites in the MOCN area by the end of 2030.

New interference management techniques should not undermine investment

- 2.50 Co-existence, coordination and cooperation are fundamental to facilitating the efficient use of spectrum. The ACMA's existing licensing regime incorporates established spectrum management practices to deliver workable co-existence. For example, Technical Liaison Groups (TLGs) and consultation to support band harmonisation and design spectrum licence technical frameworks. Cooperation and coordination to deliver effective Device Boundary Criterion (DBC), guard space or agreed registrations.⁷¹
- 2.51 Optus recognises that no licensee is entitled to operate in a completely interference free environment. The public benefits of co-existence arrangements must be carefully and transparently weighed against the potential negative impact on investment. Carefully designed technical frameworks along with traditional⁷² and, if proven, modern interference resolution techniques (e.g. Automated Frequency Coordination) may all be necessary to support co-existence, minimise interference potential and ensure efficient spectrum utilisation.
- 2.52 In this context, Optus note the ACMA's statement in its recent FYSO that "While spectrum licences may be 'technology flexible' in that they do not explicitly preclude any use, they are designed and optimised with a likely technology in mind to maximise the efficiency of these licences for their expected use, consistent with co-existence requirements of other spectrum uses/users".⁷³
- 2.53 Optus agrees with this statement to the extent that co-existence and coordination with other licence holders is a fundamental principle of effective spectrum management. We also note that the relative flexibility afforded to spectrum licensees within the spectrum space is central to enabling innovation, such as our SpaceX collaboration.
- 2.54 The existing mechanisms for third party authorisation under the Act provide a balance between enabling access and innovative spectrum use, while ensuring adherence to the relevant spectrum licence technical framework. Maintaining responsibility for interference management with a single licensee helps ensure that the task of delivering effective co-existence is clearer and more straightforward, thereby lessening the administrative burden of compliance on all stakeholders.

⁷⁰ In contrast to a Mobile Operator Radio Access Network (MORAN) arrangement, the whole of the radio access network is shared as in a Mobile Operator Core Network arrangement, except the spectrum deployed is different for different carriers. In Mobile Operator Radio Access Network, the carriers in the arrangement can have different coverage and capacity. Optus and Vodafone entered this type of sharing arrangement in 2004, to share more than 2,000 base stations nationally; ACCC Regional Mobile Infrastructure Inquiry; Final Report; 30 June 2023; p.50

⁷¹ As per section 145 of the Act

⁷² Other technical measures, such as, geographical separation distances between systems, physical shielding, filtering, interference coordination and power limits may also be considered.

⁷³ Draft FYSO 2024-29; p.63

Optus plans to use all its ESLs to continue to supply essential mobile services

- 2.55 Optus has set out a vision of Australia’s digital future, and the role of mobile services in realising its potential. This provides some context as to how access to ESL spectrum will be crucial to enabling Optus to help facilitate Australia’s future competitiveness and prosperity. Of course, the use of spectrum will also be essential to ensuring the ongoing supply of existing mobile services.
- 2.56 Optus understands that the ACMA is seeking information on “planned” use of ESL spectrum for the purposes of its assessment. The ACMA has also indicated a preference for non-confidential information. Optus has provided the ACMA with its coverage maps and access to the RFNSA database.
- 2.57 The RFNSA contains planned site and technology information. This information is indicative only. The database is used as a deployment tool so active planned sites which do not have a candidate location selected will not be in the database. Conversely, candidate locations which may not be progressing may still be listed.
- 2.58 Coverage maps represent only a snapshot in time, which means that they do not allow for future states of demand-driven deployments of coverage and capacity, with coverage coming first on low-band spectrum, followed by higher frequency spectrum as traffic demand dictates. In combination with RFNSA data, coverage maps will give sufficient evidence of our historical and current “use” of ESL spectrum.
- 2.59 In regard to future use, coverage maps, even enhanced with RFNSA information, is not guaranteed to deliver the ACMA the full view of where spectrum is, or may be, used for any given band or combination of bands. The time taken to deliver new sites (small cells, roof top, macro, inbuilding solutions) or upgrade site varies depending on the level of difficulty and the cost. Typical timeframes are well in excess of 12 months and can be multi-year process. Some priority sites are more difficult to progress with the possibility of Development Approval (DA) application rejection or other delays. Site deployment can be an iterative process when new candidate sites need to be selected due to an inability to progress preferred candidates. Some sites can remain on the priority list for 5+ years and not proceed due to difficulties in land access and approvals.
- 2.60 Further, while actual plans may be more medium term in nature, once a site is deployed and activated, spectrum may be “in use” indefinitely. Even with a technology upgrade or change, such as the decommissioning of our remaining 900MHz 3G sites to upgrade to 5G NR9, spectrum will generally be re-farmed for the purposes of supplying the upgraded services. In this context, coverage maps and data from the RFNSA and RRL will remain highly relevant to the ACMA’s assessment of “planned” use of ESL spectrum. This is because Optus plan to continue to use all its ESLs to supply 4G, 5G and in the longer term, 6G services.
- 2.61 Given the potential 20-year licence period for spectrum licence issued through the ESL process, the ACMA must adopt a long-term approach to assessing the potential future public benefits to be derived from use of ESL spectrum. The Australian mobile sector is characterised by high initial fixed cost investment but low marginal cost – therefore the investment case is inherently long term. Depending on the infrastructure deployed, the time taken to earn a return on that investment could well be the potentially 20-year term of a renewed ESL licence.
- 2.62 Similarly, innovation in the sector remains dynamic. Therefore, the potential future uses of spectrum are unknown, particularly over a 20-year period. Rather than the ACMA intervening to disrupt the investment environment which has supported deployment of national mobile networks over the last 30 years, Optus submit that the secondary market for spectrum remains the most efficient means of supporting innovation as it arises.

- 2.63 A clear case in point is our collaboration with SpaceX which offers the potential for seamless connectivity between terrestrial and non-terrestrial networks. Satellite direct to mobile services are nascent in their development, yet few could have predicted the rapid pace at which NGSO constellations have been deployed. Rather than requiring new bespoke licensing arrangements, our collaboration with SpaceX is enabled by the technological flexibility and certainty of access provided by the existing spectrum licence framework.
- 2.64 Optus is Telstra's only national mobile infrastructure-based competitor. However, the economics of continuing to deploy competitive infrastructure in regional and remote areas are increasingly challenging.⁷⁴ Our regional MOCN agreement with TPG, and particularly the sharing of spectrum, presents a real opportunity to facilitate an acceleration of our 5G network deployment and deliver sustainable infrastructure-based competition for the long-term benefit of regional Australia.

Ongoing uncertainty of renewal will undermine investment in Australia's digital future

- 2.65 There remains a significant degree of uncertainty about the ACMA's preferred approach to ESL spectrum. The lack of certainty surrounding renewal of ESLs risks future investment in critical infrastructure underpinning Australia's digital future and potentially jeopardises the long-term supply of essential mobile services. The ACMA's approach creates a very real risk to the continual supply of essential emergency and safety services. The single largest risk to the ongoing delivery of essential mobile services over the long term is a lack of certainty around ongoing spectrum availability. It is a risk that must be addressed as a priority.
- 2.66 Optus has made submissions to the ACMA and the Department since 2020,⁷⁵ regarding the lack of certainty over spectrum renewal risks undermining future mobile network investment and underutilisation of spectrum assets. Without clarity as to Optus' rights to access spectrum, the context in which Optus can undertake future planning for network investment becomes all the more complex and uncertain. There is the added risk of under-investment during the latter years of the ESL licence term.
- 2.67 Spectrum in and of itself is not valuable, but the use to which it can be put is key to promoting its publicly beneficial use. Early certainty is needed to deliver the investor confidence necessary to invest in the digital infrastructure necessary to realise Australia's digital future. Spectrum licences lasting 15-20 years are required to make large capital investment decisions. Investment decisions take into account the length of time that network equipment is depreciated over, according to standard accounting practices.⁷⁶ This is in order that equipment is not written off prematurely, to provide investor confidence in the final years of the licence and to ensure continued investment in the band.
- 2.68 In addition, sufficient lead time is required to implement any alternative spectrum layering strategies to move network traffic from one band to another that may result from the ACMA refusing to renew ESL spectrum. Relinquishing and refarming spectrum has significant impact to coverage, capacity and end user experience. The device ecosystem now and in the future needs to be considered. This is not a trivial exercise as witnessed in the current process of moving 3G traffic and simultaneously upgrading end user devices to the future technology.

⁷⁴ ACCC Regional Mobile Infrastructure Inquiry, Final Report; 30 June 2024; p.56

⁷⁵ Optus submission in response to DITRDC Consultation Paper July 2020, pp.3,17,18

⁷⁶ Optus submission in response to DITRDC Consultation Paper July 2020, p.18

- 2.69 Further, providing certainty on spectrum renewal outcomes as early as possible, at least 4-5 years in advance of licence expiry provides sufficient time to redirect investment to other spectrum assets, or to invest further in the renewed spectrum.⁷⁷ If only 2 years notice is provided, at the time of the spectrum band application window and if neither the ACMA's preliminary view (Stage 3) nor its preferred view (Stage 4) can be relied upon, this provides insufficient time and risks spectrum either being underutilised or not utilised at all with a disorderly exit from the spectrum band.
- 2.70 As with any new investment decision, spectrum renewals will also require commensurate corporate governance, due diligence, strategic planning and investment planning. More importantly, should the loss of spectrum assets that underpin existing mobile networks occur, then this would detrimentally impact on overall network operations and without sufficient contingency planning, lead time for changes to take place, and access to additional funds for network reconfiguration, this could result in the significant loss of services to end users⁷⁸.
- 2.71 Until incumbent licensees are provided with certainty of renewal, there remains an unacceptable level of uncertainty as to spectrum access to justify further large and long-term network investments required to support Australia's digital future. This in turn jeopardises the myriad of associated and external benefits that mobile networks and services deliver to the Australian economy, delaying Australia's digital future. Ensuring the ESL process supports the ongoing economic and social benefits of mobile services must be a key consideration in the ACMA's decision making.

⁷⁷ Optus submission in response to DITRDC Consultation Paper July 2020; p.19

⁷⁸ Optus submission in response to ACMA's draft spectrum management work programme Draft Five Year Spectrum Outlook 2021-2026 Public Version May 2021; and Optus submission in response to ACMA's draft Five-year spectrum outlook 2022-27 and 2022-23 work program Public Version May 2022

Section 3. RESPONSE TO ASSESSMENT CRITERIA

- Australia has world leading mobile networks – these have been delivered by the flexibility and certainty of access provided by existing arrangements governing ESLs.
- Optus current and planned use of ESL spectrum facilitates efficiency, promotes investment and innovation, enhances competition, balances public benefits and impacts and supports relevant policy objectives and priorities.
- Prospective use cases must demonstrate greater public benefit than incumbent use.
- A requirement to demonstrate “local area” use does not reflect the realities of network deployment and constitutes a retrospective application of a condition on ESL renewal.
- The public benefits of maintaining existing arrangements for use of ESL by wide area WBB outweigh any benefits of carving up spectrum to support shared or local access to ESL spectrum, particularly given the risks to continuity of essential public mobile services to a significant number of Australians.

- 3.1 The focus of this Consultation Paper is on gathering information from stakeholders about their current and planned use of ESL spectrum to inform the ACMA’s assessment of whether existing arrangements governing this spectrum remain fit for the purpose of promoting the public interest to be derived from the spectrum.
- 3.2 Optus has provided the ACMA with access to our coverage maps and the detailed site registration information contained on the Radiofrequency National Site Archive (RFNSA) in response to the ACMA’s information request. Optus submit that RFNSA data, in combination with coverage maps, should be sufficient to demonstrate current use of ESL spectrum.
- 3.3 Optus sets out its response to each of the ACMA’s public interest criteria below. Optus’ responses address the sub-headings set out under each of the criterion in the Consultation Paper and are also guided by Appendix A of the Consultation Paper.
- 3.4 We welcome the ACMA’s confirmation that it intends to publish submissions as soon as possible after the consultation closes and to then open a three week “reply to comment” period. While we strongly support this decision, we seek confirmation that the ACMA will take into account responses provided through the reply to comment process in preparing its preliminary view.

Existing ESL arrangements promote the long-term public interest

- 3.5 Spectrum licences are afforded a high degree of exclusivity and certainty under the Radiocommunications Act 1992 (“the Act”).⁷⁹ This has made the licence type suited to the long-term investment required for multiple generations of mobile network deployment. As a result, the Australian mobile market is one of the world’s leading markets in terms of penetration and speeds. Australia is served by multiple advanced 4G

⁷⁹ For example, sections 60B, 105 and 138 of the Act support the relative exclusivity of spectrum licences by limiting the ACMA’s power to issue class and apparatus licences (respectively) that overlap with spectrum licences while certainty of access is implied in the long-term duration of spectrum licences under s.65 of the Act and the protections afforded to licensees regarding variation or resumption of spectrum licences by the ACMA (chap 3)

and 5G mobile networks, supplying data throughputs that rank amongst the best in the world.

- 3.6 Optus is currently using all of its ESLs to supply 4G and 5G public mobile services. Mobile services, supplied using long term spectrum licences, enable greater productivity growth and result in more jobs throughout the whole economy. Mobile services are essential services. Use of ESL spectrum for mobile services enables social connectivity, public safety and security and the supply of critical services.
- 3.7 Existing arrangements for access to spectrum under ESLs have facilitated unparalleled public benefits for the Australian economy and broader society. When initially allocated via auction and tradeable via the secondary market, an allocation of spectrum can be taken to be efficient. Optus submits the current allocation of ESL spectrum to wide area mobile networks is efficient with no evidence of a higher value alternative use. Renewal of Optus ESL spectrum will enable Optus to continue to innovate and invest in mobile networks and services that underpin Australia’s digital future.
- 3.8 As outlined in section 2, the evidence is clear that the renewal of ESL spectrum to existing licensees will help deliver ubiquitous connectivity and realise the single network future, helping to address some of Australia’s perennial communications policy objectives, including to Close the Gap. While new use cases may help assist in realising these objectives and facilitate “Industry 4.0”, such use cases need not be enabled by carving up access to ESL spectrum, but rather should be supported by dedicated allocations of spectrum.

Prospective use cases must demonstrate greater public benefit than incumbent use

- 3.9 The ACMA is required to allocate spectrum in a manner that results in the highest public benefit. There is very strong evidence that the allocation of ESLs to the mobile industry has led to very large public benefits; and that continued use of the ESLs for existing mobile networks and services will continue these large public benefits.
- 3.10 Should the ACMA wish to test whether there are alternative users or uses of ESL spectrum that could give rise to greater benefits, it is incumbent on the ACMA to demonstrate this through robust evidence and facts.
- 3.11 Optus is concerned over the ACMA statement that an “absence of submissions from (prospective licensees) these stakeholders would not necessarily lead to preliminary or preferred views favouring renewal of ESLs” with the ACMA also stating that “there is no particular burden of proof” on prospective alternative (use case) licensees”.⁸⁰
- 3.12 Optus acknowledges that that the ACMA does not intend the public interest criteria as a “test”, but rather to capture key elements of the public interest considerations. However, with respect, given the nature of the exercise involves a weighing of competing claims for spectrum against the criteria, the ACMA is in a sense, ‘testing’ each claim against these criteria with a view to determining which may best serve the public interest over the long term. It follows that a lack of a submission from a prospective licensee must weigh strongly in favour of renewal.
- 3.13 We also understand that prospective licensees are not able to substantiate current use of ESL spectrum. However, given the significant impact on incumbents of a loss of spectrum, as well as the flow on effects for the public, it appears unreasonable that prospective licensees do not bear responsibility for demonstrating that the public interest

⁸⁰ Consultation Paper, p.15

is better served by their proposed use of ESL spectrum.⁸¹ A prospective licensee's claim for spectrum access must show that the re-allocation of ESL spectrum is, on balance, of greater public benefit than renewal of that ESL spectrum, having regard to all relevant materials.

- 3.14 Given that the ACMA encourages stakeholders to highlight interactions between ESL and non-ESL spectrum,⁸² Optus suggests that prospective licensees should be required to substantiate their use and deployment of available non-ESL spectrum and demonstrate why this spectrum may not be sufficient for their particular use case. In this context, Optus welcomes the statement in the final MPS to the effect that the ACMA should consider past, existing and potential future investment by licensees, "*as well as known market demand for spectrum and the capacity for other prospective licence holders to make the investment required to deploy and maintain an effective service with the spectrum.*"⁸³ Consideration of the viability of new entry should help reduce the likelihood of potentially speculative claims for access being rewarded.

ACMA's approach to assessing use is a departure from the last ESL process

- 3.15 The ACMA notes that submissions to the last ESL process "were used to inform the Minister's consideration of the public interest and making of the Radiocommunications (Class of Services) Determination 2012, which identified where re-issue of a licence would be in the public interest if the licence had been used by the licensee in the provision of the services identified for the relevant frequency band".⁸⁴
- 3.16 Optus does not agree with the ACMA's view that its approach to consideration of the public interest is "broadly consistent with the previous ESL process".⁸⁵ Over and above the fact that the ACMA is also considering use by prospective licensees, Optus considers that the level of granularity that the ACMA appears to be contemplating in its approach to examining use for this ESL process is a significant departure from the previous renewals process. We note the ACMA has set out a number of reservations about the utility of coverage maps in determining use and has hinted at using its information-gathering powers under section 284S and section 77A of the Act.⁸⁶
- 3.17 More specifically, the ACMA has indicated that it intends to "examine information about how incumbents are using their spectrum in certain geographic areas" in developing its preliminary views.⁸⁷ This approach is far more granular than the previous ESL renewal process, which required MNOs to provide "proof of use" data for each of their individual ESL licences – the test for last renewal process was for an incumbent to prove use of the licence itself and not potentially have to prove use within every area within every

⁸¹ We note that the ACMA's guidance material states that the ACMA will have regard to whether an "incumbent would be significantly compromised if the licence were not renewed and potential flow on effects" when assessing the public interest of renewing a licence (for 10 years or longer) – see ACMA, Our approach to licensing and allocation guidance document, 2021, p.25-26.

⁸² Consultation paper, p.10

⁸³ Section 10, final MPS Instrument 2024

⁸⁴ Consultation Paper, p.10; Optus note that the "use" test for the previous ESL process was essentially whether or not the spectrum licences had been used "to provide mobile voice and data communications services" or "wireless broadband services" (access or backhaul). The evidence provided to establish this was registrations in each spectrum licence and statements about planned future use.

⁸⁵ Consultation Paper, p.10

⁸⁶ Consultation Paper, p.18

⁸⁷ ACMA; Expiring spectrum licences, Finalised framework and response to submissions, December 2023, p.9

spectrum licence.⁸⁸ There was also provision for renewal in “special circumstances” where technical reasons, such as a lack of equipment or the licensed bandwidth, may have meant that the spectrum could not be used (e.g. 3.4GHz).⁸⁹

- 3.18 Optus submit that MNOs could reasonably have assumed that the same test would be applied for this ESL process. The apparent level of detail that the ACMA may examine in assessing use this time is a new threshold against which incumbents are to be measured. Optus submits that if the test of use for renewal had been known at the commencement of each ESL licence, it could be reasonably assumed that different investment decisions may have been made. For example, knowing that use may be assessed at a more granular level may have provided greater impetus to deploy in non-economic areas to ensure licence retention and/or that the spectrum was not lost/shared for the rest of the new renewed licence.
- 3.19 In our view, too granular an examination of use may constitute an unreasonable new condition on our use of ESL spectrum, imposed after the licence was issued. When applied to ESLs, the effect of too granular an assessment may be akin to a “specified circumstances” renewal statement, enabling the ACMA to refuse to renew ESL spectrum due to “insufficient” use. Notwithstanding the ACMA’s broad discretion to assess the public interest in renewal, Optus consider that any retrospective assessment of “sufficiency” or “adequacy” of the use to which a licensee made of its ESL spectrum is not within scope. We also note that “renewal statements” only apply to spectrum licences issued after the commencement of the Modernisation Act.⁹⁰
- 3.20 Optus also note that, if the ACMA proceeds with a more localised approach to examining use as part of its assessment process, then this would likely unfairly advantage Telstra. This is because Telstra have deeper financial reserves to use to deploy in areas that the ACMA may consider are unserved or underserved prior to expiry of their ESLs. Optus also refers the ACMA to Section 6.

Optus responses to ESL public interest criteria

- 3.21 Optus sets out its response to each of the ACMA’s public interest criteria below. Optus’ responses seek to address each of the sub-headings set out under each of the criterion in the Consultation Paper and are also guided by Appendix A of the Consultation Paper.

Question 1 – Public interest criterion 1: facilitates efficiency

How does your current and planned use of the spectrum facilitate efficiency?

- 3.22 Optus’ current use of its ESL spectrum facilitates efficiency from both an economic and technical perspective. Mobile services are predicted to increase Australia’s wealth by \$37 billion each year in 2030. There are more than 29 million mobile services in operation.⁹¹ Mobile networks deliver essential connectivity to Australians and underpin the increasingly mobile social and economic activity of the nation.

⁸⁸ In 2013, Optus provided the ACMA with evidence of use that demonstrates that as per s.82(1) of the Radiocommunications Act 1992, the licences have been used for the provision of ‘wireless broadband services’ a relevant class of services identified in the Radiocommunications (Class of Services) Determination 2012. (2300MHz)

⁸⁹ Letter from Optus to the ACMA dated 14th January 2015 (3400MHz)

⁹⁰ Section 65A of the Act was introduced by the 2020 reforms to the Act and provides that a spectrum licence issued after the commencement of the section must include a renewal statement.

⁹¹ ACCC Communications Market Report – 2022-23; p.26

- 3.23 Providing wide area mobile coverage at a cost that end users are prepared to pay requires economies of scale. MNOs are large scale businesses and realising the potential of “ubiquitous connectivity” accentuates the need for scale in the future.
- 3.24 Efficient use of spectrum is inseparable from achieving economies of scale. If production costs are too high, this will prevent some use cases from materialising due to cost. Given large economies of scale, MNOs have delivered ever lower prices per GB, higher speeds, and wide area coverage. Carving out spectrum for a single user or use case will never benefit from the same economies of scale and would be inherently less efficient.
- 3.25 Australia’s digital future and competitiveness will depend on enabling the efficiency benefits of new mobile technologies and sustainable supply of essential public mobile services. The digitalisation of industries, services and supply chains across the economy will depend significantly on the availability of ubiquitous connectivity. Realising the potential of these technologies will require operators to have access to spectrum of sufficient quantity and quality. Optus’ ongoing use of ESL spectrum will continue to facilitate efficient outcomes to a greater extent than any alternative use case for our spectrum.

Optus’ current and planned use of ESL spectrum facilitates productive, allocative and dynamic efficiency

- 3.26 Economic efficiency is when resource allocation is such that well-being is maximised, implying there does not exist another allocation that makes one or more persons better off without harming the well-being of at least one other person.⁹²
- 3.27 In assessing whether the current or planned use of ESL spectrum facilitates efficiency, the ACMA is applying a standard approach, relying principally on economic concepts of efficiency (which incorporate considerations of technical efficiency).
- 3.28 Optus submit that its current and planned use of ESL facilitates productive, allocative and dynamic efficiency for the following reasons, among others:
- (a) Public mobile networks and services do the heavy lifting in meeting Australians’ demand for data via wireless networks, with capacity increasing year on year in response to demand. Using the amount of traffic passed through spectrum as a proxy for socio-economic value generated from spectrum, then mobile services are the most productively efficient users of spectrum.
 - (b) Existing arrangements for ESL spectrum have facilitated market competition. This has driven cost efficiency into network deployment, most evident by the need to share infrastructure to deliver infrastructure-based competition to regional areas.
 - (c) MNOs continue to have incentives to use their spectrum efficiently to optimise the balance between the number of sites and maximum coverage. Establishing new sites will always be more costly and time consuming than deploying unused spectrum. As a national carrier, Optus enjoys significant economies of scale relative to smaller operators. This means that network deployments can be delivered more cost effectively.

⁹² In economics this interpretation of efficiency is referred to as Pareto efficiency and is: “attained when individuals in society maximise their utility, given the resources available in the economy”, see Productivity Commission (2013) [‘On efficiency and effectiveness: some definitions’](#) Productivity Commission Staff Research Note May 2013.

- (d) Longer term, technologies such as network slicing will enable public mobile networks to effectively become a shared resource for all use cases, avoiding the higher risks of harmful interference arising from fragmentation.
- (e) Australia's spectrum management framework facilitates allocatively efficient outcomes through the existence of a secondary market for spectrum and given that ESL spectrum has been previously allocated via auction processes and/or a previous renewal.⁹³ Therefore, it has already been exposed to incentives for efficient use and it is reasonable to assume that the current allocation of spectrum is efficient unless there is significant and credible evidence to the contrary. Optus refers the ACMA to the attached expert reports from Dr Chris Doyle and Coleago Consulting in support of this view.⁹⁴
- (f) Optus has utilised existing market mechanisms to deliver innovative and productive collaborations such as with SpaceX and our MOCN agreement with TPG.
- (g) Non-mobile operators have not sought to acquire or access Optus spectrum, and, in our experience, trade or access transactions tend to come from MNOs acquiring spectrum from non-mobile operators (e.g. Dense Air, Vivid Wireless, Qualcomm).
- (h) The need to take active measures to ensure efficient spectrum allocation in the ESL process is much weaker than at initial allocation. A further spectrum auction is inappropriate for ESL renewal and will not yield a more efficient use of the spectrum – rather it is likely to drive prices up for spectrum needed to supply essential mobile services, amounting to a form of tax on MNOs. In our view, an auction will likely lead to the spectrum being acquired by either the same MNOs who already owns it, or Telstra which would result in further market consolidation.
- (i) Mobile networks are already highly efficient users of spectrum. The technological evolution to 5G advanced and 6G deployment will deliver to even more shareable networks. Competing national networks will become platforms for an array of new use cases, solving local area problems. The economies of scale and scope of these networks will reduce the cost of innovation and better promote dynamic efficiency than by fragmenting ESL spectrum to artificially engineer access for prospective licensees or niche use cases.

Optus evolving use of the spectrum over the ESL term demonstrates efficient use

3.29 Optus has spectrum licences in the 700MHz, 900MHz, 1800MHz, 2100MHz, 2300MHz, 2600MHz, 3.4GHz, 3.6GHz, 3.7GHz and 26GHz bands. All these spectrum licences are

⁹³ Initial ESL Spectrum Allocation as follows: 850MHz auction held 1998, renewed in 2013. 700MHz auction held 2013 and unsold lots in 2017, 1800MHz metro auctions held in 1998/1999/2000, renewed in 2013. 1800MHz regional auction held in 2015/2016. Additional residual 1800MHz was auctioned in the multiband auction in 2017. 2100MHz auction held in 2001, renewed in 2015. Additional residual 2100 MHz was auctioned in the multiband auction in 2017. 2300MHz auction was originally allocated as MDS apparatus licences and then converted to 15-year spectrum licences and a conversion payment was made in 2000. Additional residual 2300MHz spectrum was auctioned in 2011. 2300MHz was renewed in 2015. Residual 2300 MHz was auctioned in the multiband auction 2017. 3400MHz auction held in renewed in 2000 and renewed in 2015. 00 Additional residual 3400 MHz was auctioned in the multiband auction 2017. 3600MHz auction held in 2018.

⁹⁴ See further Doyle; Dr Chris; Renewing expiring spectrum licences: 24 May 2024; p.4 and Coleago Consulting; ESL Pricing Paper; 15 March 2024; p.8

ESLs except for our 900MHz (2 x 25MHz national licence accessible from 1 July 2024), 3.7GHz (20MHz licence in regional QLD and rural northern NSW) and 26GHz mmWave (600-800MHz in metro and regional licence areas).

- 3.30 Optus refers the ACMA to our coverage maps and the RFNSA as key sources of information on current services deployed over our ESL spectrum holdings. Optus currently has well over 9 million mobile services in operation. Our mobile network is currently accessible by 98.5% of Australia's population and we will deliver a second 5G network to regional Australia by 2030.
- 3.31 Since the previous renewal of ESLs, Optus has used its 2100MHz spectrum (and 900MHz assigned apparatus licences) to supply 3G services. In the lead up to the 3G shutdown, Optus has "re-farmed" all of its 2100MHz spectrum to supply 4G and 5G services.
- 3.32 Optus has used all its ESL spectrum (other than 3.4GHz) to supply 4G services and uses 1800MHz and 2600MHz spectrum solely for this purpose. Optus initiated our 5G deployment using our 3.4GHz ESL spectrum and have now extended 5G to all ESL spectrum, as well as 900MHz and our 26GHz (mmWave) spectrum.
- 3.33 We do not currently use 700MHz and 1800MHz for 5G as these bands are heavily utilised for 4G services. The shutdown of our 3G network will free up capacity for 5G over 900MHz, which will convert to spectrum licensing from 1 July 2024. We also use our spectrum via apparatus licences (1800 in rural areas, 2100MHz in regional and rural areas) and AWLs (3.4GHz, 3.8GHz and 26GHz) in regional/rural areas to supply public mobile services in local areas and mobile private networks to enterprise where this does not cause undue interference to our public mobile network.
- 3.34 An overview of Optus' ESLs and the licensed spectrum space is set out in the table below. Optus also has apparatus licences in 1800MHz, 2100MHz and AWLs in the 3.4GHz and 3.8GHz bands in remote areas of Australia and 26GHz in regional areas.
- 3.35 Optus has also prepared a more detailed table at Appendix A providing a breakdown of Optus current and planned spectrum use for all our licensed spectrum, including technology and bands used, geographic availability and whether used to provide coverage or capacity/capability. We also include information regarding the latest 4G and 5G site numbers for each band.

Figure 7. Optus spectrum assets

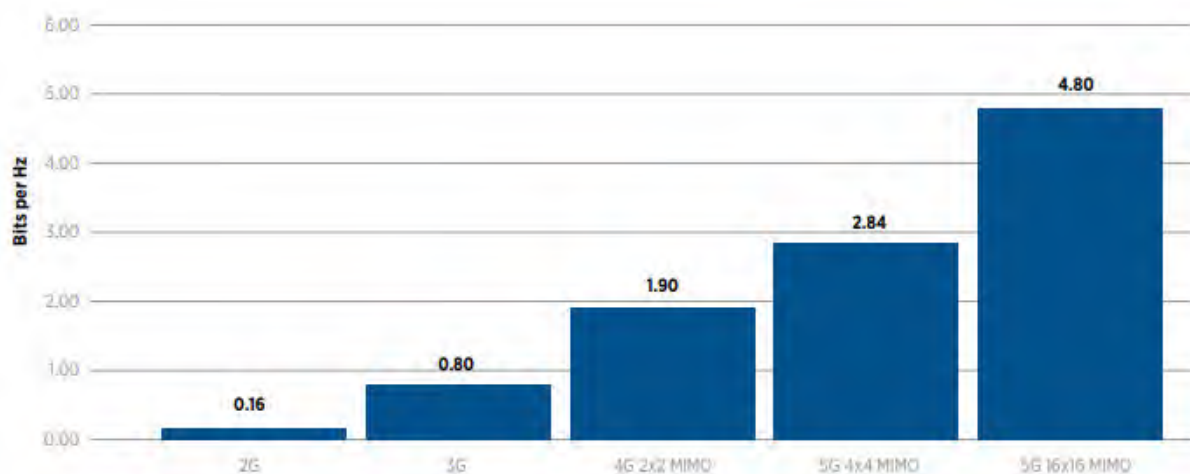
Band	Optus Licence number(s)	Licensed area	Licensed Bandwidth
700MHz (FDD)	9469858	National	2 x 10MHz
1800MHz (FDD)	9263448	Metro	2 x 15MHz
1800MHz (FDD)	10231258	Regional	2 x 20-25MHz
2100MHz (FDD)	10143562	Metro Regional	2 x 20MHz 2 x 5MHz
2300MHz (TDD)	9460720, 9460721, 9460722; 10424532, 9448618, 9448620, 9448621	Metro	98MHz (unpaired)
2600MHz (FDD)	9469864, 9469870	National	2 x 20MHz
3.4GHz (TDD)	11286124, 11286125	Metro (+ Canberra and Lorne)	65-100MHz
3.4GHz (TDD)	11286123	Regional and rural WA	32.5-65MHz
3.6GHz (TDD)	10917462	Regional and rural	30-35MHz

Source: Optus

- 3.36 Optus plans to continue to use its ESL spectrum for the purpose of deploying mobile networks and supplying mobile services to millions of Australians. Driven by the need to compete and maintain quality of service for our customers, Optus remains a highly efficient user of spectrum, promptly investing in refarming of our spectrum to the latest generations of the technology with better spectral efficiencies.
- 3.37 The following diagram from GSMA⁹⁵ illustrates the increased spectral efficiencies achieved by each successive generation of mobile technology. Of course, these efficiency gains are offset by continued increases in demand for data.

⁹⁵ GSMA, 2019; see here <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2019/06/Benefits-of-Technology-Neutral-Spectrum-Licences.pdf>

Figure 8 Average Spectral Efficiencies



Source: GSMA

- 3.38 We plan to continue to invest in updating our network as required to support new generations of mobile technology, including 5G advanced and 6G, which will both potentially fall within the licence term of any renewed licence (i.e., post 2030).
- 3.39 Optus has prepared a number of graphs that demonstrate our ongoing investment in network infrastructure (see Figure 11 and Appendix B). These graphs show that Optus has used spectrum to deliver successive generations of mobile technology. The graphs highlight that this is done by repurposing spectrum bands as needed.

Third party or sharing arrangements and other secondary market activity

- 3.40 Optus has been an active participant in the secondary spectrum market. Optus seeks to cooperate with other operators to promote the efficient use of its spectrum and has provided spectrum access to a number of access seekers for a diversity of use cases in the past. For example, Optus has
- (a) Provided shared access to our 2.3GHz spectrum to a third party in the past (see detail on our spectrum arrangements at Section 7).
 - (b) Traded blocks of 2.3GHz and 3.4GHz spectrum with NBN Co to promote defragmentation.
 - (c) Provided 3G roaming to TPG in regional Australia.
 - (d) We are also working with further third-party organisations to facilitate shared access to ESL spectrum, though details remain commercial-in-confidence.
 - (e) Adopted spectrum sharing solutions, including via network slicing, that will increase opportunities to share our spectrum in the future.
- 3.41 More recently, Optus has proactively sought collaborations that offer the potential to dramatically change Australia’s communications landscape. Our recent collaboration with SpaceX offers the potential to bridge the digital divide and Close the Gap via satellite direct to mobile (DTM) services that utilise our <<CIC begins>><<CIC ends>> spectrum licence. Optus collaboration with SpaceX, facilitated through existing spectrum

licensing arrangements, clearly aligns with the objective in the MPS to facilitate new entrants and use cases, particularly of LEOsats.⁹⁶

- 3.42 Optus plans to initially launch SMS followed by call services to areas that have been previously, and will likely remain, unserved by terrestrial networks. This is an efficient use of our national spectrum licences that delivers a long-term public benefit. Optus has provided more technical detail on this collaboration at Section 7 of this submission.
- 3.43 The use of national spectrum licences has also facilitated the delivery of network sharing arrangements for regional Australia. On 29 April 2024, Optus announced a MOCN agreement with TPG. Under the agreement Optus will supply MOCN services in the MOCN coverage area using <<CIC begins>>
- 3.44 <<CIC ends>> to supply MOCN services.

Issues with the current planning, licensing or technical arrangements that prevent efficient use

- 3.45 In our submission to the ACMA's Stage 1 consultation process, Optus identified a number of issues with the planning, licensing and technical arrangements affecting certain ESL bands. Optus refers the ACMA to this submission for further details.
- 3.46 Optus would also like to take the opportunity of this consultation to elaborate on our concerns with the 3.4GHz ESL spectrum and to highlight some specific lessons that Optus considers can be learnt for the purposes of the ESL process. We also reiterate previous concerns about a potential "dilution" of spectrum licence rights that may flow from increased demands for co-existence with apparatus and class licensed services with specific reference to the 700MHz ESL band.

Catering to a diverse range of use cases can undermine efficient spectrum use

- 3.47 The Band n78 – by which we mean the 500MHz between 3300 and 3800MHz – has been recognised as a pioneer band for 5G. 3GPP standards recommend minimum contiguous bandwidths of 100MHz to deliver the potential spectral efficiency enhancements of 5G cost effectively. The wider the band in which 5G is deployed, the higher the spectral efficiency.
- 3.48 Deploying 5G in a 100MHz wide channel in upper mid-band spectrum delivers a 7% higher spectral efficiency compared to deploying it in only a 20MHz channel bandwidth. Spectrum utilisation is less than 100% for all 5G NR channel bandwidth options because the resource blocks do not fully occupy the channel bandwidth. However, the utilisation decreases with the channel bandwidth for 30kHz sub-carrier spacing (as shown in Figure 4).⁹⁷
- 3.49 Optus has long advocated for harmonisation across the entirety of the 3.4-4.0GHz band and more specifically, for allocation of at least 100MHz of contiguous mid-band spectrum for each MNO and NBN Co, consistent with 3GPP standards as per the following high level band configuration:⁹⁸

⁹⁶ Section 7, final MPS Instrument, 30 April 2024

⁹⁷ Taken from ECC Report 287, Guidance on defragmentation of the frequency band 3400-3800 MHz, October 2018, page 41

⁹⁸ Optus submission to ACMA consultation on proposed spectrum re-allocation declaration for the 3.4GHz and 3.7GHz bands; May 2022

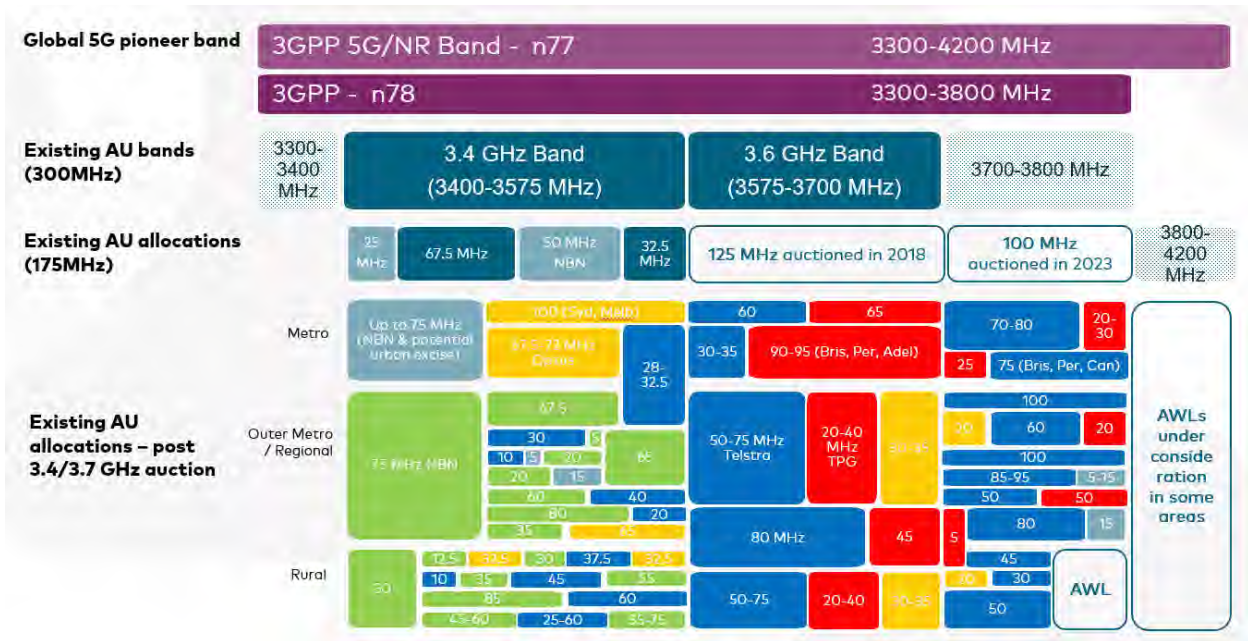
Figure 9 3400 – 4000 High Level Band Configuration



Source: Optus

- 3.50 However, the ACMA's approach to this spectrum has been piecemeal, with multiple different allocation processes and diverse licence types and conditions being used to cater to different use cases and scenarios. The 3.4 to 3.8GHz band is already highly fragmented – with different geographic areas in different parts of the band undermining the tradability of the spectrum. The following highlight the disparate activities that the ACMA has taken to the allocation of this spectrum:
- (a) (Partial) defragmentation activities in 3.4GHz and formalisation of the licence variations completed. This only addresses current issue in the 3.4GHz band between mix of NBN PTS apparatus licences and the 3.4GHz spectrum licences,
 - (b) Differences in 3.4GHz and 3.6GHz licence areas hamper current usability of the spectrum. There also remain possible co-existence issues across geographic boundaries and this issue has been further entrenched by 3.4/3.7GHz allocations.
 - (c) Presence of WISPs in some 3.6GHz licence areas. These regional licences remain encumbered until 2025, limiting the ability of MNOs to deploy and utilise licences in affected areas. Further detail is provided at Section 7.
 - (d) Results from the recent 3.4/3.7GHz auction highlight there may be future need for defragmentation given that there were unsold lots (7 lots in each of the bands).
 - (e) The ACMA's ongoing administrative processes to allocate 3.8GHz spectrum to AWLs in outer metro, regional and remote Australia.
 - (f) The imposition of limitations on the use of spectrum between 3.7 and 4.2GHz band in and around airports
- 3.51 In Optus view, the end result of the ACMA's approach to 3.4GHz to 4.0GHz spectrum has been to create a complex and highly fragmented spectrum landscape that ultimately undermines the potential utility and efficiency of the spectrum.
- 3.52 In particular, the channel sizes for 5G mid-band deployment are generally limited to between 30 and 60MHz and the geographic areas covered by 3.4GHz and 3.6GHz and 3.7GHz licences do not align. There is no restriction in the band that causes this; rather it is a result of allocation decisions by the ACMA.
- 3.53 The fragmentation of spectrum products is further compounded by the imposition of restrictions on the use of spectrum above 3.7GHz around airports to protect old radio altimeter equipment used on aircraft. The following diagram illustrates the inefficient levels of fragmentation:

Figure 10 Overview of the 3.4-4.0 GHz band



Source: Optus

3.54 As a result of a range of allocation decisions by the ACMA, this band is not optimised for 5G. The resultant defragmentation will be hard to resolve via market mechanisms alone. Optus consider that a key insight from this experience for the ESL process is to avoid designing multiple allocation processes to support too wide a range of use cases and to minimise the number of licence boundaries, so the spectrum is optimised for use.

Workable co-existence – Avoid policies that dilute spectrum licence rights

- 3.55 Optus has also raised concerns about the potential for a “dilution” of spectrum licence rights. Optus takes the opportunity to reiterate these concerns in the context of the ESL, and notes that the ACMA’s proposals to adjust arrangements at the upper edge of spectrum licensed 700MHz band provides a recent example in this regard.
- 3.56 The Australia wide spectrum licences in the 700MHz band were acquired at auction in 2013 on the basis that the band was unencumbered other than arrangements made for legacy digital terrestrial television broadcasting (DTTB) services. The relative exclusivity that this afforded spectrum licensees was key to ensuring that the 700MHz band was then heavily utilised by mobile carriers to deploy national 4G mobile networks, which have delivered significant public benefits to Australia.
- 3.57 Given the propagation characteristics of this spectrum it will remain key spectrum to deliver 4G, 5G and 6G mobile coverage in the future. Furthermore, the very propagation characteristics that make this band so useful in supporting current and future wide-area service provision render it extremely difficult to coordinate across co-channel spectrum boundaries. The inter-site distances required to prevent harmful interference for licensees on either side of any spectrum boundaries need to be extremely large, significantly undermining spectrum efficiency and utilisation.
- 3.58 The 700MHz spectrum licences are due to expire on 31 December 2029. Any erosion of MNOs capacity to utilise this low band spectrum for the long term via renewed 700MHz ESL, appears, in Optus view, to be inconsistent with the ACMA and the Government’s expectations regarding mobile and telecommunications network operator’s role as suppliers of essential services. Because 700MHz is crucial to coverage, any refusal to

renew or a decision to carve up this band, would compromise Optus' ability to provide wide area coverage and undermine continuity of service objectives across Australia.

Market mechanism are most effective at facilitating efficient use of spectrum

- 3.59 More generally, with regard to facilitating new entry and use cases for ESL spectrum, the ACMA should be guided by the need to let market forces deliver economically efficient use of spectrum. The Act establishes a secondary market for spectrum access, including via third party authorisation such as our arrangement with SpaceX or via spectrum trading (as we recently completed with NBN Co in 2.3GHz and 3.4GHz bands largely for the purpose of promoting spectrum efficiency).⁹⁹ As highlighted by the global spectrum expert Dr Doyle, an effective secondary market delivers economically efficient allocation of spectrum rights and usage.¹⁰⁰
- 3.60 As noted in our response to the Department's consultation on the draft MPS Instrument,¹⁰¹ Optus is concerned about the lack of objective rationale for encouraging the ACMA to "explore future arrangements that reduce barriers to entry" to ESL spectrum, recommended by the ACCC.¹⁰² To proceed without clearly establishing market failure creates a heightened risk of regulatory failure, which in turn could strand spectrum and undermine its efficient use.
- 3.61 While Optus readily concedes that the mobile sector is characterised by high barriers to entry due to the high cost of spectrum and high cost to deploy, the ACCC's recommendation is not based on a formal analysis of the current state of competition in the national mobile market. Further, as accepted by the ACCC and the Competition Tribunal, access to spectrum is but only one barrier to entry faced by potential entrants. It is highly doubtful that discriminatory access to spectrum for new entrants would actually result in new entry.¹⁰³ We refer the ACMA to Section 5 (Alternative licence conditions) and Section 7 (case studies) of this submission for further information.
- 3.62 In the circumstances, any change to existing spectrum licence arrangements to support local entry into the national mobile market should be treated with a high degree of caution. Recent history would suggest that any further entry at a national level is highly unlikely. While there have been numerous open auctions in recent years for mid and low band spectrum, none has demonstrated any real demand by new national entrants.¹⁰⁴

⁹⁹ Sections 68 and 85 of the Act

¹⁰⁰ Doyle, Dr Chris of Cambridge Economic Policy Associates Pty Ltd (CEPA); Renewing expiring spectrum licences: By Dr Chris Doyle for SingTel Optus Pty; 24 May 2024; p.4

¹⁰¹ Optus submission; April 2024

¹⁰² ACCC submission, ACMA Stage 1 consultation paper

¹⁰³ Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No 2) [2023] ACompT2; ACT 1 of 2022; 21 June 2023; para 335; p.124-125

¹⁰⁴ Spectrum has never been reserved for a new entrant in a spectrum auction in Australia presumably because it could never be justified in the highly competitive mobile market. There has been no sustainable new entrant who has acquired spectrum in Australia since 2013. The only examples of a new entrant acquiring spectrum in a low or mid band auction since 2013 are TPG and Dense Air, however neither were sustainable as individual entities and either merged or were acquired by an existing MNO. TPG acquired 2x10MHz of 2600MHz in 2013 and 2x10MHz of 700MHz in 2017, however this resulted in a merger with an existing MNO, Vodafone which commenced in 2018 and was finalised in 2020. In 2018, Dense Air acquired 3.6GHz metro spectrum, however they traded the 3.6GHz spectrum for 2.6GHz spectrum with TPG in 2021 and were later acquired by Telstra in 2023. The rest of the low/mid band auctions resulted in the spectrum being acquired by the existing MNOs.

Any policy decision that aims to promote inefficient entry is likely to reduce the public benefit of spectrum use.¹⁰⁵

- 3.63 There is also scant international precedent for using an ESL process to introduce local area or regional private mobile licences. Rather, the more common approach (for the currently few examples) is to consider new releases of spectrum.¹⁰⁶ Optus support this approach and note that the ACMA has successfully made 3.8GHz AWLs available for prospective users via administrative allocation processes. We also note the success of OfCom's Shared Access Licence in meeting demand for private networks via the 3.8-4.2GHz band with OfCom observing that "the popularity of the 3.8-4.2 GHz band reflects its suitability for a range of newer 5G use cases, with a developing 5G ecosystem and significant bandwidths available".¹⁰⁷ By contrast we note the limited uptake of OfCom's Local Area Licence designed to enable access to MNO spectrum.¹⁰⁸
- 3.64 To the extent that the ACMA considers that existing spectrum access arrangements do not provide sufficient support for new entry into the Australian market, the ACMA should consider non-ESL spectrum bands, such as the 3.8GHz band. LEOSat services and other new entrants and use cases can also operate in spectrum outside of bands allocated and optimised for WA WBB, avoiding the inefficiencies created by licence boundaries.
- 3.65 Our SpaceX collaboration highlights the effectiveness of existing mechanisms of spectrum access to deliver the benefits of new entry and use cases in WA WBB spectrum space. Optus has authorised SpaceX to use our national ESL spectrum to deliver direct to mobile services to customers in underserved geographic areas of Australia. Our arrangement respects the relevant technical framework, promoting efficient use of this spectrum and helping to deliver regional connectivity goals.
- 3.66 This collaboration was also enabled by the flexibility afforded to licensees under the existing spectrum licence regime. In our view, an important benefit of using a third-party authorisation arrangement is that the (terrestrial) spectrum licence holder remains ultimately responsible for interference management, lessening the burden on the ACMA and any affected adjacent licensees. Such arrangements may prove attractive to overseas Non-Geostationary Satellite Operators (NGSO) such as SpaceX who might seek to reduce the administrative burden of cross-jurisdictional filing and licensing requirements.
- 3.67 Maintaining responsibility for interference management with a single licensee, via third party authorisation arrangements or otherwise, helps ensure that the task of delivering effective co-existence is clearer and more straightforward, thereby lessening the administrative burden of compliance on all stakeholders. In this way, existing mechanisms allow for coordinated access to spectrum that enables new use cases or operators while maintaining the operating integrity of the existing mobile networks that avoid the problems of geographic boundaries outlined elsewhere in this submission (see case studies at Section 7).

¹⁰⁵ With some notable examples of failed set asides to facilitate new entry being the 2008 Canadian Advanced Wireless Spectrum auction and German 3.5GHz auction in 2019 – (see [Spectrum-Set-Asides-Germany.pdf \(gsma.com\)](#))

¹⁰⁶ In the UK, over 650 licences have been issued for shared access in 3.8-4.2GHz since 2020

¹⁰⁷ [Evolution of the Shared Access Licence Framework \(ofcom.org.uk\)](#), which states that more than 850 Shared Access Licences have been issued since 2019 and the adoption of a similar approach for local licences in the 3.8GHz-4.2GHz band in France and Norway; p.6

¹⁰⁸ Consultation Paper, p.50 notes that only 27 (now 28) Local Access Licences have been issued. We note that none of these are in low-band spectrum – see also [Local Access Licences Chart \(ofcom.org.uk\)](#),

Question 2 – Public interest criterion 2: promote investment and innovation

How does your current and planned use of the spectrum promote investment and innovation?

- 3.68 Optus' historical, current and planned use of ESL spectrum promotes investment and innovation, helping realise the long-term public interest to be derived from ESL spectrum. Optus sets out more detailed reasoning for this below.
- 3.69 Optus also provided a number of comments on the importance of renewal of ESL spectrum to the long-term investment required to deliver Australia's digital future in our submission to the ACMA's Stage 1 consultation process. We refer the ACMA to this submission for further details.

Successive generations of mobile technology deliver vast economic benefits

- 3.70 The Australian economy is increasingly the digital economy. Mobile connectivity is essential to modern life, underpinning communication with friends and family, access to news and entertainment, and an ever-growing list of services and applications. Mobile connectivity is crucial to businesses and to lifting productivity and driving innovation and economic growth. Mobile services, supplied using long term spectrum licences, enable greater productivity growth and result in more jobs throughout the whole economy. In addition to economic benefits, sustained investment in mobile networks will be crucial to network resilience and security of critical infrastructure.¹⁰⁹
- 3.71 GSMA research shows that the baseline economic impact of mobile services increases when upgrading from one generation of mobile technology to the next (15% from 2G to 3G and 25% from 2G to 4G).¹¹⁰ The positive spillover effects of mobile technology upgrades on the broader economy are widely recognised, which will continue with 5G.¹¹¹ With 5G MNOs can now provide a platform for a wide variety of use cases, including massive machine type communication, smart city, virtual private network by means of network slicing and more.¹¹²
- 3.72 The spectrum licenced to MNOs is deployed to service a wide variety of users, use cases, and applications with a limited amount of spectrum. In effect, MNOs are highly efficient spectrum sharing platforms. There is no other comparable use of spectrum serving such a diverse range of usage. Moreover, economies of scale in the MNOs network reduce the cost of innovation for alternative users wishing to share.
- 3.73 5G advanced and 6G deployment imply a radical shift to more shareable networks, in which competing national networks become platforms for an array of new use cases. The economies of scale and scope of these networks will reduce the cost of innovation and better promote dynamic efficiency than by fragmenting ESL spectrum. Similarly, the costs of interference management will be minimised by an MNO able to more effectively ensure coordinated third-party access that preserves the quality of end-user services.

¹⁰⁹ Draft FYSO 2024-29; p.6

¹¹⁰ "Mobile technology: two decades driving economic growth", 2020, p 3; GSMA working paper; accessible at <https://data.gsmaintelligence.com/api-web/v2/research-file-download?file=121120-working-paper.pdf&id=54165922>

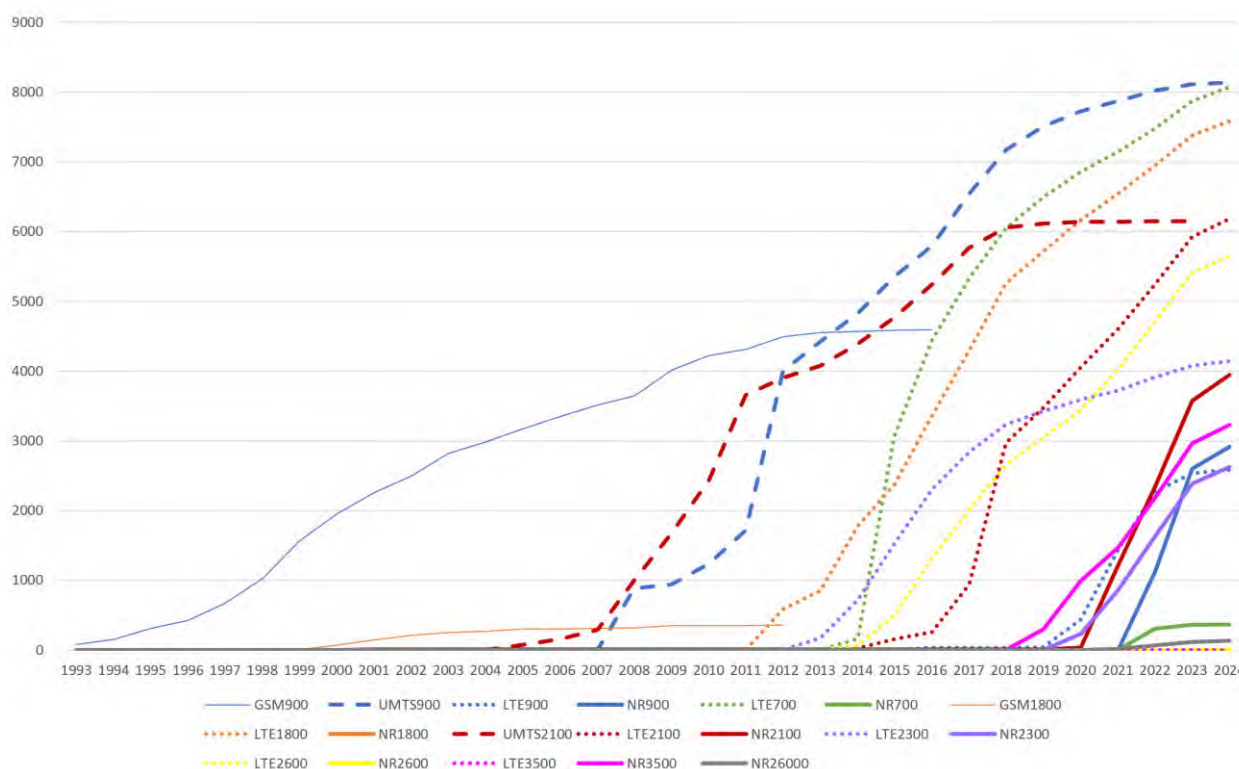
¹¹¹ The Mobile Economy 2021, GSMA Intelligence, 2021; The Global economic impact of 5G, PWC, 2020

¹¹² With regard to users and use cases, the development from 4G (LTE) to 5G (IMT-2020) already saw an expansion of requirements to cover a wide range of use cases and applications. While 4G can be thought of as a best effort mobile data service for smartphones, 5G addresses a wide range of use cases and with new capabilities such as low-latency, network slicing, and ultra reliability. In essence, a mature 5G network is a platform which addresses all present use cases.

3.74 Given their significant economies of scale to efficiently use ESL spectrum, MNOs remain best placed to invest the necessary capital – but the right investment environment is needed. Access to spectrum of sufficient quantity and quality at a price that maximises the ability of operators to invest in network deployment will be crucial. Offering to renew all Optus ESLs on the same terms at a nominal price will best promote the long-term public benefit derived from ESL spectrum.

3.75 Figure 11 shows the number of technology units per band deployed in the Optus network from 1993 until 2024 and represents Optus levels of investment in the network. This graph clearly demonstrate how Optus network investment and use of spectrum bands aligns with successive generations of mobile technology. Note that these numbers may differ slightly from the RKR data.

Figure 11 Optus Deployment of technologies on sites per year



Source: Optus

Optus’ current use of ESL spectrum promotes investment and innovation

3.76 The Australian mobile sector has invested billions of dollars in spectrum licences and deploying network infrastructure. This investment has delivered new generations of mobile technology, with better service performance that has enabled downstream investment and innovation in new products and services.

3.77 Over the past 30 years, Optus invested some \$45 billion in infrastructure, in turn allowing other companies to connect, sell, and thrive in today’s digitalised economy. Optus now typically invests over \$1.5 billion in capital expenditure annually in its mobile network and services. Optus also invests very heavily in spectrum, having acquired and renewed licences worth a combined \$1.9 billion in the last five years alone and over \$4 billion since 2013, including the 900MHz and 26GHz acquisitions in 2021 and the 3.7GHz spectrum in 2023.

3.78 This investment has delivered and maintained national 2G, 3G, 4G and 5G mobile networks used by millions of Australians on a daily basis. The deployment of successive

generations of mobile technology has supported downstream investment and innovation in new technologies and applications. The wide availability of high-quality mobile networks has supported industry changing innovation in the transport sector (Uber), remote work and education (especially post-COVID) and Government services, among others.¹¹³

- 3.79 Optus has been the major competitive force in the market that has created price and service innovation tension across communications markets. Optus coverage maps and the RFNSA data demonstrate the extent of our network investment during the ESL licence period. Notwithstanding an increasingly difficult investment environment, Optus has exceeded its FY24 Greenfields 5G macro rollout target <<CIC begins>><<CIC ends>>.
- 3.80 However, investment plans can change to accommodate changes in priorities. A combination of historic low industry returns, market imbalances in spectrum and the significant costs and market distortion created by the 5G Huawei security decision (which imposed considerable costs on Optus and TPG but not Telstra) have made it difficult for Optus to maintain its high levels of network investment.
- 3.81 Optus has continued to invest in competitive infrastructure across Australia. Our MOCN agreement with TPG will deliver cost efficiencies enabling us to further accelerate our 5G deployment to 2444 sites in the MOCN area by 2030. Optus continues to invest and innovate in new 5G products and services, including via collaborative 5G standalone solutions for the Government and enterprise market.¹¹⁴
- 3.82 Optus continues to target the 5G network opportunities presented by growth in digitisation and automation to deliver solutions to customers that demand the precise positioning and high-performance deliverable by 5G standalone infrastructure, including to support applications that improve safety in human-robot collaborations, track and trace asset utilization and boost productivity and efficiency. <<CIC begins>><<CIC ends>>.¹¹⁵

Delivering Australia's digital future requires a supportive investment environment

- 3.83 In their report on the "State of the Telecommunications Industry", Venture Insights observes:

"In a global economy where capital is mobile, private capital investment cannot be sustained unless returns meet industry benchmarks. Nations that create attractive investment environments for telecommunications investors will reap the benefits of better digital infrastructure and a stronger digital economy. Nations that do not will be laggards, forced to rely on public injections of capital that will inevitably be constrained."¹¹⁶

- 3.84 The need to support investment in critical digital infrastructure and uptake of 5G is increasingly recognised as a policy priority of Government and stakeholders across the wider economy. In its recent pre-Budget submission, the Tech Council of Australia (TCA) recommended that the Federal Government "Invest in the digital infrastructure that underpins our modern economy, including initiatives that enable 5G adoption and development" observing that "The digital transformation of our society and industries is

¹¹³ ACMA Market Analysis; *Private wireless networks using 4G or 5G in Australia*, market study; September 2023; p.2

¹¹⁴ [5G Innovation Hub \(optus.com.au\)](https://www.optus.com.au/5g-innovation-hub); the 5G Innovation Hub is an innovation space for Australian enterprises and government to explore, test and co-create new 5G technology and use cases.

¹¹⁵ [Optus Connected Car | Optus Enterprise](#)

¹¹⁶ [REPORT: State of the Australian Telecommunications Industry - Venture Insights](#)

underpinned by enabling digital network infrastructure. Fixed and mobile network connectivity, such as that provided by 5G networks, are an important backbone of our economy and society”.¹¹⁷

- 3.85 The productivity benefits of investing in digital infrastructure, particularly for regional Australia, have been recognised by the Productivity Commission which also identified internet speed (and a lack of skills) as the biggest barriers to adoption of digital technology by Australian businesses.¹¹⁸ Telecommunications and digital infrastructure projects, feature prominently on the Infrastructure Australia Priority List.¹¹⁹ Insufficient support for ongoing investment in mobile infrastructure risks network resilience, lower productivity, underperforming industries and economic competitiveness, lower levels of innovation and a slower energy transition.
- 3.86 The billions of dollars of investment made by industry in spectrum and network deployment were made on the basis of the spectrum licences providing sufficient certainty and exclusivity of spectrum access over the term of the licence.¹²⁰ Changes to these arrangements risk undermining the business case for deploying digital infrastructure essential to Australia’s future. Given the criticality of spectrum to the supply of services, the re-allocation of ESL spectrum would introduce significant service migration costs and risk potential stranding of network assets.

Nominal pricing for ESL renewal promotes the long-term public interest derived from use

- 3.87 There remains a high risk that Australia is facing a “digital investment gap” due to long term declines in ROIC and the high levels of investment required to densify 5G networks.¹²¹ Optus continue to face a challenging investment environment with our ROIC at below 2% and well below our cost of capital. Barrenjoey research shows that industry ROIC has halved since 2017, and sites well below costs of capital.¹²²

¹¹⁷ [TCA-2024-25-pre-budget-submission-vF.pdf \(techcouncil.com.au\)](#); Recommendation 1F; p.8

¹¹⁸ [Volume 4 - 5-year Productivity Inquiry: Australia’s data and digital dividend \(pc.gov.au\)](#); Report No. 100 - & February 2023; p.21 and 34

¹¹⁹ [Infrastructure Priority List \(infrastructureaustralia.gov.au\)](#)

¹²⁰ ACMA document - Our approach to radiocommunications licensing and allocation, Implementing the Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020, March 2021, p.6.

¹²¹ [REPORT: State of the Australian Telecommunications Industry - Venture Insights](#); 13 June 2023

¹²² Choi, Eric & Annie Zhu; Barrenjoey; “Will Singtel sell a partial stake in Optus?”; Equity Research update, Sector Report, Telecommunications Services; 14 March 2024, p.2

Figure 12 Industry ROIC

Figure 1: B* Industry ROIC calculations

	Units	FY17	FY18	FY19	FY20	FY21	FY22	FY23	CY23
Telstra									
EBIT ex NBN payments	A\$m	4,856	3,891	2,089	2,031	2,190	2,665	3,392	3,565
NOPAT	A\$m	3,399	2,724	1,462	1,422	1,533	1,866	2,349	2,496
Invested capital	A\$m	29,840	29,295	29,257	31,991	30,538	29,696	32,234	32,856
ROIC (NOPAT / IC)	%	11.4%	9.3%	5.0%	4.4%	5.0%	6.3%	7.3%	7.6%
Optus (Mac-YE)									
EBIT ex NBN payments	A\$m	1,146	1,101	950	188	(128)	180	286	267
NOPAT	A\$m	802	771	665	132	(90)	126	200	187
IC ex goodwill	A\$m	9,515	10,893	11,102	12,671	11,533	11,761	11,982	11,982
ROIC (NOPAT / IC)	%	8.4%	7.1%	6.0%	1.0%	(0.8%)	1.1%	1.7%	1.6%
Merged TPG + VHA									
EBIT	A\$m	828	883	755	608	436	267	472	403
NOPAT	A\$m	580	618	529	426	305	187	330.4	282.1
IC ex goodwill	A\$m	4,516	5,734	5,938	7,534	7,763	7,548	7,162	7,930
ROIC (NOPAT / IC)	%	12.8%	10.8%	8.9%	5.6%	3.9%	2.5%	4.6%	3.6%
Industry									
EBIT ex NBN payments	A\$m	6,830	5,875	3,794	2,827	11,862	3,112	4,150	4,235
NOPAT	A\$m	4,781	4,113	2,656	1,979	8,304	2,178	2,905	2,965
Invested capital	A\$m	43,871	45,922	46,297	52,196	49,834	49,005	51,378	52,768
ROIC (NOPAT / IC)	%	10.9%	9.0%	5.7%	3.8%	16.7%	4.4%	5.7%	5.6%

Source: Company data, Barrenjoey Research estimates. * TPG ROIC may vary depending on IC definition (e.g. is goodwill included, net debt incl & excl leases)

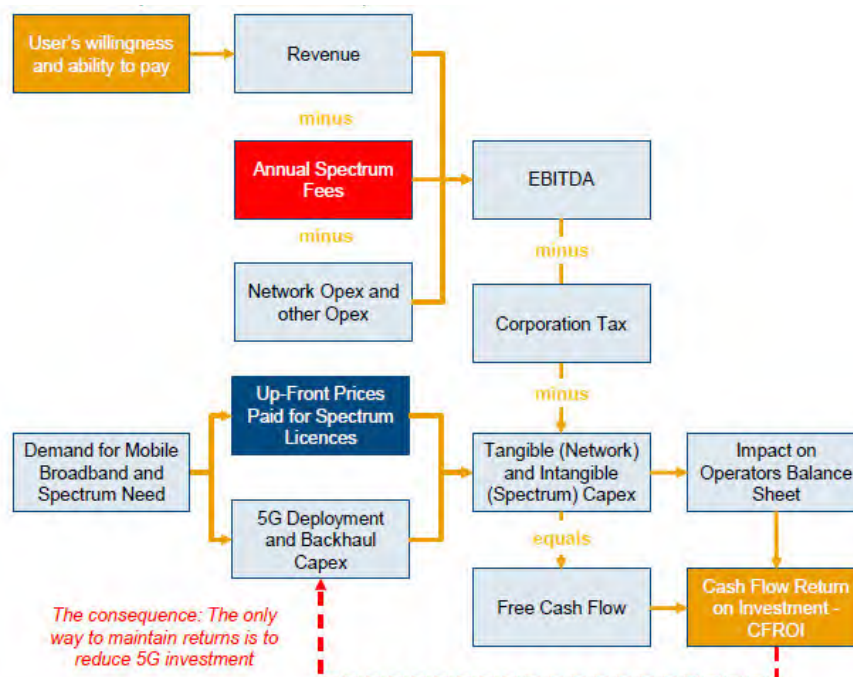
Source: Analyst report

- 3.88 The Australian mobile sector is characterised by high fixed cost investment and low variable costs to. Industry has paid billions to acquire and then renew ESL spectrum. The annual cost to industry has grown from \$241 million in 2015 to \$818 million in 2024. The annual cost¹²³ of spectrum to Optus in Australian financial year 24/25 will be <<CIC begins>><<CIC ends>> including the recent 900MHz, 26GHz and 3.7GHz acquisitions.
- 3.89 Few, if any, industry sectors pay such sizeable upfront licence fees, with no link to future revenue, cost savings or profits generated from use of those licences. Revenue generation from existing mobile broadband services has become more challenging worldwide, over the last 10 or 15 years. As the GSMA has observed, “countries that persist with excessive pricing... risk experiencing a widening gap in quality and pricing of the mobile services available”.¹²⁴
- 3.90 Mobile operators fund spectrum acquisition fees, renewal fees and network investment from the same investment pool. High spectrum prices reduce the funds available to invest in network and customer experience. The following diagram illustrates the mobile operator business model with the tangible (network) /intangible (spectrum) capex coming from the same investment pool and directly impacting cashflow.

¹²³ Amortisation of spectrum licence payments

¹²⁴ NERA, Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, Report for the GSMA, February 2017, p.13

Figure 13 Spectrum licence fee impact on network investment



Source: Coleago

- 3.91 Lower spectrum renewal pricing enables mobile operators to fund investment in 5G and future 6G infrastructure and deliver digital transformation. If the price of spectrum is “ineffective”, then there is a risk that the spectrum will not be allocated. In a competitive market, low spectrum prices can be passed onto end users through lower retail prices and superior networks.¹²⁵
- 3.92 Spectrum licence fees are a significant fixed cost for mobile operators and the fixed cost, including the cost of capital for the initial and ongoing investment, has to be recovered over the life of the licence/s for a sustainable industry. Absent retail price increases for services – which may be competitively difficult and have a knock-on effect on acquisition and retention of customers– operators have limited options to reduce tangible capital expenditure.
- 3.93 In short, high spectrum prices make the business case for future investment in 5G and beyond less viable and sustainable. Renewal fees should be set at a level that provides appropriate incentives for operators to continue to invest in providing mobile services. In the context of the need to support investment in Australia’s digital future and the broader benefits to GDP and sustainable market competition, high spectrum costs are unsustainable. The renewal of ESLs at a nominal price would best support sustainable market competition and investment for the long-term public benefit.

Optus current and proposed uses of the spectrum align with the objectives in the MPS

- 3.94 Optus’ current and planned uses of ESL spectrum align with all the objectives in the MPS and in particular, we note that our SpaceX collaboration and MOCN agreements are both highly aligned with the Government’s regional connectivity policy objectives.
- 3.95 Our collaboration with Space X to deliver direct to mobile handset services via our national ESL spectrum presents an opportunity to Close the Gap by solving perennial

¹²⁵ Ibid, p.15

problems of delivering connectivity to areas that have been “too hard to serve” by terrestrial networks. This collaboration, and others that may contemplate ubiquitous and seamless connectivity between terrestrial and non-terrestrial networks particularly align with the MPS objectives of:

- (a) Supporting service continuity for end users, particularly where no alternative service is available,
- (b) Facilitating opportunities for new use cases, including for low earth orbit satellites,
- (c) Connectivity and investment in regional and remote areas to deliver improved services to end users.

3.96 Our MOCN services agreement with TPG will enable Optus to more cost effectively deploy a competitive 5G network in regional Australia in part as result of the cost efficiencies afforded by sharing ESL spectrum. The presence of a sustainable network alternative to Telstra will deliver improved connectivity services and network resilience to regional Australia. Therefore, our MOCN agreement clearly aligns with the MPS objectives of

- (a) Connectivity and investment in regional and remote areas to deliver improved services to end users,
- (b) Promote competition,
- (c) Capacity for sustained investment and innovation.

3.97 More generally, with respect to capacity for sustained investment – Optus note that the above collaborations have been enabled by the existing mechanisms for third party authorisation under section 68 of the Act.

3.98 Providing Optus with the option to renew all our ESLs on the same core licence conditions will provide the certainty of long-term spectrum access necessary to support our sustained investment in innovative connectivity solutions for the long-term public benefit of Australians.

Question 3 – Public interest criterion 3: enhances competition.

How does your current and planned use of the spectrum enhance competition?

3.99 Optus’ historical, current and planned use of ESL spectrum enhances competition in the national mobile market. The long term public interest to be derived from Optus ESL spectrum will be promoted by offering to renew Optus ESLs as this will help ensure that Optus can continue to compete effectively in relevant downstream markets for mobile services.

3.100 Optus uses its ESL spectrum to:

- (a) Compete effectively in the national mobile market (retail and wholesale) as well as the market for Government and Enterprise services,¹²⁶
- (b) Deploy a 4G network in metropolitan, regional and remote areas of Australia that currently reaches 98.5% of Australia’s population,

¹²⁶ [5G Optus Campus Network](#)

- (c) Invest over \$45 billion over the last 30 years and now typically invest over \$1.5 billion annually in competitive mobile infrastructure,
- (d) Deploy a 5G network that currently reaches over 80% of Australia's population;
- (e) Consistently deliver 5G services that rank first for speed and performance,¹²⁷
- (f) Offer retail plans that are highly competitive in terms of value for money and at a significant reduction to Telstra's price premium.

3.101 Optus' investment in its mobile networks and services has placed competitive pressure on the incumbent, driving Telstra to innovate and invest. Optus is the only real infrastructure-based competitor to Telstra outside metro areas.

3.102 Optus' planned use of ESL spectrum will continue to enhance competition in the national retail and national wholesale mobile markets and associated Government and Enterprise markets. Maintaining economies of scale of spectrum holdings, for example in our 2.3GHz and 3.4GHz bands, have provided Optus with the scale needed to compete on 5G service quality and speed, particularly in metro. The sharing of ESL spectrum under our MOCN services agreement with TPG promises to go a significant way to levelling the playing field with Telstra's regional spectrum holdings, thereby enhancing infrastructure-based competition in regional Australia for the long-term.

3.103 The ACMA has also noted that "a relevant consideration of the public interest is circumstances where spectrum holdings across ESLs are not creating or incentivising a competitive environment, or where there is evidence of entrenched end-user demand that the market is not addressing".¹²⁸ However, Optus submits that:

- (a) Any unmet end-user demand, particularly outside terrestrial mobile network footprints will be best addressed by maintaining existing ESL arrangements, including secondary market mechanisms,
- (b) There is no evidence that the secondary market has failed – while it may be thin this does not mean that it is not efficient – prospective licensees have not approached Optus about access to our ESL spectrum,
- (c) There are three MNOs all with national licences – accordingly there is opportunity for access to all three MNOs spectrum on commercial terms where access is needed,
- (d) MNOs are incentivised to trade or provide access to their unused spectrum where it does not cause disproportionate levels of harmful interference to their public mobile networks – a key incentive for TPG in entering the MOCN agreement with Optus was to monetise its regional spectrum.
- (e) There is a Digital Divide to the extent that regional Australia has not received the benefits of competition to the same extent as metro areas – however our MOCN services agreement with TPG promises to deliver sustainable infrastructure-based competition for the long term, changing the dynamics of the supply of mobile services in regional Australia.

¹²⁷ Optus 5G services rank highly in OpenSignal's "Mobile Network Experience Report", consistently recording the fastest 5G download speeds and recently winning the "Consistent Quality" and 5G Games Experience awards

¹²⁸ Consultation Paper, p.40

- (f) While spectrum is a barrier to entry, deployment costs for a national network are even greater – spectrum is only one barrier to entry and there is no realistic possibility of a new national entrant given the maturity of the mobile market, the high fixed costs, industry ROIC, and the dominance of Telstra who extracts most of the industry’s profits.
 - (g) Optus and other MNOs use national spectrum to deploy national networks – mandating localised entry, via regulatory intervention such as new licence conditions, raises the significant risk of disproportionate harmful interference to public mobile networks – introducing costs into network deployment that will only increase the cost of downstream services – such public detriment would substantially outweigh any, largely private not public, benefit of enabling local entry,
 - (h) MNOs can and do supply services to the Enterprise and Government services market that meet the needs of these customers in terms of performance and reliability and can also provide hybrid (MOCN) and standalone network solutions.
- 3.104 Changes to existing arrangements governing Optus’ ESL spectrum will adversely affect Optus’ ability to compete in the national mobile market. It will also jeopardise the MOCN services agreement, undermining the opportunity it presents to improve regional mobile competition and consumer outcomes for the long term. Removing spectrum to support localised entry will have an outsized impact on the operation of national networks, undermining competitive tension in the national retail and wholesale mobile services market.
- 3.105 Optus provided some comments on the importance of renewal of ESL spectrum to enhancing competition in the national mobile market in our submission to the ACMA’s Stage 1 consultation process. We refer the ACMA to this submission for information and also set out further detailed responses to the ACMA’s questions in this Consultation Paper below – guided by the issues for consideration set out under this criterion and Appendix A of the Consultation Paper.

The nature of competition in mobile markets

- 3.106 Competition is not an end, in itself, but is the process by which best consumer outcomes, both in terms of price and quality, are achieved. Market structure is important in achieving beneficial consumer outcomes. Concentrated markets rarely deliver good consumer outcomes, particularly when a market is dominated by a single player with inherent scale and supply advantages. Competition drives innovation and investment in new technology.
- 3.107 Mobile competition includes infrastructure and service-based competition.¹²⁹ Infrastructure based competition is characterised by greater levels of differentiation, particularly in terms of coverage and performance, and therefore more intense competition that leads to greater downstream benefits for consumers.
- 3.108 The relevant markets are the national (retail or wholesale) mobile services market and fixed broadband services market. In addition to the retail and wholesale mobile market, MNOs also supply home broadband services and services to the Government and

¹²⁹ (i) Infrastructure based competition describes competition on coverage, capacity, and capability of services, which depend upon the underlying network infrastructure. (ii) Service based competition occurs within the confines of available network infrastructure: MNOs compete on, for example, price and inclusions (including data and content)

Enterprise. NBN Co has ESLs in the 2.3GHz and 3.4GHz bands which it uses to supply NBN fixed wireless access (FWA) services.

- 3.109 The three MNOs, Optus, Telstra and TPG compete in the supply of public mobile services and apply national pricing to their mobile offerings. There are also mobile virtual network operators (MVNO) that acquire wholesale mobile services from the MNOs to provide retail services to consumers. The MNOs also operate sub-brands (e.g., Belong, Felix and Amaysim) that compete directly with the MVNOs for the more price sensitive segment of the retail market.¹³⁰
- 3.110 The mobile sector remains the only sector of the telecommunications industry that has successfully embraced competition. This has been delivered through effective and fierce infrastructure competition which has driven one of the fastest 5G rollouts in the world.¹³¹ Infrastructure competition is most effective in metro Australia. The ACCC has stated that “In urban areas, Telstra, TPG and Optus each have strong network infrastructure and they exert competitive pressure on each other to densify their networks, deploy 5G technology upgrades and invest in spectrum and fibre.”¹³²
- 3.111 A key reason for this is because MNOs have largely similar metro spectrum holdings. A refusal to renew or only partially renew ESL spectrum in metro areas will undermine competition and in particular, limit MNOs ability to respond to future capacity demands. Indeed, a recent report from Coleago Consulting concludes that it is more likely that further mid-band spectrum will be needed to cost-effectively respond to predicted capacity demands in metro areas.¹³³ Renewal of Optus ESLs will continue to enhance competition in metro areas and promote the public interest derived from use of ESL spectrum.

Telstra’s spectrum holdings entrench its market power, particularly in regional Australia

- 3.112 A key criterion for effective competition in mobile markets is access to spectrum. Without access to sufficient spectrum, MNOs cannot provide a service.¹³⁴ Access to spectrum of comparable quantity and quality is crucial to promoting competition in mobile markets.¹³⁵
- 3.113 The ACCC has observed that “asymmetry of spectrum holdings could raise competition issues if it constrains the ability of specific operators to compete in the relevant market.”¹³⁶ Large spectrum holdings can confer a competitive advantage on the licensee. This is because access to spectrum is the cheapest way to improve capacity of

¹³⁰ Following the TPG/VHA merger and the Optus/Amaysim transaction, the ACCC considers there to be 3 ‘tiers’ of providers of retail mobile services. These are (i) the MNOs flagship brands, (ii) the MNOs own sub-brands and subsidiary MVNOs, and (iii) independent resellers and MVNOs.

¹³¹ Deloitte Access Economics, 5G Unleashed; AMTA; 2022; p.iii

¹³² Regional Mobile Infrastructure Inquiry 2023; June 2023; p.86

¹³³ IMT spectrum demand; Estimating the mid-band spectrum needs in the 2025-2030 time frame in Australia; Coleago Consulting, 15 November 2021, p.1

¹³⁴ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.17

¹³⁵ For example; Peha, Jon M; Cellular Economies of Scale and Why Disparities in Spectrum Holdings are Detrimental; Carnegie Mellon University; Telecommunications Policy Journal, Elsevier, 2017; p.1 where it states that “any Pareto optimal assignment will split the spectrum fairly evenly among competing MNOs. This is not simply a method of ensuring that there are many competitors; spectrum should be divided fairly evenly regardless of whether the number of competitors is large or small. A large disparity in spectrum holdings may yield poor results with respect to both objectives, i.e. the lower cost-effectiveness of a larger number of MNOs, and the lower competitive pressure of a smaller number of MNO”

¹³⁶ ACCC, Allocation limits advice for the 850/900MHz spectrum allocation, March 2021, p.10

a mobile network while densification or deployment of improved technology (to improve spectral efficiency) are more expensive.¹³⁷

- 3.114 Historically, Telstra's national low band holdings have been significantly greater than Optus and will only finally become comparable on 1 July 2024, when Optus gains access to our 2021 acquisition of 2 x 25MHz of 900MHz spectrum. Although mid band spectrum holdings in metro are generally comparable among MNOs, Telstra's regional mid band spectrum holdings continue to far outstrip both Optus and TPG Telecom across all bands.
- 3.115 The following table is an indicative representation of MNOs current regional (excluding Canberra and Darwin) and rural spectrum holdings following the recent 3.4GHz and 3.7GHz spectrum auctions:

Figure 14 Australian MNO Spectrum Holdings

Band (Total available)	Telstra	Optus	TPG
3.4GHz - 3.7GHz (400MHz)	135 – 183MHz	0 – 65MHz	20 – 90MHz
2.6GHz (2 x 70MHz)	2 x 50MHz	2 x 20MHz	0MHz
2.3GHz (98MHz)	0 – 98MHz	0MHz	0MHz
2100MHz (2 x 60MHz)	2 x 10MHz or 2 x 20MHz*	2 x 5MHz or 2 x 20MHz*	2 x 5MHz or 2 x 20MHz*
1800MHz (2 x 75MHz)	2 x 35-40MHz	2 x 20-25MHz	2 x 10-20MHz
900MHz (2 x 25MHz)	0MHz	2 x 25MHz	0MHz
850MHz (2 x 20MHz)	2 x 15MHz	0MHz	2 x 5MHz
850eMHz (2 x 10MHz)	2 x 10MHz	2 x 1MHz**	2 x 5MHz
700MHz (2 x 45MHz)	2 x 20MHz	2 x 10MHz	2 x 15MHz

* in Hobart and Darwin; ** "downshift" spectrum

Source: Optus

- 3.116 The economics of Telstra's network deployment benefit from its superior regional spectrum holdings across all bands other than 900MHz (from 1 July 2024). This has all led to Telstra having a material coverage advantage in 5G – primarily through upgrading its regional network sites, which still include a large number of sites originally built through Government funding.¹³⁸

¹³⁷ *Vodafone Hutchinson Australia v Australian Competition and Consumer Commission* [2020] FCA 117, at [159]

¹³⁸ The ACCC in its Mobile Infrastructure Report 2021 noted that "outside of Major Cities, Telstra had significantly more sites than the other MNOs between 2018 and 2021...Telstra had 75% more sites than Optus compared with 3% more sites in Major Cities. Compared to TPG, Telstra had 15% more sites in Major Cities but over 300% more sites outside of Major Cities."

3.117 Optus remains Telstra's only real infrastructure-based competitor in regional Australia. Optus has invested more than \$45billion in its network over the last 30 years and over \$4billion on spectrum acquisition and renewal since 2013. Optus now typically invests over \$1.5 billion in capital expenditure annually in its mobile network and services. Optus investment has been the major competitive force in the market that has created price and service innovation tension in the Australian communications landscape.¹³⁹ The ACCC has stated that:

“investment decision (including the threat of potential future investment) by Optus is a material influence on decisions by Telstra to make investments in its own network...the lessening of this competitive pressure could be expected to reduce the incentives for Telstra to invest to improve elements of its network such as coverage, quality of innovation”¹⁴⁰

3.118 This investment has been enabled by access to ESL spectrum. However, Australia's geographic expanse and low population density outside metro areas limits the commercial viability of infrastructure investment. It is recognised that the comparatively less intense competition in “regional” and “remote” Australia has contributed to a “Digital Divide”.¹⁴¹

Optus' and TPG Telecom's MOCN services agreement can deliver sustainable infrastructure-based competition in regional Australia

3.119 Telstra dominates regional spectrum holdings, and its scale and legacy network advantages means that it has a distinct competitive advantage in delivering services to regional and remote Australia. Industry ROIC remains at historic lows. There is a need for a strategic reset in the design of schemes to facilitate incentives for collaborative industry sharing through multi-carrier solutions.

3.120 Given the disproportionate effect that localised entry would have on public mobile networks and services, Optus submit that the main competition policy objective of the ESL process should be to support “sustainable infrastructure competition”, particularly in regional Australia, for the long term. If it is approved, Optus' and TPG's MOCN services agreement will go a significant way to delivering sustainable infrastructure-based competition in regional Australia by facilitating the deployment of a second 5G mobile network by 2030.

3.121 Telstra currently holds 2 times and 3.1 times the individual spectrum bandwidths of Optus and TPG, respectively, in the MOCN coverage area. The sharing of spectrum under the MOCN agreement will help mitigate the significant spectrum advantage that Telstra holds in regional Australia. The following map provides a high-level illustration of the extent of the MOCN Coverage area <<CIC begins>>

¹³⁹ ACCC, Regional Mobile Inquiry, Final Report – finding at page 86-87 that “Telstra and Optus have made significant investments in regional, rural and remote areas, despite the challenges, to differentiate themselves on geographic coverage”

¹⁴⁰ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.vii

¹⁴¹ House of Representatives Standing Committee on Communications and the Arts; Inquiry into co-investment in multi-carrier mobile coverage; submission by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts – Communications and Media Group; November 2022; p.8

Source: Optus

3.122 <<CIC ends>>

3.123 In brief, Optus submit that the MOCN agreement will deliver the following benefits, among others:

- (a) Cost reductions and improved efficiencies for Optus network deployment,
- (b) Enhance consumer choice,
- (c) Improved incentives to invest, particularly exerting greater pressure on Telstra to invest over the longer term,
- (d) Improved incentives for Telstra to compete on price,
- (e) Improved incentives and ability to compete in the wholesale market, as services of both Telstra and “MOCN” are improved,
- (f) Improved network resilience – will provide an alternative network to Telstra’s in the MOCN coverage area and Optus and TPG Telecom will continue to operate separate core networks.
- (g) Support wholesale market competition, particularly relative to the TPG MOCN deal with Telstra.

3.124 TPG will also gain access to 2,444 Optus mobile network sites in regional Australia, increasing its current national 4G coverage from around 400,000 square kilometres to around 1,000,000 square kilometres. Customers and communities will also benefit from Optus’ commitment to accelerate its 5G rollout in the regions, fast-tracking the number of 5G sites in the regional MOCN to 1,500 by 2028 and 2,444 by the end of 2030.¹⁴²

3.125 The sharing of spectrum for the supply of MOCN services will enable both Optus and TPG to deliver enhanced capacity, speed and service quality to TPG and Optus customers in regional Australia. It enables Optus to more cost effectively deploy its 5G network and deliver a real alternative to Telstra, paving the way for a new era of choice and competition for customers across regional Australia. It also enables TPG to compete more effectively in retail and wholesale markets.

3.126 This is in large part because the spectrum sharing helps level the playing field with Telstra’s regional spectrum holdings. The MOCN arrangements mean that Optus will have access to TPG’s mid-band spectrum, enabling both Optus and TPG to compete more effectively with Telstra on capacity and service quality.

3.127 The presence of a viable alternative network in regional Australia will also alleviate any congestion that Telstra is currently facing, both by enabling customers to transfer to competitive Optus or TPG Telecom offerings and acting as an incentive for Telstra to invest in upgrading its network in those areas.

¹⁴² [TPG Telecom and Optus sign network sharing agreement marking new era of mobile services for regional Australia](#)

- 3.128 The MOCN arrangements have an initial term of 11 years and include an option for TPG Telecom to extend the agreement for a further five years. The renewal of ESL spectrum underpinning this agreement will be crucial to its success and the delivery of improved connectivity to regional Australians.
- 3.129 Optus ability to meet the 2030 deployment timeframe and to continue to provide competitive mobile services in the MOCN Coverage area clearly depends on access to ESL spectrum. If the agreement is allowed to proceed (i.e. found not to raise competition concerns), then the ACMA should adopt a preferred view that any ESL spectrum can be renewed upon application.

Optus need ESL spectrum to continue to compete with Telstra regardless of MOCN

- 3.130 Regardless of whether the MOCN services agreement is approved, Optus submit that renewal of Optus ESL holdings is in the long-term public interest. Any reduction in Optus spectrum holdings will undermine Optus ability to continue to effectively compete with Telstra in the national mobile market.
- 3.131 In this context, other competition considerations that the ACMA should have regard to in developing its preliminary and preferred view are:
- (a) The impact of Telstra’s spectrum advantages - Telstra dominant regional spectrum holdings add to the significant cost advantages it has in deploying networks in regional Australia. The ESL Process should not enable Telstra to acquire via auction more spectrum in the bands that are expiring than it already has – i.e. ESL spectrum should be renewed rather than auctioned.
 - (b) Telstra’s financial strength undermines the efficiency of any auction – Should the ACMA chose to auction ESL spectrum, Telstra is financially well placed to acquire more spectrum thereby further entrenching its market power. If the MOCN Services agreement is not approved, then the ACMA must impose restrictive allocation limits to limit the further market distorting effects of Telstra spectrum dominance.
 - (c) Promoting competition while maintaining a three-player market: The Australian mobile market has proven that it is not able to sustain more than three MNOs. Given historically low ROIC there is no prospect of new entry at the national level. In this context, any support for new localised, niche, single-use, dedicated spectrum users or entry of smaller operators into ESL spectrum to meet “unmet demand” must be treated with caution.

As highlighted in detail below, facilitating new localised entry into ESL spectrum space raises the risk of significant interference and disruption to national network deployment, or potential stranding of spectrum should the new operator’s business fail. Optus consider the likelihood of a speculative acquisition of spectrum (from a non-MNO) resulting in underuse and eventual consolidation by an existing MNO, is very high based on the recent Dense Air experience, where Telstra acquired its 2.5GHz spectrum.

- 3.132 In Optus’ view, offering to renew ESL spectrum at a nominal price will best promote sustainable competition in mobile services and ensure continuity and quality of service for the tens of millions of Australian mobile customers.

Changing ESL arrangements for new entrants is unjustified and disproportionate

- 3.133 Optus note that the ACCC has called for the ACMA to “explore future arrangements that reduce barriers to new entry” stating that:

“Since the merger of TPG and Vodafone in 2020, there has been limited prospect of new entry. Without spectrum management policies favourable to new entrants, the likelihood of one emerging in the near future is very low. This has competition implications in the market...While the ACCC is not currently aware of any potential new entry into the mobile services market, we consider the ACMA’s process could investigate the possibility of new entrants”.¹⁴³

- 3.134 This recommendation has been supported by the Minister in the final MPS Instrument.¹⁴⁴ The ACMA is also seeking feedback from stakeholders on “spectrum related barriers to being able to compete effectively in downstream markets, and encourage competition in regional, rural and remote areas”.¹⁴⁵
- 3.135 Optus has expressed its concern about the lack of a clear rationale for the inclusion of this objective as a consideration in the ACMA’s decision-making. In Optus’ view, any regulatory intervention must be based on very sound and considered evidence that (i) there is a problem to be addressed, (ii) existing market mechanisms are not fit for purpose and (iii) any benefit of mandating entry outweighs any public detriment.
- 3.136 Optus readily concedes that the mobile sector is characterised by high barriers to entry. However, the high cost (and relative scarcity) of spectrum is only one among a number of barriers to entry to the national mobile services market, including (i) large up-front sunk capital investment required, (ii) economies of scale, (iii) brand perception and (iv) phase in technology cycle (first mover advantage).¹⁴⁶
- 3.137 We note that the ACCC’s recommendation for the ACMA to investigate the possibility of new entrants, including by possibly reserving spectrum at auction,¹⁴⁷ is not based on a formal analysis of the current state of competition in the national mobile market. More specifically, there does not appear to be any assessment of whether existing legislative mechanisms are in fact unfit for the purpose of enabling the desired spectrum access for new entrants or niche market players or any consideration of the extent of the negative technical impact on the MNOs would be.
- 3.138 Optus submit that it is not in the public interest to intervene to enable new entry into ESL spectrum. Existing mechanisms of spectrum access already promote efficient spectrum use. New entry, either via re-allocation of the spectrum or entry by way of the introduction of “alternative licence conditions”, will distort investment - decision-making, carve up spectrum space by introducing new boundaries which will have a disproportionate impact on the performance of mobile services in that area.
- 3.139 Mandating access will also distort the market by undermining incentives to invest, either by encouraging licensees not to invest, or to undertake inefficient investments simply to maintain their licences (i.e., UIOLI/UIOSI scenarios). We explain our concerns about the possibility of “alternative licence conditions” in further detail in Section 5.

¹⁴³ ACCC submission to ACMA Stage 1 Consultation “Approach to Expiring Spectrum Licences”, August 2023

¹⁴⁴ Section 7 of the final MPS Instrument “Facilitating opportunities for new entrants and use cases, including for low earth orbit satellites” states “the Government supports the position expressed in the ACCC’s submission...namely, that the ACMA should explore future arrangements that reduce the barriers to entry for new users of spectrum for either new use cases or existing uses, as a dynamic and competitive communications market is most likely to promote the public interest”

¹⁴⁵ Consultation Paper, p.13

¹⁴⁶ Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No 2) [2023] ACompT2; ACT 1 of 2022; 21 June 2023; para 335; p.124-125

¹⁴⁷ ACMA’s Approach to Expiring Spectrum Licences, ACCC submission, August 2023, p.4

The secondary market for spectrum promotes efficient outcomes

- 3.140 As noted in our response to “Public interest criterion 1: facilitates efficiency”, market mechanisms are most effective at facilitating efficient use of spectrum.
- 3.141 The Act enables spectrum licensees to trade the whole or part of a spectrum licence as well as to authorise third parties to operate radiocommunications devices under a spectrum licence.¹⁴⁸ As the ACMA notes “flexible and tradeable licences are recognised as a means to facilitate innovation and competition, after an initial allocation”.¹⁴⁹ The attached expert report from Dr Chris Doyle confirms that the presence of a secondary market for spectrum access coupled with the fact that ESL spectrum was initially auctioned (or renewed) weighs heavily in favour of finding that the current allocation of spectrum is efficient (because it has been exposed to the market).
- 3.142 Optus agrees that the secondary market for spectrum licences may be characterised as “relatively thin” – however, we note that the market is for assets for which the acquirer has paid considerable sums of money. We are also not aware of any “entrenched” end-user demand that cannot be addressed either by MNOs or via existing market-based mechanisms of spectrum access. Optus submits that the following points highlight that the secondary market for spectrum continues to promote efficient outcomes:
- (a) The ACCC has observed that network access agreements “can enable the acquiring MNO to offer higher service coverage and quality than they could using only their own networks, but typically do not allow the acquiring MNO to improve or differentiate their services as much as they could had they invested directly in their own network infrastructure.”¹⁵⁰ Optus’ MOCN services agreement with TPG includes a non-discrimination obligation on Optus to ensure that it supplies TPG with MOCN services using the same spectrum that it uses to supply its own services. We also note that preserving separate core networks allows for service differentiation.
 - (b) Trades to facilitate defragmentation are still trades – that can be “mutually beneficial, and typically results in both (or all) parties to the trade holding the same quantum of spectrum in the same areas as they did before the trade, but in more efficient contiguous blocks”.¹⁵¹ Optus has recently undertaken spectrum trades of 2.3GHz and 3.4GHz spectrum fragments with NBN Co., largely for the purpose of facilitating defragmentation and band optimisation.
 - (c) TPG sold its holdings in the 2.5GHz band to Dense Air Networks Australia, and concurrently bought Dense Air Limited’s licences in the 3.6 GHz band¹⁵² and had a spectrum access agreement in place with the sub-national MNO Pivotel, allowing Pivotel access to licensed ‘LTE’ spectrum. A key incentive for TPG to enter its proposed MOCN Services Agreement with Telstra was that it provided the opportunity to monetise its regional spectrum.

¹⁴⁸ Section 85 and 68 of the Act respectively

¹⁴⁹ Consultation paper, p.40, citing Cave, Doyle and Webb

¹⁵⁰ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.vii

¹⁵¹ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.20

¹⁵² In Optus view, the Dense Air spectrum acquisition (via auction) appears to have been localised and highly speculative at best, resulting in most of the spectrum being subsequently traded on the secondary market and eventually consolidated by Telstra.

- (d) The availability of the secondary market was a relevant consideration in the ACCC's decision to reject the TLS/TPG MOCN proposal in 2023 noting:

"TPG has an incentive to monetise its underutilised spectrum assets under any counterfactual where TPG does not seek to build out its regional network to the full extent of Telstra's. To the extent that there are other potential users of the spectrum that TPG might seek to monetise, *the ACCC considers that secondary trading may occur and this would enable use of the spectrum by a new entrant or an MNO other than Optus and Telstra, or a fixed operator such as NBN Co, or for other innovative uses such as neutral host services or satellite services such as direct-to-handset connectivity. Further, as the availability of spectrum presents a very large barrier to entry for new firms, the potential availability of TPG's spectrum on the secondary market may induce demand for it in a way that the Proposed Transaction does not allow*".¹⁵³
(emphasis added)

Cost and resource implications of increased interference management

- 3.143 While we recognise that there may be growing opportunities in the market for local area and private wireless networks, we consider that mandating access to ESL spectrum, via re-allocation, alternative licence conditions or otherwise, will cause disproportionate risk of interference to the surrounding public network and disruption to the supply of essential mobile services.
- 3.144 Carving up ESL spectrum for new entrants would also create uncertainty in spectrum access, undermining investment and introducing further costs and resource burdens into operations and planning for MNOs that will need to be recouped.
- 3.145 The certainty of spectrum access afforded by existing ESL arrangements enables Optus to develop network plans to deliver various deployment objectives such as coverage expansion, coverage infill and capacity relief. These plans will either identify new greenfield site requirements or site upgrades which are underpinned by spectrum availability. Deployment activities and site decisions can then be based on the delivery of these requirements.
- 3.146 The impact of a lack of certainty on operations is illustrated by Optus 2300MHz band in metro or apparatus licences in regional/remote areas. Depending on the outcome of the Accredited Person (AP)'s initial assessment, site designs may need to be altered in order to balance the spectrum coordination requirements against the site objectives. For instance, is it better to mitigate a site design for ACMA registration or should the coverage and capability of the site be reduced.
- 3.147 These questions result in multiple design modifications which increases the costs to Optus. In addition, Optus must also invest in complex compliance auditing practices to manage the tilts and power mitigation required. For Optus, the most complex bands to manage are 2300MHz and 3.4GHz. Apparatus licences in the remote/regional space also require regular auditing, particularly on sites which have non-standard configurations. This highlights the cost and resource implications of greater interference management burden that will result from changing existing ESL arrangements to enable new entry.

¹⁵³ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.x

3.148 Enabling non-MNO's ESL spectrum to supply dedicated services considerably increases the risk of harmful interference to the surrounding public network. This is illustrated more clearly in the case studies set out in Section 7.

Private wireless network operators should not be offered dedicated ESL spectrum

3.149 GSMA states that “Measures to address the spectrum needs of private networks should be carefully considered. While private networks are an integral part of 5G, supporting their growth does not have to mean resorting to asymmetric spectrum carve outs or set asides. Such measures are an aggressive regulatory tool with a huge economic cost...there is no one single approach to best meet the spectrum needs for private 5G in all markets”.¹⁵⁴

3.150 Allocation to mobile private wireless network use cases does not deliver a public benefit from the use of the spectrum, but rather excludes spectrum from use for public benefit and transfers it directly to private commercial control. The supply of public mobile networks and services delivers incalculable network externalities and public economic and social benefits.

3.151 The ACMA has already made provision for local area and private wireless networks in outer metro, regional and remote Australia via administrative allocation in the 3.8GHz band. The arrangements in 3.4GHz spectrum highlight the inherent inefficiencies of spectrum fragmentation that result from catering to too wide a range of use cases in the band. Apparatus licences are also available in 1800MHz and 2GHz bands.

3.152 We also note that wireless indoor or campus connectivity is playing an increasing role and is important for delivering Industry 4.0. However, there is no need to carve out scarce IMT spectrum for this purpose. It is precisely for local and campus use that spectrum is identified for R-LANs (Radio Local Area Networks) with WiFi being the most common R-LAN technology. With the most recent addition of 500 MHz in 5925 – 6425 MHz the spectrum available for R-LAN in Australia now amounts to 500 MHz in lower 6GHz band, 83.5 MHz at 2.4GHz, and 575 MHz at 5GHz, i.e. 1,158.5 MHz in total in below 10 GHz.

3.153 There is no evidence that private local networks require IMT spectrum rather than implementing their network using unlicensed spectrum. The new Wi-Fi 6, or IEEE 802.11ax, with an extended version, Wi-Fi 6E, that adds the 6 GHz band provides a massive improvement in performance including data speed, reduced latency, reduced interference, and improved reliability. In other words, Wi-Fi 6E using unlicensed spectrum is an excellent solution for local private networks. Optus note that there are already some smaller operators using unlicensed 60GHz spectrum (known as V-band) and the WiGig standard to supply local area internet services.¹⁵⁵

How current and proposed uses of the spectrum align with the objectives of the MPS

3.154 If ESL spectrum is renewed, Optus business strategies and proposed use of spectrum will enhance competition in downstream mobile markets and align with the objectives of the MPS to:

- (a) promote competition, Optus use of its ESL spectrum has promoted competition in the national retail and wholesale mobile services market. Optus

¹⁵⁴ GSMA report on Exploring 5G private network opportunities in Asia Pacific; p.27; GSMA has also noted the failure of spectrum set asides to promote entry in recent auctions such as the German 3.5GHz auction in 2019 – see further [Spectrum-Set-Asides-Germany.pdf \(gsma.com\)](#)

¹⁵⁵ [Australian ISP Move Up Internet to launch Meta-developed Terragraph gigabit technology - DCD \(datacenterdynamics.com\)](#)

has invested billions in its networks and spectrum, to deploy national 3G, 4G and 5G networks. Optus 5G services consistently rank highly for speed and performance (Opensignal). Optus' planned use of its ESL spectrum for our MOCN services agreement will help deliver sustainable 5G infrastructure-based competition in regional Australia for the long-term public benefit.

- (b) facilitate opportunities for new entrants and use cases, Optus' proposed use of ESL spectrum for our collaboration with SpaceX is a first of its kind agreement in Australia – use of our national FDD ESL spectrum, with access enabled via existing mechanisms for third party authorisation, helps to reduce barriers to entry for new LEOSat use cases in regions of Australia that have never, and will likely never, be served by terrestrial mobile services.

- 3.155 Optus note that other key MPS policy considerations that weigh in favour of renewal of ESLs are the need to promote continuity of service, innovation and sustained investment and to carefully consider “existing investment by licensees, as well as known market demand for spectrum and the capacity for other prospective licence holders to make the investment required to deploy and maintain an effective service with the spectrum”.¹⁵⁶ Failure to properly interrogate the claims for access and unmet demand, or to consider alternative spectrum to support an identified demand, raises the risk of failed regulatory intervention.

Existing ESL spectrum arrangements can support inter-operability between terrestrial and satellite services

- 3.156 The use of national spectrum licences to enable terrestrial and non-terrestrial network interoperability was a primary focus of the FCC's Order to establish a regulatory framework for a Supplemental Coverage Service (SCS). Seamless connectivity between terrestrial and non-terrestrial networks to deliver ubiquitous coverage is the potential offered by MNOs retaining control over national spectrum space.
- 3.157 Upcoming 3GPP Releases 17 and 18 will provide for new network architectures that enable interoperability and possible connectivity with all standard mobile devices.¹⁵⁷ Given the ubiquity of mobile phones, the potential of such technological development to address perennial problems of hard to serve areas is clear.
- 3.158 The entry of LEOSats offers opportunities to bridge the Digital Divide and Close the Gap. An ‘IMT’ satellite direct to mobile (‘Sat DTM’) service uses the terrestrial mobile spectrum to transmit between existing user equipment (mobile handsets) and satellite, thereby complementing terrestrial mobile network coverage.
- 3.159 Optus has provided an early glimpse of this via its collaboration with SpaceX to deliver ‘IMT’ DTM services using our national FDD ESL spectrum. This collaboration is facilitated by the existing spectrum licence framework. The technological flexibility of the spectrum licence framework allows licensees to repurpose spectrum for other uses, provided there is compliance with the technical framework and applicable regulations.
- 3.160 ITU Member States have recently resolved, under Agenda Item 1.13 at WRC-23, to undertake “studies on possible new allocation to the mobile-satellite service for direct connectivity between space stations and International Mobile telecommunications (IMT)

¹⁵⁶ Section 10, Final MPS Instrument

¹⁵⁷ 3rd Generation Partnership Project (3GPP) [Release 17 \(3gpp.org\)](#) and [Release 18 \(3gpp.org\)](#)

user equipment to complement terrestrial IMT network coverage” in time for WRC-27.¹⁵⁸ In this context, Optus considers that it is appropriate that IMT satellite DTM services initially operate on a “no-interference, no-protection” basis.¹⁵⁹

3.161 Optus refers the ACMA to our February 2023 submission to the ACMA’s consultation on “satellite direct to mobile services: regulatory issues” for further information.

Question 4 – Public interest criterion 4: balances public benefits and impacts

How does your current and planned use of the spectrum balance public benefits and impacts?

- 3.162 Mobile networks supply essential communications services to Australians across the country, providing access to emergency, education, banking, health, social, commercial and government services among others. Being connected and having access to a reliable and affordable phone and internet service has become crucial for many people to work and connect to education, health, public safety and government services.¹⁶⁰ A loss of service can have serious personal and public consequences.¹⁶¹
- 3.163 The ACMA has recognised telecommunications as essential services and that access to these services has become even more critical since the COVID-19 pandemic.¹⁶² The Communications Minister has noted they are “a necessity to support ... access to critical services”.⁸ The Government’s Statement of Expectations confirms that the ACMA “has an important role to support industry and consumers in delivering and accessing essential communications services”.¹⁶³
- 3.164 Optus current and planned use of ESL spectrum for mobile services “balances public benefits and impacts”. While mobile services are “commercial services” they contribute to the overall public benefit and deliver more than just “economic outcomes”.¹⁶⁴ Optus ongoing access to ESL spectrum is crucial to:
- (a) ensuring continuity of supply of essential mobile services and network resilience, particularly in parts of Australia where there may be limited alternatives.
 - (b) providing Australians with access to other essential services, in particular, public safety and emergency services, across Australia
 - (c) enable two-factor and multi-factor authentication (via SMS) for Australians to gain secure access to a range of other services, including banking
 - (d) enabling hybrid and flexible working arrangements

¹⁵⁸ Resolution COM6/9; pg 567-568 of the Provisional Final Acts“ provides for “studies on possible allocations to the MSS in the frequency range between 694/698 MHz and 2.7 GHz, taking into account the IMT frequency arrangements addressed in the most recent version of Recommendation ITU-R M.1036;” and “studies on spectrum requirements and on technical, operational and regulatory matters related to the implementation of the mobilesatellite service for direct connectivity to the IMT user equipment to complement the terrestrial IMT network coverage”

¹⁵⁹ As per ACMA’s FYSO 2023-28 and as provided by ITU-R Regulation No. 4.4

¹⁶⁰ [ACMA calls on telcos to improve support for customers in hardship | ACMA](#)

¹⁶¹ Australian Government Response to the Bean Review Final Report; Review into the Optus outage of 8 November 2023; April 2024; p.1

¹⁶² ACMA, What consumers want – Consumer expectations for telecommunications safeguards A position paper for the telecommunications sector; July 2023.

¹⁶³ Government’s Statement of Expectations, December 2022

¹⁶⁴ Consultation paper, p.41

- (e) facilitating social connections, cohesion and broader social and psychological benefits
- (f) supporting environmental policy objectives – to meet carbon reduction and net zero emission targets, operators need sufficient spectrum to avoid unnecessary site densification.

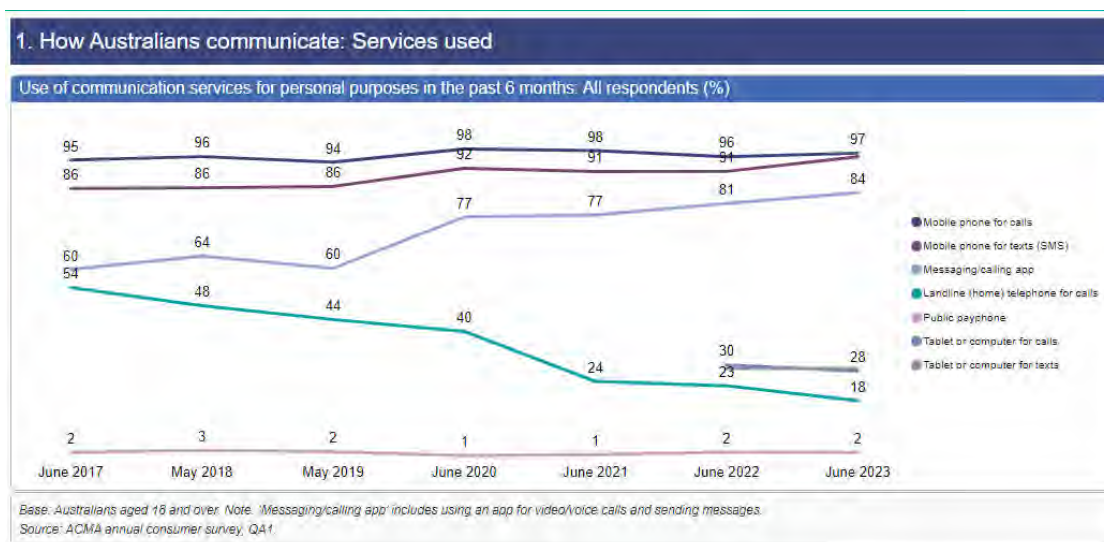
3.165 Having regard to the need to maintain supply of these broader “non-commercial” public benefits of mobile services, Optus submit that continuity of service objectives must feature prominently in the ACMA’s decision making. In particular it is clear that a decision to not renew ESL spectrum may adversely affect the supply of essential services and “put at risk the delivery of services to a significant number of people”.¹⁶⁵

Reflects issues and guidance on “balances public benefits and impacts”

3.166 As highlighted elsewhere in this submission, the use of ESL spectrum for mobile services has and will continue to deliver vast economic and productivity benefits to Australia. Optus submit that these are clearly public benefits, given that there are over 9 million mobile services in operation (SIOs) over Optus’ network, across Australia.

3.167 As the ACMA notes, commercial services deliver more than economic outcomes, facilitating social connections and broader societal benefits. Mobile phones are ubiquitous and critical to our daily lives. They enable us to contact essential services, including emergency services at times of need, interact with family and friends and engage on social media. The prevalent use of mobile services for personal communications is clearly demonstrated in the following from the ACMA’s research:¹⁶⁶

Figure 16 Communication Services used by Australians for personal purposes



Source: ACMA

3.168 Mobile services are vital to businesses and consumers. Maintenance of these services is crucial to business continuity – end-users have invested in devices with the reasonable expectation that services will continue to work on the existing spectrum bands to provide

¹⁶⁵ MPS instrument, section 6

¹⁶⁶ [Communications and media in Australia: How we communicate | ACMA](#); states that “Mobile phone calls have long been the most widely used way to communicate, but in 2023, mobile text messages came close. Messaging is also growing in popularity via apps such as Facebook Messenger and WhatsApp”

consistent or improving coverage, capacity and customer experience. A degradation or loss of mobile services can cause financial, health and security harms.

- 3.169 At the extreme, disruption to mobile services will cause the loss of access to the emergency call service and access to SMS-based emergency alerts under the National Emergency Warning System (NEWS), which can have significant adverse consequences on mobile service users.
- 3.170 The availability of sufficient spectrum will be crucial to ensuring we can continue to deliver reliable and ongoing access to Australians when they most need it. Certainty of spectrum renewal will enable operators to continue to invest in ensuring the highest levels of network reliability and resilience in times of disaster.
- 3.171 MNOs are tasked with a range of responsibilities and programs to improve network resilience, protect national critical infrastructure, ensure network security, access to emergency services, SMS-based emergency alerts under NEWS and network integrity. The use of ESL spectrum is also crucial to the quality and reliability of our mobile services to deliver access to other essential services, most notably the emergency call service (“000”). We note that mobile private networks are not required to provide access to emergency calling; and unlike PMTS networks, many do not support such a feature.
- 3.172 For the same reasons as set out elsewhere concerning the impacts of carving up ESL spectrum space, Optus do not consider that a public safety mobile broadband service should be provided over dedicated spectrum. Many critical services such as first responder networks are transitioning to using a network built by MNOs. For example, in the US, AT&T operates the First Responder network in 700MHz spectrum which is also used for AT&T’s customers when the capacity of the band not needed by first responders. First responders would simply not have the funds to deploy a network with the coverage AT&T can provide.
- 3.173 Mobile telecommunications networks are also designated as critical national infrastructure.¹⁶⁷ Accordingly, MNOs are subject to numerous obligations to ensure the security of their networks.¹⁶⁸ This underscores the nature of mobile services as essential to the Australian public. Disruption to our services may undermine compliance with our security obligations.

Optus comments on public interest served by other ESL (non WBB) bands

- 3.174 Optus recognises that some ESLs, such as rail safety use of the 1800MHz band, provide expressly “public” or non-commercial benefits. However, the current Global System for Mobile Communications – Railway (GSM-R) standard is expected to reach its end-of-life around 2030.¹⁶⁹ In ACMA’s Replanning of the 1800-1920MHz band, Optus agrees with the approach to introduce arrangements for RMR uses between 1900-1910MHz for the Future Railway Mobile Communications System (FRMCS) which is to supersede the GSM-R.
- 3.175 Optus reiterates the importance of co-existence considerations with adjacent spectrum-licensed bands (such as 1.8GHz and 2.1GHz) and submits that any new assignment in the 1.9GHz band should not cause interference with the adjacent bands, nor should it mandate any new deployment restrictions in the adjacent bands.

¹⁶⁷ Telecommunications (Carrier Licence Conditions—Security Information) Declaration 2022 and Telecommunications (Carriage Service Provider—Security Information) Determination 2022

¹⁶⁸ under Part 14 of the Telecommunications Act and other security laws, including the Security of Critical Infrastructure Act and associated regulatory instruments under the Telecommunications Act.

¹⁶⁹ <https://www.ericsson.com/en/press-releases/3/2023/moving-ever-closer-to-5g-on-trains>

3.176 We note that both rail licensees and MNOs have similar requirements of providing coverage along rail corridors. Deutsche Bahn (DB), Ericsson, O2 Telefónica and Vantage Towers are working together in Germany to establish extensive 5G mobile communications along train tracks and develop proposals and cooperation models for the rail and mobile communications industries and tower operators where towers could be shared for 5G and FRMCS (with its dedicated 1900MHz band) without distorting competition.

Question 5 – Public interest criterion 5: supports relevant policy objectives and priorities

How does your current and planned (including regional, rural, and remote connectivity, investment and competition)?

- 3.177 As highlighted elsewhere in this submission, Optus' current and planned use of ESL spectrum delivers significant public benefits. The renewal of ESL spectrum will help provide continuity of service to Optus mobile customers, particularly in areas of Australia where there are few alternative services. Existing secondary market mechanisms continue to facilitate efficient use of spectrum and new use cases.
- 3.178 Offering renewal with the same conditions as existing ESLs will also provide the investment certainty necessary for Optus to continue to deploy competitive networks and services that will ultimately help the Government deliver on numerous policy objectives, including those set out in the MPS Instrument relating to improved connectivity for Australians in regional and remote areas.
- 3.179 Opus reiterates its view that many other policy objectives, including those directed at improving network resilience or temporary disaster roaming are best addressed through other Government policy programs. Furthermore, as the ACMA's Consultation Paper acknowledges, regional connectivity and Closing the Gap goals will not be addressed solely through the ESL process and will require reforms to the wide array of policies and programs that the Government has implemented over the years, including the Mobile Black Spot Program (MBSP), Regional Connectivity Program (RCP) and Universal Service Obligation (USO). Optus directs the ACMA to our recent submissions and engagement on these matters with the ACMA and Department for further information.

Renewal of ESL will enable Optus to deliver improved connectivity to regional and remote Australia for the long term

- 3.180 Telstra's legacy network advantages have provided it with a significant first mover advantage across most generations of mobile technology, which is even more acute with the roll-out of 5G. Indeed, Telstra has stated that its 5G network will reach 95% of the population by 2025. Telstra is able to continue to build on its network presence as a result of receiving the vast majority of government co-contribution funding.¹⁷⁰ Its 5G advantage has also been aided by government security decisions.
- 3.181 While price continues to be a significant driving factor for consumer decisions, non-price factors have gained greater prominence in consumer decision-making.¹⁷¹ Telstra's legacy advantages enable it to differentiate itself in the market on the basis of coverage and performance, bolstering its market share. This has led to the establishment of "pockets of market power", particularly in outer regional and remote Australia, where

¹⁷⁰ In its 2021 Mobile Infrastructure Report, the ACCC noted that "As at 31 January 2020 and 31 January 2021, Telstra had deployed 629 and 735 sites respectively with the assistance of funding from this co-contribution program. This is significantly more co-funded sites than Optus (93 and 126) and TPG (60 and 60) combined"

¹⁷¹ ACCC Communications market report, 2021-22, p.9

Telstra is the only network operator.¹⁷² Outside of metropolitan areas, Telstra's market power increases significantly.

- 3.182 Telstra has little commercial incentive to agree to share physical infrastructure. Telstra's wholesale network covers only 98.8% of the population – the same coverage offered to TPG under the MOCN deal and approximately the same extent as Optus mobile network. Government funded programs that have focused on funding “new” coverage provide Telstra with further commercial advantages and differentiation, further limiting the ability of challenger networks to compete.
- 3.183 While Optus has been the main infrastructure challenger to Telstra, a combination of historic low industry returns, market imbalances in spectrum and the significant costs and market distortion created by the 5G Huawei Security Guidance (which requires Optus and TPG, but not Telstra, to replace legacy government sanctioned 4G technology to be able to deploy 5G technology) have made the regional and remote investment case even harder. History has shown that where infrastructure competition is weak the dominance of Telstra grows and outcomes for consumers are poorer. As a consequence, regional consumers are likely experiencing significant detriment relative to metro consumers.¹⁷³
- 3.184 Without Optus' ongoing network deployment in regional Australia, there will be little competition to Telstra and regional communications will continue to experience a Digital Divide. While Telstra's legacy network advantage mean that it may be able to more cost-effectively deploy, Optus MOCN service agreement will ensure sustainable 5G infrastructure-based competition for regional Australia.
- 3.185 Our SpaceX collaboration, and other potential IMT satellite direct to mobile services, also offers the potential to realise other policy objectives related to bridging the Digital Divide, including the delivery of emergency communications to provide mobile phones in areas affected by disaster, especially where terrestrial networks are disrupted. In the longer term it may also deliver reliable mobile network connectivity to remote communities across Australia, helping to Close the Gap. Promoting use of spectrum in areas that are hard or uneconomic to serve via terrestrial networks can only be a positive development and one that should be supported by way of ESL renewal.
- 3.186 Given the significance of spectrum as a key underlying network input for the provision of a mobile service, any significant reduction in an operator's core spectrum holding is likely to be detrimental to ongoing network operation and deny any public benefit that could be derived from the use of the spectrum. It therefore follows that a failure to re-issue existing ESLs to incumbent licensees, would have negative consequences for infrastructure investment and threaten the billions of dollars of economic activity that is dependent on mobile networks.

Alternative uses for spectrum

- 3.187 Optus welcomes the opportunity to provide further comment on possible alternative uses for ESL spectrum. We also welcome the ACMA's decision to provide a 3 week “reply-to-comment” period following this consultation. Optus will provide further detailed comments in response to other submissions at that time.

¹⁷² Optus submission in response to ACCC market inquiry – Telstra and TPG application for merger authorisation for proposed spectrum sharing in regional Australia; (CIC version) June 2022; para 3.27; p.21

¹⁷³ See for example, 2021 Regional Telecommunications Review, p.26, p.41, p.43 and p.99

3.188 In Section 7, Optus sets out a number of case studies that highlight the consequences of intervening in ESL spectrum to allow for new entry. The key issue is that carving out spectrum from ESL holdings, creates new boundaries, undermining efficiency of the ESL spectrum and its use by MNOs to deliver public networks. Optus submit that on balance this is likely to be a cost that outweighs any benefit of enabling entry.

Question 6 – Resilience and temporary disaster responses

We would welcome feedback from stakeholders concerning resilience and temporary disaster responses that arise in the context of spectrum licences and the ESL process .

3.189 Optus understand that network resilience and temporary disaster responses are important communications policy priorities for the Government, particularly in the wake of numerous natural disasters. Optus does not consider that these topics raise questions directly relevant to the ESL Process, other than to the extent that certainty over ESL renewal will provide the investment environment necessary to continue to maintain and upgrade our networks to deliver improved network resilience and redundancy in the case of disaster. We reiterate that the nature of a MOCN configuration is that it preserves separate core networks, thereby promoting resilience and will deliver a sustainable second 5G network to regional Australia.

Section 4. VIEWS ON USE OF FREQUENCY BANDS

- Optus welcomes the ACMA's initial view that continued use of ESL frequency bands for WBB use is "likely to promote the long-term public interest".
- Optus considers that continued use of all ESLs for wide area mobile networks and services is in the public interest, particularly given the following considerations:
 - Low-band (sub-1GHz) spectrum is essential for in-building and wide area coverage. Removing even a small amount would significantly impair quality of service for end users reliant on mobile services provided over these bands.
 - Mid-band Frequency Division Duplex (FDD) spectrum can be used for LEO satellite deployment whereas TDD spectrum cannot.
 - Mid-band Time Division Duplex (TDD) spectrum, namely ESLs in the 2.3GHz and 3.4GHz bands, are the only bands which enable MNOs to deploy in a 100MHz wide channel. This is essential to deliver the area traffic capacity required for 5G in cost effective manner and the high speed to deliver an improved customer experience.
- Considerable uncertainty remains as to the ACMA's preferred view on future use of ESL spectrum and Optus requests that the ACMA deliver its preferred view across all bands at its earliest opportunity.

Continued use of ESLs for wide-area WBB services promote the long-term public interest

- 4.1 Optus welcomes the ACMA's initial views at Stage 2 on the general use of frequency bands subject to this ESL process and in particular support the greater certainty provided by the ACMA's statement that "continued WBB use of the 700MHz, 850MHz, 2GHz, 2.3GHz, 2.5GHz and 3.4GHz bands is likely to promote the long-term public interest".¹⁷⁴
- 4.2 We also support the ACMA's views relating to use of 1800MHz band, though consider the public interest in use of the spectrum could be promoted if the band were optimised for 5G services. We also welcome the statement that "further consideration needs to be given to whether WBB use is an alternative or complementary use" of the 2.5GHz "mid-band gap".¹⁷⁵
- 4.3 As the ACMA notes, "where possible, the ESL process should not be a 'greenfields' or 'from the ground up' exercise in spectrum planning".¹⁷⁶ Optus agree that the international WBB use of 700MHz, 850MHz, 1800 MHz, 2GHz, 2.3GHz, 2.5GHz and 3.4GHz is well supported domestically and internationally through international harmonisation (ITU) and industry standardisation (3GPP). We also agree that there is considerable WBB equipment availability in these bands, which has facilitated widespread take up of mobile services in Australia.
- 4.4 GSMA highlights that keeping Australia's spectrum allocation aligned with international standards will be important for harmonisation with global networks.¹⁷⁷ There are clear

¹⁷⁴ Consultation Paper, p.22

¹⁷⁵ Consultation Paper, p.22

¹⁷⁶ Consultation Paper, p.19

¹⁷⁷ 5G Spectrum: GSMA Public Policy Position

benefits to aligning spectrum at an international level, including making it easier to use 5G enabled equipment and compatibility of devices, minimising interference with other countries, leveraging economies of scale and reducing costs of spectrum, and supporting a more competitive economy.

- 4.5 In regard to any consideration by the ACMA of the need for regulatory intervention to facilitate new entry or use cases in ESL spectrum space, Optus reiterate our view that the overall objective of promoting efficient spectrum use and the long-term public benefit derived from the use of ESL spectrum can already be delivered effectively via existing mechanisms under the Act.
- 4.6 Given the overwhelming public benefit that Optus and other MNOs deliver via their use of ESL spectrum for wide-area subscriber networks, we consider that it is incumbent upon prospective licensees and/or the ACMA to establish that existing mechanisms are failing to deliver on the relevant objectives before intervening in ESL spectrum space.

The ITU has harmonised ESL spectrum bands and will identify more spectrum for IMT

- 4.7 The International Telecommunications Union (ITU) provides guidance on the use of spectrum for IMT and has periodically published recommendations on how it expects future technology to develop and what spectrum is appropriate to support the delivery of new services. In 2015, ITU-R Recommendation M.2083 set out expectations for 5G services, including that IMT traffic will grow 10-100 times in 2020 to 2030, which would require additional spectrum and contiguous and broader channel bandwidths.¹⁷⁸
- 4.8 More recently, as standardisation of 6G technology is commencing, the ITU has published ITU-R Recommendation M.2160 which addresses the service concepts and technology enhancements expected for 6G (or IMT-2030). It notes that IMT-2030 is expected to use a wide range of frequency bands ranging from Sub 1GHz bands up to frequency bands above 100GHz.
- 4.9 The ITU also emphasised the need for spectrum harmonisation which has benefits of "... facilitating economies of scale, enabling global roaming, reducing complexity of equipment design, improving spectrum efficiency including potentially reducing cross border interference. Harmonization of spectrum for IMT would lead to increased commonality of equipment and is desirable for achieving economies of scale and affordability of equipment, thus promoting digital inclusion."¹⁷⁹
- 4.10 It is against this backdrop that the most recent World Radiocommunications Conference (WRC-23) met to consider global spectrum management. The conference considered the needs of IMT in particular and it concluded on the need for:
- (a) Global harmonisation of spectrum bands identified for IMT to include 3.3-3.8GHz and 6.425-7.125GHz in all ITU regions,
 - (b) Identification of further spectrum in the range 470-694MHz for IMT,
 - (c) Resolution that several bands in the range 102 to 275GHz should be used for investigation of 6G technology and service development,
 - (d) Formulation of agenda items for WRC-27 to include consideration of 4400 to 4800MHz, 7125 to 8400MHz and 14.8 to 15.35GHz for IMT.

¹⁷⁸ ITU-R Recommendation M.2083

¹⁷⁹ ITU-R Recommendation M.2160

- 4.11 In Optus' view, this international activity emphasises that for the ESL process in Australia:
- (a) Demand for spectrum for IMT services is increasing with traffic growth, higher data speeds and the introduction of innovative technologies,
 - (b) Existing bands assigned for IMT use in Australia are harmonised internationally and are particularly important for roaming and facilitating economies of scale,
 - (c) Additional spectrum as identified at WRC-23 is required for future development of IMT technology and the provision of services that support digital inclusion.
- 4.12 Device manufacturers design devices and equipment based on international frameworks in order to service global, large-scale markets and deployments. Australia is too small a market to diverge from the prevailing international standardised approach and bespoke solutions will add further cost and delay to the supply of downstream connectivity services.
- 4.13 Accordingly, we believe that all the ESLs currently held by Optus should be renewed to allow the continued provision of WBB services. A reduction in the spectrum currently allocated to IMT would compromise 4G and 5G service delivery and hamper the development of 6G services into the future.

Other WBB use cases can be supported via existing ESL arrangements

- 4.14 Given the ACMA's initial views on continued use of frequency bands for WBB being "likely to promote the long-term public interest", Optus is reassured that the ACMA is not contemplating a complete rearrangement of the spectrum bands that underpin the supply of essential mobile services in Australia.
- 4.15 However, we note that there remains considerable uncertainty about the ACMA's preferred approach. As the ACMA has highlighted, "a notable difference" between this and the previous ESL process is that the ACMA is also "seeking submissions from prospective alternative licensees to assist our consideration of whether alternative users and uses may promote the long-term public interest".¹⁸⁰
- 4.16 The ACMA also confirms that it is yet to form views about specific use cases and notes in particular that "WBB can include a range of use cases that vary with the services to be provided to end-users, users and business cases, technologies utilised, and scale of deployment. This could include mobile and fixed WBB, wide area and local area deployments, industry verticals or private networks".¹⁸¹
- 4.17 In its recent draft FYSO, the ACMA states that it generally recognises "3 broad categories of WBB use-cases", namely
- (a) "wide-area subscriber networks" (or 'conventional' telecommunications carrier fixed or mobile broadband operations
 - (b) "more limited market subscriber networks over smaller, localised areas" (e.g., Wireless Internet Service Providers or "WISPs")

¹⁸⁰ Consultation Paper, p.10

¹⁸¹ Consultation Paper, p.19

- (c) “business, government or non-commercial enterprise services operated or controlled by an entity within the confines of their own premises or land estate” (‘mobile private networks’)
- 4.18 The ACMA then adds that “Our planning, allocation and licensing activities seek to support a range of regional communications use-cases and users. This is particularly relevant for WBB services, where there are multiple types of service offerings, users and deployment models, resulting in a diverse range of spectrum needs in regional Australia.”¹⁸² Support for new use cases must be balanced with the interference risk to incumbent services.
- 4.19 As highlighted elsewhere in the submission, as well as in our response to the ACMA’s Stage 1 consultation process, changes to existing ESL arrangements will create a number of significant risks for incumbent licensees, that, in our view outweigh any benefit of accommodating new use cases. These are expanded upon throughout this submission, with the risks to public mobile services clearly illustrated in the case studies (Section 7). In summary, Optus consider that:
- (a) Imposing sharing requirements on spectrum licences, beyond how spectrum is allocated and shared across geographical boundaries will introduce many coordination issues and is unproven as a viable option to provide additional utility and efficiency to spectrum that is already licenced and in use.
 - (b) Changing the core conditions of a licence to support new entry, particularly in the absence of any alternative expressed demand for ESL spectrum, risks regulatory failure and stranding spectrum where there is no viable business case – such an outcome is ultimately inconsistent with the long-term public interest to be derived from use of the spectrum.
 - (c) Any retrospective application of varied spectrum boundaries into national or large area spectrum licences creates complexity and additional cost in terms of interference management, introduces inefficient spectrum use and fragments spectral and geographical holdings, therefore reducing the utility and efficiency of the spectrum to incumbent and prospective licensees alike. This fragmentation undermines the value of spectrum licences in the secondary market if the spectrum products are inconsistent and can, in turn, undermine longer term investment in networks. This is illustrated in the case studies provided in Section 7
 - (d) The introduction of new licence types for use of ESL spectrum, for example from spectrum licences to Area Wide Licences (AWLs), also creates a disproportionately high risk due to the increased likelihood of harmful interference and/or significant disruption to services delivered in surrounding spectrum licensed space.
- 4.20 In summary, Optus considers that the possible approaches to “freeing up” access to ESL spectrum being considered by the ACMA are unnecessary and disproportionate to the risk to public mobile services. Optus submit that any such impacts on incumbent services would weigh heavily against converting any of the existing spectrum licences in any of the geographical areas into AWLs.¹⁸³

¹⁸² Draft FYSO 2024-29, p.18

¹⁸³ Section 100(4) of the Act provides that the ACMA “must have regard to...the effect on radiocommunications of the proposed operation of the radiocommunications devices that would be authorised under the licences”

- 4.21 They also risk unintended outcomes such as consolidation of spectrum holdings resulting from third-party authorisations or sale of stranded spectrum assets to the dominant operator, poor spectrum efficiency, sub-optimal consumer and business customer outcomes and failure to deliver on regional connectivity and the economic benefit of 5G. Optus suggest that any of these outcomes would constitute a regulatory failure.
- 4.22 The ACMA's ongoing allocation of AWLs to assist rollout of localised wireless broadband including 5G and mobile private networks in the 3.8GHz band highlights how new entry can be facilitated without causing disproportionate disruption to public mobile networks and essential mobile services. This allocation process implicitly recognises that support for new use cases can be effectively delivered outside of ESL spectrum space. The ACMA should not seek to extend the use of AWLs below this spectrum band due to the risks of creating further complexity in the management of 3.4GHz band spectrum.
- 4.23 Optus repeats that the provision of mobile services through the ESLs has resulted in billions of dollars of extra economic activity and public benefits. The burden lies with the ACMA to demonstrate that the public benefits of any change to existing ESL arrangements outweigh the public benefits of existing use of ESLs.
- 4.24 Optus urge the ACMA to develop a preliminary view that, to the greatest extent permitted by the Act, promotes certainty for ongoing investment, having a comparable effect, or at least, intent, to the Class of Services Determination issued during the previous renewals process which precipitated significant investment in national 4G mobile networks. In other words, the ACMA's preliminary view should communicate that the renewal of all ESLs is in the public interest.
- 4.25 Optus sets out further detail on band specific considerations that we consider the ACMA should have regard to in determining its preferred use case for ESL spectrum.

Band specific considerations – optimising ESL spectrum for wide area 5G services

- 4.26 Optus uses all its ESLs for the provision of wide area public mobile networks and wireless broadband services. Optus sets out its use of ESL spectrum in Appendix A.
- 4.27 The ESL bands fall into the general categories of low, mid-band FDD and mid-band TDD spectrum with the following considerations relevant to the ACMA's ESL assessment:
- (a) Low-band (sub-1GHz) spectrum is essential for in-building coverage and wide area coverage. The total amount of low band spectrum is small relative to all spectrum and does not support higher orders of MIMO. Removing even a small amount of spectrum, say 2 x 5MHz would significantly impair quality of service for end users reliant on distant coverage or in-building service from these bands.
 - (b) Mid-band Frequency Division Duplex (FDD) spectrum can be used for LEO satellite deployment whereas TDD spectrum cannot (this is all ESL bands other than 2.3GHz and 3.4GHz-3.7GHz spectrum)
 - (c) Mid-band Time Division Duplex (TDD) spectrum, namely ESLs in the 2.3GHz and 3.4GHz bands, are the only bands which enable MNOs to deploy in a 100MHz wide channel. This is essential to deliver the area traffic capacity required for 5G in cost effective manner and the high speed to deliver an improved customer experience.
- 4.28 As noted in Section 2 of this submission and in more detail in Appendix B, national public mobile networks have been built based on the spectrum resources Optus has acquired and renewed over the last 30 years. Removing one spectrum band or reducing

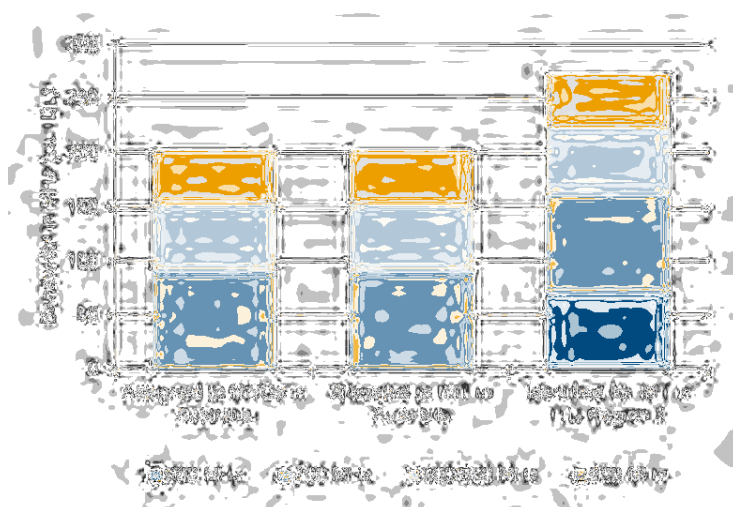
the amount of spectrum in a band would negatively affect network performance and hence have a significantly detrimental impact on millions of end-users. Optus also provided feedback in relation to band specific considerations in response to the ACMA's Stage 1 consultation paper. Optus reiterates these below, adding further comments for the ACMA to consider when assessing whether existing arrangements governing use of ESL spectrum remain fit for purpose.

Low-band – Optus 700MHz ESL

- 4.29 Optus has ESLs in the 700MHz (703-713MHz/758-768MHz) and 850MHz¹⁸⁴ bands and together with its 900MHz apparatus licenses, the bands are used for the provision of 3G, 4G and 5G services. Its 900MHz apparatus licences will convert to spectrum licences, commencing 1 July 2024
- 4.30 The 700MHz band is FDD spectrum widely used for the provision of WBB services in urban centres and regional areas. The band has been used primarily for 4G services by Optus and will have continuing importance for delivery of deep in-building coverage in built-up areas. Its propagation characteristics enable also cost-effective wide-area rural coverage. It is harmonised across ITU Region 3 and is therefore crucial for international roaming.
- 4.31 The 700MHz band is strategically important low band spectrum currently heavily utilised by all mobile operators. Given the propagation characteristics of this spectrum it will remain key spectrum to support the supply of 5G and 6G mobile and WBB services on a national basis in the future. Any changes to the use of this band or the core conditions of existing national spectrum licences will have potentially significant consequences for the costs of deployment and ultimately the quality and geographic scope of these services and therefore must be very carefully considered.
- 4.32 Furthermore, the very propagation characteristics that make this band so useful in supporting current and future wide-area service provision render it extremely difficult to coordinate across co-channel spectrum boundaries. The inter-site distances required to prevent harmful interference for licensees on either side of any mooted spectrum boundaries would be need extremely large, significantly undermining the efficiency and utilisation of the spectrum in this highly valuable band.
- 4.33 The following graph shows low band allocation in Australia and ITU Region 3:

¹⁸⁴ Optus is licensed to use 2x1 MHz of the 850 MHz which is due to expire in June 2028. From 1 July 2028, the 850 MHz downshift is expected to occur and new licensing arrangements commence for Optus in the 900 MHz band.

Figure 17 Low Band Spectrum – Australian Assignment, IMT Allocation and Region 3 Identification



Source: Optus and Coleago

1800 and 2100MHz (mid-band FDD) Optus ESLs

- 4.34 Optus has ESLs in the 1800MHz band (ESLs for 1755-1770MHz/1850-1865MHz) and 2100MHz band (ESLs for 1940-1960MHz/ 2130-2150MHz in metro and 1960-1965MHz/2150-2155MHz in regional areas). Optus uses 1800MHz ESL for 4G and 2100MHz for 4G and 5G services. Both are FDD spectrum bands.
- 4.35 The 1800MHz band is FDD spectrum is usually deployed as capacity layer, where low band is present. Given Optus relatively limited low band (700MHz) holdings (until 1 July 2024) Optus has used 1800MHz as a supplementary 4G coverage layer in regional and rural areas to supplement our low band spectrum. 1800MHz also penetrates relatively well into buildings which is important because there is limited sub-1GHz spectrum available and the additional capacity provided by the 1800MHz band is essential to deliver adequate user experience indoors.
- 4.36 This band is not spectrum licenced nationally and in remote Australia is subject to an apparatus licence regime. This fragmentation and the restrictions on apparatus licences means that the band cannot be used for national LEO satellite deployment. Remote 1800MHz apparatus licences have 2 x 30MHz available to non-MNOs (a maximum of 2 x 10MHz is available per licensee) and is currently being used for private wireless networks and this solution appears ideal for small, localised networks with low level demand outside public mobile network coverage.
- 4.37 The 2100MHz band is FDD spectrum and is an important capacity resource. Optus considers that the 1800MHz and 2100MHz bands are close functional substitutes. The efficient, nationally optimised use of these bands is undermined by complex and inconsistent licence boundaries. The need to coordinate and manage potential interference at multiple boundaries undermines the efficient utilisation of the spectrum, adding to operational complexity and cost.
- 4.38 The need to coordinate and manage potential interference at multiple boundaries undermines the efficient utilisation of the spectrum, adding to operational complexity and cost. The 1880-1920MHz band is subject to a mix of apparatus and class licensing arrangements across Australia that creates significant complexity. In particular, point-to-point links in remote areas are undermining efficient use of this spectrum. For example, the 14MHz bandwidth links which have 15km protections up to the 2nd adjacent lot. This

effectively prevents PTS registrations as it impacts up to 70MHz of spectrum (i.e., 28MHz +14MHz +28MHz)

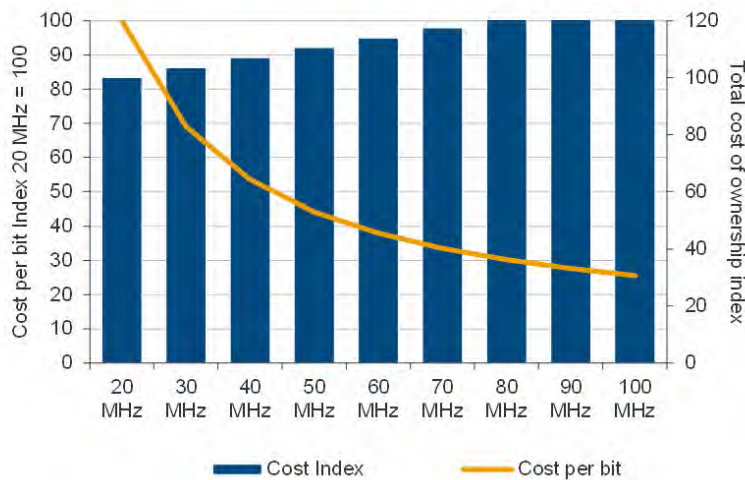
- 4.39 Optus has indicated previously that it does not oppose the expansion of the band arrangements in regard to the use of railway mobile radio (RMR) (between 1900-1910MHz). Optus reiterates that any new assignment in the 1.9GHz band should not cause interference with the adjacent bands, nor should it mandate any new deployment restrictions in the adjacent bands. Ultimately, Optus considers that the spectrum would be better utilised if the 1800MHz band was harmonised for 5G mobile services.

2300MHz (mid-band TDD) Optus ESLs

- 4.40 Optus has ESLs in the 2300MHz (or 2.3GHz band) (ESLs for 2302-2400MHz in all metro except Canberra where we have 70MHz due to protection for Tidbinbilla). Optus faces ongoing issues of managing interference with NBN Fixed Wireless access (“FWA”) services in this band. The 2.3GHz band is a TDD band. Optus has 98MHz of 2.3GHz which it uses for 4G/5G services in metro areas (Sydney, Melbourne, Brisbane, Perth and Adelaide) and uses 70MHz in Canberra.

- 4.41 The amount of spectrum that can be deployed in a single radio is a key determinant of the cost of producing area traffic capacity. The following graph shows that the closer a mobile operator gets to achieving spectrum holdings approaching the maximum channel bandwidth, the lower their cost of producing area traffic capacity.

Figure 18 Cost per Bit by Available Bandwidth



Source: Coleago

- 4.42 Deploying 5G in a 100MHz wide channel in upper mid-band spectrum delivers a 7% higher spectral efficiency compared to deploying it in only 20MHz. Spectrum utilisation is less than 100% for all 5G NR channel bandwidth options because the resource blocks do not fully occupy the channel bandwidth.
- 4.43 To deliver 5G economically, MNOs require a wide allocation of TDD spectrum, ideally a contiguous 100MHz block. Reducing the available contiguous bandwidth drives up network complexity and costs, making it more difficult to efficiently deliver 5G user experience data rates of 100 Mbit/s DL and 50 Mbit/s UL in an economically feasible manner. Therefore, Optus urges the ACMA to use the ESL process to renew our current allocation in the 2.3GHz band and optimise the band by offering Optus the additional 2MHz (2300-2302MHz) by administrative assignment.

2.5GHz (mid-band FDD) Optus ESLs (including mid-band gap)

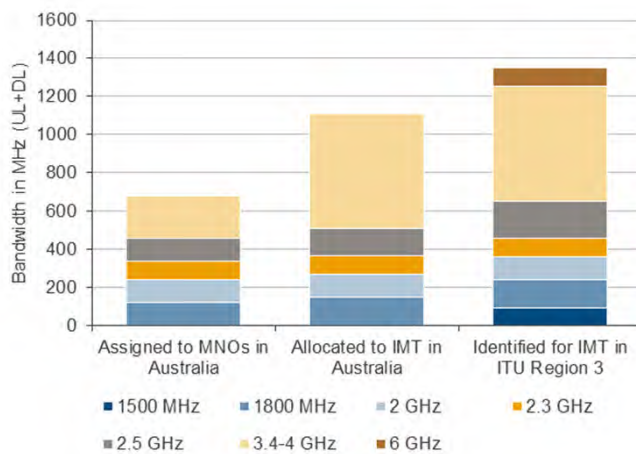
4.44 The 2500MHz band is the only FDD mid-band spectrum subject to national spectrum licences, with Optus holding 2 x 20MHz in this band (ESLs for 2550-2570MHz / 2670-2690MHz).

4.45 <<CIC begins>><<CIC ends>>

3400 – 3800MHz (mid-band FDD) Optus ESLs

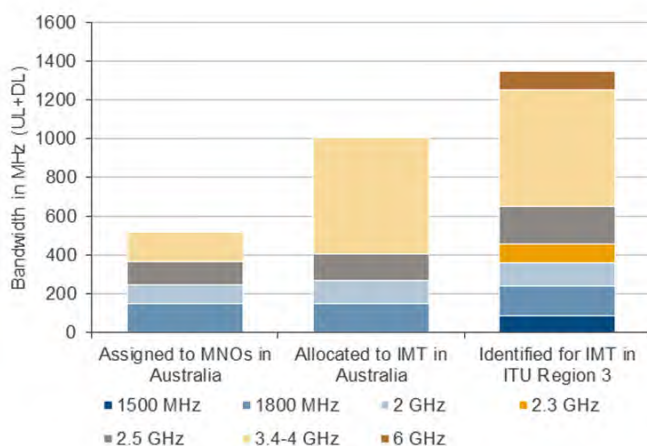
4.46 The 3.4GHz TDD band is a 5G pioneer band. Optus has ESLs in the 3.4GHz, 3.6GHz and 3.7GHz bands. Optus refers to Appendix A for further details. An important distinction between this and the 2.3GHz band is that the 3.4GHz band can be deployed with a higher order of MIMO giving it a higher spectral efficiency compared to 2.3GHz. Therefore the 3.4GHz is required alongside 2.3GHz to produce the capacity density (Mbit/s/m²) required for 5G. The following diagrams set out mid-band allocations in Australia metro (top) and regional (below) as well as ITU-Region 3:

Figure 19 Mid Band Metro Spectrum: Australian Assignment, IMT Allocation and Region 3 Identification



Source: Optus and Coleago

Figure 20 Mid Band Regional Spectrum: Australian Assignment, IMT Allocation and Region 3 Identification



- 4.47 The regional licences in the 3.6GHz are still subject to a reallocation period which does not conclude until March 2025. This has delayed the use of this band for mobile services as it has prevented licence holders from switching on sites due to the risk of interference with incumbent services. This band serves as an example of the negative impact of disproportionately long re-allocation periods on spectrum use.
- 4.48 Optus has raised concerns about the fragmentation resulting from the ACMA's allocation of the 3.4GHz band. Optus views on this are expanded on in response to the Assessment criteria ("facilitates efficiency") under Section 3.

Section 5. ALTERNATIVE LICENCE CONDITIONS

- Alternative licence conditions are not necessary or proportionate for Australia given levels of mobile coverage, the ongoing effectiveness of existing mechanisms of spectrum access and the high risks and consequences of regulatory failure in design and implementation.
- There is no evidence of market failure, which should be a pre-requisite to any regulatory intervention.
- The ACMA should consider other approaches to supporting efficient use and further deployment objectives.

- 5.1 The ACMA is seeking feedback on the effectiveness of “alternative licence conditions” in achieving certain policy objectives, particularly in relation to delivering “broader coverage and more efficient spectrum use”, for the purpose of preparing advice to the Minister.¹⁸⁵ In particular, the Minister has asked the ACMA to consider:
- (a) Rollout obligations and their effectiveness in achieving broader coverage.
 - (b) Use-it-or-lose-it (UIOLI) and Use-it-or-share-it (UIOSI) conditions and their effectiveness in achieving more efficient spectrum use.
- 5.2 The ACMA seeks feedback on a number of issues relevant to the design and implementation of alternative licence conditions.¹⁸⁶
- 5.3 The ACMA notes a number of alternative mechanisms of achieving policy objectives and the fact that the Minister has indicated that “the unique challenges of the Australian context mean that these alternative licence conditions may not be the most effective mechanism to deliver improved outcomes”.¹⁸⁷

Alternative licence conditions are not necessary or proportionate for Australia

- 5.4 National mobile networks require national spectrum licences. The framework for sustainable investment in a national mobile network, requires certainty of access to spectrum. Existing arrangements governing ESL have delivered billions in network investment and world leading coverage and network performance for Australia.
- 5.5 The proposed alternative licence conditions would fundamentally alter the spectrum access arrangements that have supported industry investment to date. While there may be demand for bespoke network solutions – these should not be at the expense of access to national spectrum for national public networks.
- 5.6 In this section, Optus sets out our general view that alternative licence conditions are not necessary or proportionate to the Australian mobile market. This is not only because of our unique geography and low population densities outside metro areas. It is because:

¹⁸⁵ Michelle Rowland MP to ACMA Chair Nerida O’Loughlin PSM; 14 December 2023

¹⁸⁶ ACMA has stated that “consideration is largely confined to how they may be designed and might be implemented through the ESL process and under the spectrum licensing framework as licence conditions” and “under the Act more generally”

¹⁸⁷ Consultation paper, p.26

- (a) There are existing mechanisms to access ESL spectrum, including via spectrum trading and third-party authorisation, that facilitate efficient use of ESL spectrum;
 - (b) Australia has, by international standards, achieved one of the fastest deployments of 5G in the world;
 - (c) While the secondary market for spectrum access may be characterised as “infrequent” or “thin”, given the high value of the assets, the level of activity is reflective of an efficient market;
 - (d) No clear rationale or justification for regulatory intervention has been established;
 - (e) There is low likelihood of designing regulated access conditions that function more efficiently than commercially negotiated access or sharing agreements – and attempts to do so raises the real prospect of regulatory failure.
 - (f) The implementation risks, including the distortion of investment incentives and the risk of harmful interference to public networks, outweigh any benefit of creating a scheme to facilitate localised private access – there is a high “potential divergence between ex-ante commitments and ex-post outcomes”.¹⁸⁸
 - (g) Ensuring such conditions can be operationally effective, from a compliance and enforcement perspective, will be complex and risks disproportionate regulatory burden (of compliance) and ineffective and/or heavy-handed penalties (from enforcement);
 - (h) The conditions are likely to have an anti-competitive effect given that Telstra’s competitive advantages mean that it will be less likely to be adversely impacted – the result would be to further entrench Telstra’s dominance in the national mobile market.
- 5.7 Overall, when considered in the context of the public benefit to be delivered via the ongoing use of ESL spectrum for mobile services, the real risk of regulatory failure weighs heavily against introducing alternative licence conditions.
- 5.8 Optus encourages the ACMA and the Minister to consider the broader context of the ESL decision-making framework, including optimisation of ESL bands, as well as relevant communications policy objectives, including reform of the USO, to deliver the stated objectives.
- 5.9 Optus acknowledge the ACMA’s questions on “alternative licence conditions”. As outlined above, Optus consider that existing arrangements are fit for the purpose of delivering the identified deployment and efficiency objectives. In our view, there is no need for alternative licence conditions to be introduced into any renewed ESLs.
- 5.10 Further, there are also real concerns about the rigour of the analytical process that we understand has given rise to the ACMA’s questions. The position outlined by the ACCC in its submission to the ACMA’s Stage 1 Consultation Paper is not based on an assessment of the state of competition to the level that would be expected to justify intervention into the national mobile market.

¹⁸⁸ Pogorel, Gerard; Spectrum 5.0 – Re-Thinking Spectrum Awards for Optimal 5G Deployment; 5 October 2018; p.18

5.11 Accordingly, Optus has set out our general views on the implications of the matters raised in the ACMA's questions rather than responding to each question individually. Optus also refers the ACMA to its response to the public interest criteria "facilitates efficiency" set out under Section 3, particularly in regard to the fitness of existing market mechanisms. We also refer the ACMA to the case studies in Section 7 of this submission, which clearly demonstrate the impact on the performance of national mobile networks and services that will flow from carving up spectrum space that would result from alternative licence conditions.

Existing market mechanisms facilitate efficient use of spectrum

5.12 Optus agrees with the ACMA that "flexible and tradeable licences are recognised as a means to facilitate innovation and competition, after an initial allocation".¹⁸⁹

5.13 In Optus' experience, the secondary market for ESL spectrum is working efficiently. Optus has utilised the existing market-based mechanisms set out under the Act to collaborate with SpaceX on satellite DTM and, if approved, to share regional spectrum with TPG. Other recent secondary market spectrum activity includes:

- (a) TPG sale of 2.5GHz spectrum to Dense Air and concurrent purchase of Dense Air's 3.4GHz spectrum licences in August 2021
- (b) TPGs spectrum access agreement with Pivotel
- (c) TPG and Telstra's spectrum access agreement in the 3.4GHz band in metro areas¹⁹⁰
- (d) Telstra's purchase of Dense Air's 2.5GHz spectrum in late 2023

5.14 Spectrum trading activity is also regularly used for the purposes of spectrum defragmentation. For example, Optus has recently traded fragments of 2.3GHz and 3.4GHz spectrum with NBN Co for defragmentation and band optimisation purposes. Other examples include TPG and Telstra trading equivalent blocks of 2GHz and 1800MHz spectrum to facilitate defragmentation.

5.15 While the market may be characterised as "thin" it concerns high value assets, which in most other contexts, do not trade that frequently. Further, trades for the purpose of defragmentation also clearly facilitate efficient spectrum use. We also note that while network footprints between the MNOs differ, many spectrum holdings are national. Therefore, the secondary market for spectrum access is by nature competitive and should enable access seekers to obtain access on fair and reasonable terms.

5.16 However, access seekers must actually seek access to the spectrum from the spectrum licence holder to secure these terms. Optus have not been approached about access to its spectrum, despite numerous public comments from prospective licensees that suggest MNOs are blocking access. This would suggest there is either a lack of demand for spectrum access, or more likely, a lack of demand for spectrum access on commercial terms that would include compliance with co-existence requirements.

5.17 Optus invites prospective licensees to negotiate commercial terms for spectrum access if they wish to do so. We note that a failure to make use of existing mechanisms is not evidence of market failure, and any public benefit of new entry must be well established

¹⁸⁹ Consultation paper, p.40, citing Cave, Doyle and Webb

¹⁹⁰ ACCC, Reasons for Determination, Application for merger authorisation lodged by Telstra and TPG in respect of the proposed Multi-Operator Core Network commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.20

and outweigh the costs to existing public mobile network performance of carving up spectrum space. A pre-requisite to intervention should be clear evidence and analysis that the status quo is not delivering desired outcomes. To proceed without clearly establishing market failure creates a heightened risk of regulatory failure, which in turn could strand spectrum and undermine its efficient use.

This consultation cannot form a sufficient basis for the contemplated regulatory intervention

- 5.18 The ACMA has itself acknowledged that “alternative licence conditions” would constitute a “substantial regulatory intervention” into the national mobile market.¹⁹¹ The assessment of whether to intervene in a market to promote competition generally involves careful analysis of whether the current state of the market may be hindering competition, by for example, enabling one operator to take unfair commercial advantage of its market position. For example, the ACCC must follow a regulatory process set out under legislation before it can declare that a specified eligible service is a declared service under Part XIC of the *Competition and Consumer Act 2010* (Cth).¹⁹²
- 5.19 Optus submit that the ACMA’s inquiries via this Consultation Paper, prompted by the Minister’s December 2023 letter, do not satisfy the standard of inquiry necessary to determine whether to introduce alternative licence conditions. Optus submits that the ACMA must clearly substantiate the case, including clear evidence of market failure, before recommending to the Minister that such conditions be implemented.
- 5.20 Dr Darryl Biggar, in querying whether the concept of “market failure” remains relevant to modern public policy decision-making notes that:
- “There is a broad consensus amongst economists that, where they operate effectively, no human institution is better able to deliver economic welfare in the long run than well-regulated competitive markets. This is not intended as an ideological assertion but rather as a pragmatic observation which sees: “... *the primacy of the market neither as an ideal nor a necessary evil, but as the best pragmatic solution to a wide range of economic problems.*”
- 5.21 He notes that the traditional economic approach to public policy takes this observation as a starting point and asserts that government intervention in markets can be limited to situations where conventional competitive markets do not operate effectively.¹⁹³ In Optus’ view there is no evidence that the secondary market for spectrum access is no longer fit for purpose. Optus and other MNOs actively engage in the secondary market for spectrum, including via sharing, third party authorisations or trading. There is no market failure, or any other reason, to justify the imposition of alternative licence conditions, particularly given the disruptive and distortionary effects that would flow on from such intervention.
- 5.22 In this context, Optus are also concerned about the analytical rigour underpinning the ACMA’s exploration of “future arrangements that reduce barriers to new entry”, the impetus for which came from the ACCC’s submission to the ACMA’s Stage 1 ESL Consultation Paper, which was then referred to in the Final MPS Instrument as a matter to which the ACMA is to have regard in its ESL decision-making.¹⁹⁴

¹⁹¹ Consultation Paper, p.28

¹⁹² As required under section 152AL(3) of the CCA; see further ACCC; Public inquiry into the declaration of the domestic transmission capacity service and fixed line services; Final Report, March 2024; p.9

¹⁹³ Biggar, Dr Darryl; Public policy for regulators: Is “market failure” passe? Network; Issue 85 December 2022; p.1 accessible here: [Network \(acc.gov.au\)](https://www.accc.gov.au/network)

¹⁹⁴ Section 7; Final MPS Instrument 2024; 30 April 2024

- 5.23 Optus submits that the ACCC's statements cannot be interpreted as reflecting a formal view on the state of competition in the national mobile market and/or the need for regulatory intervention to change existing ESL arrangements. This and other statements that might suggest that market competition is softening¹⁹⁵ are not based on a formal assessment of the state of market competition.
- 5.24 As Optus has highlighted on numerous occasions and has been recognised again recently by the ACCC, Telstra's enduring competitive advantages in regional areas raise barriers to expansion for rival MNOs.¹⁹⁶ Rather than considering whether to facilitate new entry through changes to existing arrangements governing ESL, Optus suggest that the ACMA should focus on ensuring the sustainability of a three-player mobile market by offering to renew Optus ESLs.

Australia has globally competitive levels of mobile coverage

- 5.25 Intense infrastructure-based competition has resulted in population coverage that ranks among the highest in the world.¹⁹⁷ The market has delivered greater mobile coverage than in smaller jurisdictions that have imposed deployment obligations.
- 5.26 It is true that international experience, as highlighted in the examples set out in the Consultation paper, does show that deployment obligations can lead to beneficial extensions in coverage. However, it is notable that coverage in Australia, without the use of rollout conditions, exceeds coverage in many of the countries when obligation were imposed, which was often at initial allocation rather than renewal. For example, rollout obligations (NZ and Canada) were imposed at a time when (3G) coverage was limited and certainly much less than Australia's present population coverage of 98.5% for Optus 4G and 99.5% of population for Telstra 4G coverage.
- 5.27 For context, the Productivity Commission found that Australia performs comparatively well on coverage and while internet speeds (capacity) performance lags, this was mainly in fixed services rather than mobile, where Australia ranks 18th in the world.¹⁹⁸ For our part, Optus has rapidly deployed successive generation of mobile technology to compete with Telstra. Our 4G coverage exceeds our 3G coverage as set out below¹⁹⁹:

Figure 21 Optus' 4G Outdoor Geographic Coverage as a percentage of 3G Outdoor Geographic Coverage by ABS Remoteness Area

	2018	2019	2020	2021	2022	2023
Major Cities of Australia	100.6	99.2	99.4	n/a	n/a	102.7
Inner Regional Australia	91.4	83.8	85.2	n/a	n/a	107.4
Outer Regional Australia	82.7	70.8	72.0	n/a	n/a	114.7
Remote Australia	71.2	59.1	59.9	n/a	n/a	128.1
Very Remote Australia	62.0	54.7	48.2	n/a	n/a	142.3
Total	80.9	70.6	70.7	n/a	n/a	119.2

Source: ACCC

¹⁹⁵ ACCC Communications market report 2021-22, p.9

¹⁹⁶ ACCC, Regional Mobile Inquiry, Final Report, 30 June 2023, p.86-87

¹⁹⁷ [Australia's multibillion-dollar 5G opportunities | Austrade International](#)

¹⁹⁸ [Advancing Prosperity - 5-year Productivity Inquiry report - Productivity Commission \(pc.gov.au\)](#)

¹⁹⁹ ACCC, Regional Mobile Inquiry, Final Report, 30 June 2023, pp.86-87

- 5.28 We continue to deploy our 5G network to compete with Telstra. Our MOCN services agreement with TPG will allow Optus to deliver sustainable 5G infrastructure-based competition for the long-term benefit of regional Australia. Our future IMT satellite direct to mobile services offer the potential to deliver connectivity across the country. These commercial agreements were both facilitated by the flexibility afforded by existing arrangements governing ESL.
- 5.29 While Australia's unique geography and highly urbanised population make the investment case for regional and remote areas challenging, MNOs do not need rollout obligations imposed on renewed ESLs. Rollout obligations will not be as effective in achieving broader coverage or even technological upgrades to Australia's mobile networks than what is already achievable under existing arrangements. As we have highlighted in submissions to other Government consultation process, Optus encourage the Government to reform the many funding programs directed at delivering wider coverage or to mandate access to publicly funded infrastructure.

Implementation risks outweigh any public benefit

- 5.30 Alternative licence conditions run a high risk of failing to strike the right balance between efficient access and the promotion of network investment. It seems very unlikely to Optus that such conditions could be designed and implemented in a manner that will deliver more efficient outcomes than can and already are being delivered via the market. In Optus view, licensees remain best placed to:
- (a) assess the risk and manage the design and implementation of measures to mitigate the interference that will arise from increased sharing.
 - (b) respond to market demand and make financially sustainable investment decisions about network deployment.
- 5.31 Replacing market mechanisms with regulatory mechanisms places significant pressure on designing the framework correctly, raising the risk of regulatory failure in the form of higher costs, spectrum fragmentation and/or long-term underuse of spectrum. For example, we note that in 2021 OfCom rejected calls to include UIOLI conditions in 700MHz and 3.6-3.8GHz spectrum licences on the grounds that:
- (a) Such conditions are very difficult to make workable in practice because of the problem of defining what constitutes 'use' and therefore what the trigger for an enforced trade or revocation would be;
 - (b) There may be entirely legitimate reasons for spectrum remaining unused – the licensee may be holding back until it sees a suitable commercial opportunity or until the technology it wishes to use is ready; and
 - (c) Imposing such an obligation also has the potential to distort and/or chill the incentives to invest in the spectrum, and so reduce consumer benefits.²⁰⁰
- 5.32 We also note the relative success of OfCom's Shared Access Licences for 3.8-4.2GHz spectrum in meeting demand for private networks in the UK since 2019, compared to the uptake of its Local Area Licences, of which there are only 28 current licences, none of which are in low-band spectrum.²⁰¹ If not designed correctly, alternative licence conditions may have adverse flow on effects on innovation and investment, continuity of

²⁰⁰ [Statement: Award of the 700 MHz and 3.6-3.8 GHz spectrum bands \(ofcom.org.uk\)](https://www.ofcom.gov.uk/consult/condocs/700/700_statement.pdf); p.186

²⁰¹ [Local Access Licences Chart \(ofcom.org.uk\)](https://www.ofcom.gov.uk/consult/condocs/local-access-licences-chart/)

services, competition in the national mobile market and the overall financial health of a sector crucial to Australia's digital future.

Risks to innovation and investment

- 5.33 Optus note that certain overseas approaches that seek to accommodate a degree of flexibility as to how a condition may be met, though well intentioned, may also introduce uncertainty into the nature and scope of the compliance obligation.²⁰²
- 5.34 For example, UIOLI/UIOSI licence conditions will involve complex decisions about incumbent "use" and when an alternative use might be preferable – Optus submits this will inevitably lead to greater disputation and reductions in spectrum utility and efficiency.
- 5.35 Given this, and the distortionary effect such conditions may have on investment incentives,²⁰³ Optus consider that the introduction of alternative licence conditions in a mature market is an unnecessary and disproportionate response to any policy concern to be solved. Introducing uncertainty into licensees' access to national FDD spectrum risks undermining innovation, including in nascent IMT satellite DTM services.
- 5.36 Optus strongly objects to any proposal to vary any in-force spectrum licence, particularly without the agreement of a licensee.²⁰⁴ Changing the conditions upon which the licence was issued, particularly without agreement, sets a poor precedent for the ESL process and undermines investment.

Risk to sustainable competition in the national mobile market

- 5.37 Optus consider that alternative licence conditions will favour Telstra, as it has the widest geographic coverage and is "using" the most spectrum. Given this, the implementation of alternative licence conditions is likely to have anti-competitive effect, as Optus and TPG face a potentially disproportionate compliance burden.
- 5.38 Optus consider that UIOLI/UIOSI obligations are highly likely to harm the sustainability of competition in the national mobile market. Telstra's market power and relative financial strength mean that it can more readily absorb the costs of any regulated access (as opposed to commercially negotiated access). Given the extent of its coverage, it is also more likely that Telstra would be found to be "using" its spectrum, which means that it is less likely to have to "lose it" or "share it" than Optus.
- 5.39 Ultimately alternative licence conditions risk distorting the market in favour of Telstra and the marginal business cases of prospective licensees to the detriment of competing MNOs.

UIOLI/UIOSI conditions dilute spectrum licence rights

- 5.40 The rationale for alternative licence conditions is to address concerns about lack of use or "underuse" of spectrum under ESLs. As the ACMA recognises, there are legitimate reasons, from a network planning and deployment perspective, for spectrum to remain

²⁰² Walden, Ian et al; *Telecommunications Law and Regulation; Fifth Edition; Oxford; 2018*; p.235 citing the FCC requirement that carriers provide "substantial" service upon renewal – the service level is deliberately "unspecific" as it takes into account the nature and scope of communications services that have developed in the radio band – but as a result is also unclear.

²⁰³ For example, the FCC has noted that "keep-what-you-serve" and "use or offer" could create "an adverse incentive for licensees to serve the most desirable areas within the licence area and leave the rest unserved" Wireless License Renewal and Service Continuity Reform Second Report and Order and Further Notice of Proposed Rulemaking, WT Docket 10-112; 13 July 2017; p.41

²⁰⁴ Section 73 of the Act

unused.²⁰⁵ Given the underlying impetus is to promote spectrum sharing, UIOSI as well as UIOLI effectively raise the same technical interference concerns that we have raised elsewhere in this submission about possible re-allocation or new techniques of sharing to manage interference. Any notion that “opportunistic access” via a UIOSI regime can be implemented without “risking harmful interference or undermining the deployment plans of primary licensees” should be treated with a high degree of caution.²⁰⁶

- 5.41 In our view, the major issue with UIOSI or UIOLI provisions is that they logically degenerate into retrospectively applied spectrum licence boundaries for incumbent licensees. The first step is to determine use and how that can be measured. If such a lack of use is demonstrated and accepted by the ACMA, the next issue is to determine how “sharing” is defined and implemented. As shown in Section 2 and Section 3, the MNOs currently successfully operate in an environment where traditional sharing methods are applied.
- 5.42 Once the ACMA has determined that spectrum is unused, the areas of the spectrum to be released for other users will need to be determined. This is an activity fraught with potential issues and unintended consequence. As demonstrated in Section 7, the introduction of these boundaries will lead to dead zones where co-channel interference between licensees will result in a lower utility and less efficient use of the spectrum. Even if genuine use or future need can be properly evaluated, the ACMA must also consider the costs “UIOLI/UIOSI” conditions can impose.
- 5.43 Optus therefore strongly opposes the introduction of UIOLI or UIOSI provisions in any ESLs as they represent the gateway to the application of retrospective spectrum licence boundaries, with their incumbent inefficiencies for spectrum use and potential to cause harmful interference into established networks, undermining the public benefit derived from them.
- 5.44 To highlight the need for caution, we note that the restrictions in the Act on the ACMA issuing overlapping licences are there for good reason. While the limitations on new licences within existing spectrum licence space do mean that the services that can be so licensed are very limited,²⁰⁷ they are specifically “designed to provide certainty and protection to incumbent spectrum licensees”.²⁰⁸
- 5.45 As the ACMA notes, “alternative licence conditions would represent a substantial regulatory intervention” into the market.²⁰⁹ In Optus’ view, requiring a licensee to authorise access involves an unprecedented degree of regulatory intervention into a spectrum licence holder’s use of spectrum, thereby severely diluting the utility of spectrum licences as a means of promoting long term network investment.

Compliance and enforcement

- 5.46 From a practical perspective it also introduces a high degree of complexity in implementation, particularly with respect to the (lack of) “use” threshold that might trigger the obligation as well as any process used to assess third party proposals. The ACMA has not specifically considered how compliance with new conditions might be assessed

²⁰⁵ Consultation paper, p.27; as the ACMA acknowledges “there may be reasons for a licensee not to use, or only lightly use, their spectrum at a given time, such as acquiring spectrum for future capacity or deployment, or to lower interference management costs. Spectrum utilisation can also be sporadic, responding to dynamic demand”

²⁰⁶ Calabrese; Michael A; Open Technology Institute at New America; 48th Research Conference on Communication Information and Internet Policy; TPRC48; February 17-19, 2021

²⁰⁷ Consultation paper, p.33

²⁰⁸ Item 38 and 80 of the Explanatory Memorandum to the Modernisation Bill; p.32

²⁰⁹ Consultation Paper, p.28

– however, in Optus view this is a threshold question as to whether or not such conditions would be effective. Given that an area that may be the focus of such a condition is likely to be “harder to serve”, it is too simplistic to assume that a condition will result in either an existing licensee expanding their current deployment or an area being “served by another entity planning to provide new or improved services”.²¹⁰

- 5.47 Enforcement of UIOSI/UIOLI will ultimately result in carveouts to spectrum licences, which will in fact undermine the efficiency objectives they were intended to promote. The threat of enforcement risks incentivising inefficient investment by incumbents in an effort to demonstrate use. Such consequences are particularly concerning given the absence of any rigorous analysis of the problem to be addressed.
- 5.48 Optus strongly objects to any application of UIOLI that would involve a comparison of the suitability of a new entrant’s service to meet the needs of a niche downstream use case, against the service offering of an incumbent licensee if the incumbent is making that service available. Optus notes that such an assessment would risk failing to properly take into account the interference risks, including costs to manage such risk, created to the surrounding public mobile network.

Other approaches to supporting efficient use and network deployment

- 5.49 As the ACMA has noted, there are other barriers to the delivery of stated policy objectives, including “infrastructure deployment, financial incentives and land planning issues”.²¹¹ A number of these issues have been canvassed in the inquiries that have been undertaken recently by the ACCC and the Standing Committee regarding regional connectivity.²¹²
- 5.50 Rather than risk the market distortions and harmful interference that would flow from alternative licence conditions, Optus urge the ACMA and the Government to consider other approaches to promoting efficient and deployment objectives.
- 5.51 In regard to efficiency objectives, Optus advocate for optimisation of technical frameworks and defragmentation of spectrum holdings as important steps to maximising market outcomes. Where spectrum is substitutable, such as mid-band FDD, Optus encourages the ACMA to consider how it may design spectrum products in a manner that is most conducive to trade. This includes seeking to align licence duration, geographic areas and to the greatest extent practicable, non-core conditions or external policies that may affect licence use.
- 5.52 In regard to deployment, the most effective mechanism to deliver infrastructure to “non-commercial areas” will be direct Government subsidy or co-funding schemes. In particular, Optus reiterate calls for reform to the Governments Mobile Blackspots program and Regional Connectivity Plan to ensure a level playing field in access to Government blackspot funding. Optus also supports the ongoing consideration of reform to State and Territory planning laws and urges the Government to set out a plan to abolish the USO and redirect the funding to support the uptake of new LEOSat solutions, such as Optus DTM service, to be deliver connectivity outside the terrestrial mobile footprint.

²¹⁰ Government of Canada, [Decision on New Access Licensing Framework, Changes to Subordinate Licensing and White Space to Support Rural and Remote Deployment \(canada.ca\)](#), January 2024, para 29

²¹¹ Consultation paper, p.34

²¹² ACCC, Regional Mobile Infrastructure Inquiry, Final Report, 30 June 2024 and Connecting the country: Mission critical – Inquiry into co-investment in multi-carrier regional mobile infrastructure; House of Representatives, Standing Committee on Communications and the Arts; November 2023

Section 6. EXAMINATION OF USE SHOULD REFLECT THE REALITY OF NETWORK DEPLOYMENT

- Coverage maps and RFNSA data are sufficient to establish “use of spectrum” for the purposes of the ESL process.
- To granular an approach to examining use will not reflect the realities of network deployment decision-making and may constitute an unjustifiable retrospective application of a condition on our use of ESL spectrum.

- 6.1 In addition to the ACMA’s request for information on current and planned use, the ACMA is also seeking feedback from stakeholders on approaches to examining use under existing spectrum licences.²¹³
- 6.2 Optus raised a number of concerns about the general approaches to examining spectrum use set out in the ACMA’s “Stage 1” consultation paper.²¹⁴ Optus cautioned that too granular an assessment runs the risk of being meaningless given national network deployment considerations. We recommended that levels of previous and planned investment be given considerable weight in decision making and suggested that the ACMA have recourse to existing information to reduce administrative burden.
- 6.3 The ACMA has provided a general outline of how it intends to examine use of spectrum for the purpose of assessing the public interest in its “Finalised framework and response to submissions document” issued in December 2023 as well as this Consultation Paper.²¹⁵ Optus welcomes the ACMA’s confirmation that it intends to examine use based largely on publicly available information – including the coverage maps that Optus and other MNOs are required to supply to the ACCC under its Infrastructure RKR. However, we note that the ACMA has also identified a number of perceived deficiencies which “limit the extent to which coverage maps alone may inform the design of potential changes to licence conditions, such as licence boundaries”.²¹⁶
- 6.4 The ACMA’s approach to examining use of spectrum under ESLs is important to the ACMA’s view on whether or not existing arrangements for ESL spectrum are fit for purpose or whether changes are needed to support alternative uses of ESL spectrum. The ACMA’s approach will form the basis for its decision on whether to renew, partially renew or refuse to renew an ESL. Accordingly, we have prepared this section of our submission to respond directly to the ACMA’s request for feedback and to assist with the ACMA’s assessment. We provide further explanation as to the utility of coverage maps used in combination with RFNSA data to establish use. We also provide a brief explanation of how spectrum is used by MNOs in deployment decision-making with a

²¹³ Consultation Paper, p.3

²¹⁴ ACMA, Stage 1 Consultation Paper, p.28

²¹⁵ See pages 9 and 37 of Finalised framework document and

²¹⁶ Consultation Paper, p.17; in summary the ACMA states that coverage maps (a) are modelled on “predicted coverage” rather than a representation of “actual coverage” (b) “do not directly indicate spectrum utilisation or interference potential considerations” (c) “based on a variety of inputs that may vary between operators and years, limiting direct comparison” (d) “Do not indicate total bandwidth used but do generally indicate which frequency bands have been used” (e) “Do not generally indicate where coverage is planned, or where there may be difficulties providing coverage”

view to helping ensure that the ACMA's approach to examining use reflects the operational realities of network deployment.

Coverage maps and RFNSA data sufficiently establish historical and current use

- 6.5 Optus uses all its ESLs to supply more than 9 million mobile services over our 3G, 4G and 5G mobile networks. Optus 3G services are currently supplied via our 900MHz apparatus licences, which will convert to spectrum licensing from 1 July 2024. When Optus shuts down its 3G network, our 900MHz spectrum will be “re-farmed” to supply 5G services.
- 6.6 We have provided the ACMA with access to our coverage maps and access to the detailed site registration information contained on the Radiofrequency National Site Archive (RFNSA) in response to the ACMA's information request. The RFNSA provides more detail on our spectrum use than the ACMA's Register of Radiocommunications Licences (RRL). The RFNSA shows where a base station has been deployed and activated. In other words, where the spectrum is being used to make mobile services available to Optus customers. The RFNSA also provides detail on the progress of base station deployment over time.
- 6.7 In Optus view, the RFNSA is more indicative of the actual state of deployment as the RRL does not demonstrate where an operator may have attempted to deploy but been delayed. There may be various reasons for delays to deployment, including land access, planning and approval delays, community opposition to a site and the need to connect a site to power and backhaul.²¹⁷ By depicting sites that are “in-flight”, the RFNSA more accurately represents an operator's near-term deployment plans and therefore spectrum use.

Optus response to ACMA's comments on use of coverage maps

- 6.8 The ACMA has also made a number of comments on how it will use coverage maps for the purposes of examining use of spectrum. For example, the ACMA states that
- “we will use (coverage maps) as one input into forming preliminary views about the overall use of spectrum licensed bands, and the public benefit derived from the use of the spectrum. We will use coverage maps to examine the uses to which overall spectrum holdings have been put, and the geographic areas where services have been indicated as available to the public in considering the public interest derived from that spectrum”.²¹⁸
- 6.9 While we agree that coverage maps should not be solely relied upon to determine spectrum usage, we consider that RFNSA data, in combination with coverage maps, provide “evidence of strong support for a particular use or uses of a band” in an area and should be sufficient to demonstrate current use of ESL spectrum. The ACMA has also identified a number of perceived deficiencies with coverage maps as a tool for assessing spectrum use – Optus responds to each below:
- (a) maps are modelled on “predicted coverage” rather than a representation of “actual coverage” –
- Optus agrees with this statement. However, we submit that it is the same for all coverage maps. Measurements of “actual coverage” are unreliable due to

²¹⁷ See Chapter 4 of ACCC Regional Mobile Infrastructure Inquiry; Chapter 4

²¹⁸ Consultation Paper, p.14

the statistical significance of the samples collected and the methods by which the collected data is managed.

For instance, drive data is a snapshot in time. The performance of a network changes depending on the traffic load. Serving cells may alter due to localised network outages or signal strengths may be reduced due to near fields blocking (for example, a large truck blocking the signal from the mobile cell site and drive test car).

Crowd sourcing data also has issues as there is no information on where the test samples are taken from. For example, the signal strength vary significantly depending on whether the handset is located outside or inside a building. It will also vary depending on the performance of the handset. Similarly, it is not possible to collect coverage measurement data over the entire extent of any mobile network.

Any measurement of “actual coverage” represents only a snapshot in time and cannot necessarily be relied upon to represent coverage into the future, especially in areas of development or subject to seasonal change.

Propagation models and their underlying mapping and terrain data are extensively used and represent the best manifestation of coverage provided by mobile networks, given the differences and limitations presented by end user equipment, environment and other variables that are beyond the control of the spectrum licensees.

- (b) maps “do not directly indicate spectrum utilisation or interference potential considerations”

As set out above, Optus consider that the data sought can be sufficiently gathered from the RFNSA and/or the ACMA RRL, in combination with coverage maps, to indicate whether or not spectrum is used or intended to be used. We note that the interference potential question is dealt with under s145 of the Act, using the Device Boundary Criteria (DBC).

- (c) maps are “based on a variety of inputs that may vary between operators and years, limiting direct comparison”

There are some differences between the way that MNOs predict and present their coverage maps. The underlying terrain and clutter data will vary between all parties predicting coverage according to the source and currency of the data used. These data sets are expensive to purchase and keep up to date due to ever-changing clutter and landscape as determined by changes to land use and urban expansion.

All MNOs strive to produce maps that are as accurate and reliable as possible so as to manage customer expectations and provide service where it is claimed to be available. Comparisons between coverage maps on a large scale are generally reasonable and indicative of the coverage landscape. However, comparing on very small scales (pixel-by-pixel) will yield unreliable, wildly variable and ultimately inaccurate results for whose network coverage is “best”.

- (d) Do not indicate total bandwidth used but do generally indicate which frequency bands have been used

Where a band is deployed it is typically deployed in full, according to the technology in use and supported channel bandwidths. This information will not be included in any coverage map, but the configuration of the spectrum and

bandwidth is an input into the coverage predictions. This changes the power spectral density (PSD), which, in turn influences coverage. It is not possible to determine how much spectrum has been deployed in a specific band from the extent of the coverage provided by that band.

- (e) Do not generally indicate where coverage is planned, or where there may be difficulties providing coverage

Optus agree and this is why an examination of “use” should involve reviewing coverage information as well as the detailed site related information on the RFNSA and ACMA RRL. These data supplement and complement each other to provide a more complete picture of where spectrum is, and is intended to be, deployed.

MNOs need flexibility and certainty of spectrum access to deploy national networks

- 6.10 The ACMA has also indicated that it intends to “examine information about how incumbents are using their spectrum in certain geographic areas”.²¹⁹ In other words, the ACMA appears to be considering a localised examination of use of spectrum under existing licences. Optus notes that this is a significant departure from the previous renewals process under which licensees were only required to demonstrate use of the licence itself. We also consider that too granular an examination of use may constitute an unreasonable retrospective application of a new condition on our use of ESL spectrum, after licence issuance (see further discussion under Section 3)
- 6.11 Existing ESL arrangements provide spectrum licensees with the flexibility of use and certainty of access that underpin the billions of dollars of investment required to deploy networks that will deliver Australia’s Digital Future. Optus strongly caution against an approach that does not take into consideration the realities of how spectrum is used in network deployment decision-making and the supply of national public mobile services.
- 6.12 For example, a lack of uptake or evidence of “usage data” in a particular area should not determine that the spectrum is not being used, or certainly that it will not be used in the future, by an ESL holder. Such an approach fails to reflect the dynamic nature of mobile usage by end-users and the importance of “unused” spectrum to the cost-effective deployment of network infrastructure. We encourage the ACMA to adopt an approach to examining spectrum use that reflects the realities of mobile network deployment.
- 6.13 The availability of the network in a particular area is crucial to customer experience. Too granular an assessment of usage data will not give a fair indication of “use” of spectrum given that there may be areas where consumers simply do not take up a service. If consumers choose not to use our network in certain areas this says nothing about potential future usage. Ultimately changes in usage data inform investment decision-making – where it is evident that there is sustained increased use in an area, then a decision to upgrade or build out the network may follow.
- 6.14 To further illustrate how spectrum may be used in network decision-making, we note that the different propagation characteristics and the amount of bandwidth available at a particular frequency will influence how an MNO chooses to deploy their network.²²⁰ It will

²¹⁹ ACMA, Expiring spectrum licences; Finalised framework and response to submissions; December 2023, p.9

²²⁰ For example, “low-band” (sub-1GHz bands) can carry signals over long distances making it useful for providing a “coverage” layer, particularly in sparsely populated regional areas; (a) “mid-band” (spectrum 1 to 6GHz) does not carry signals as far as low-band, but because there is more spectrum made available, the wider bandwidths enable a higher capacity and “capability” service (i.e., a “capacity layer”) and “high

also impact the variability in capacity and speed that customers experience the areas serviced by those sites. However, the deployment layering strategy for low, mid and high band spectrum is highly differentiated. Low band spectrum (700/850/850e/900) provides a coverage layer and tends to be deployed ubiquitously and this can also apply for mid band spectrum when there is no low band coverage layer e.g., Optus deployed 1800MHz as the coverage layer for 4G prior to the deployment of 700MHz and 3.4GHz.

A lack of site or mobile coverage data is not determinative of a lack of use

6.15 Optus supports the ACMA's comments:

"There is a general assumption that unutilised or underutilised spectrum does not result in an output or benefit to the public and is, therefore, an inefficient use or allocation of the spectrum. There can be productive, allocative and dynamic dimensions to this perceived inefficiency, such as when a licensee is acquiring spectrum for future capacity or deployment, or to lower interference management costs. We also note that spectrum utilisation can be sporadic, responding to dynamic demand, and that efficient uses of certain spectrum may not exist at a given time."²²¹

6.16 Our submission to the ACMA's Stage 1 Consultation paper explains that the mobile operator's role is to provide the mobile network where customers need it and the customers choose to use the available network in a particular location (registering usage on a particular site deployed) or in the future. With the key issue being that the site is available for customers to use if they choose to. Ultimately usage on a particular site is dependent on customers and is not under the control of the MNO. Mobile operators deploy their expensive spectrum assets in line with their customers' needs and their network deployment strategy to provide capacity and coverage to their customers unless there are regulations that prevent them from doing so (e.g., reallocation periods, interference issues).²²²

6.17 An absence of current use (whether by geography or bandwidth) cannot be taken as an absence of need to access spectrum in the future. Adequately capturing plans for use will be critical in determining spectrum utilisation and the ACMA should consider appropriate means for determining this. Optus strongly endorses the ACMA's comment that:

"holding unused spectrum can also potentially provide licensees utility by providing greater flexibility to deploy or adjust services on a needs basis in the future, particularly in bands where significant new releases of spectrum are not expected over the term of a licence. In such cases, the length of time that the spectrum has not been used, or underused, would need to be considered in connection with technology and investment cycles, and anticipated future use of the spectrum".²²³

6.18 An example of where erroneous conclusions for spectrum utilisation may be drawn would be for the 3.6GHz band, where an excessively long reallocation period of 7 years for incumbent WISPs has hamstrung Optus' ability to deploy in some regional towns. Similarly, a slowly developing network or device ecosystem may stymie a licensee's

band" (spectrum bands above 13GHz, e.g., mmWave) – does not travel as far as "mid-band" spectrum but has more capacity and can deliver faster speeds due to the very high bandwidths available

²²¹ Consultation Paper, p.27

²²² Optus submission to Stage 1 consultation paper; p.45

²²³ ACMA Stage 1 Consultation Paper, p.20

desire to utilise spectrum efficiently or in a manner it desires, for example the lack of available iPhone mmWave devices currently available.

- 6.19 A lack of site or coverage data is not determinative that spectrum is not or will not be used. Optus should not be required to provide usage data as it will not give a fair indication of “use” of spectrum given that there may simply be areas where consumers simply do not take up a service.

Optus is using our ESL spectrum for critical network infrastructure and essential services

- 6.20 In addition to the coverage maps and RFNSA data that Optus has provided to the ACMA, we note that there is significant other publicly available information to inform the ACMA’s assessment of use. For example, the following tables from the ACCC’s Mobile Infrastructure Report 2023, which are based on the data collected from MNOs via the annual Infrastructure RKR, demonstrate at a high level that Optus is using all its ESLs to supply 4G and 5G public mobile services.²²⁴

Figure 22 Number of 4G and 5G sites deployed by MNOs to 2023

Table 3.10: Total number of 4G sites by MNO & radiofrequency spectrum deployed – 2018 to 2023

	2018	2019	2020	2021	2022	2023
Optus						
700 MHz	5,590	6,271	6,639	6,895	7,196	7,425
900 MHz	33	36	40	542	1,531	533
1800 MHz	4,519	5,340	5,751	6,140	6,522	6,786
2100 MHz	1,053	3,014	3,486	4,037	4,656	5,154
2300 MHz	2,984	3,253	3,426	3,575	3,701	3,768
2600 MHz	2,235	2,795	3,139	3,489	4,093	4,745
3500 MHz	-	-	-	1	-	-

Table 3.11: Total number of 5G sites by MNO & radiofrequency spectrum deployed – 2020 to 2023

	2020	2021	2022	2023
Optus				
900 MHz	-	-	-	982
2100 MHz	-	208	956	2,579
2300 MHz	-	291	988	1,677
3500 MHz	426	1,006	1,596	2,225
26000 MHz		4	25	72

Source: ACCC

²²⁴ ACCC, Mobile Infrastructure Report 2023; November 2023; p.21-22

Section 7. CASE STUDIES ON THE IMPLICATIONS OF CHANGING EXISTING LICENCE BOUNDARIES

- 7.1 Optus has prepared a number of case studies to highlight the consequences of creating new licence boundaries that would result from the potential new entry into existing ESL spectrum space contemplated in the ACMA's Consultation Paper. Cross-references to these case studies are included throughout the submission.
- 7.2 In summary, new boundaries lead to a greater need to manage interference risk, which in turn leads to more "dead zones" or wasted spectrum. Such inefficient spectrum outcomes are the opposite of what the ACMA is tasked with giving effect to under the Act and ostensibly seeking to deliver via the ESL Process.
- 7.3 At any co-channel spectrum boundary, under the existing spectrum licence technical frameworks, the licensees are required to comply with the device boundary criterion set out in Section 145 of the Act. This is to ensure that the licensees are afforded the necessary protections to operate their network without harmful interference from their geographical neighbours. Previous decisions regarding the proposed and implemented boundaries in at least two bands should be at the forefront of the ACMA's thinking when deciding whether this course of action should be considered for any of the ESLs.
- 7.4 As previously described, the adoption of any UIOLI or UIOSI would represent an inevitable slide into a scenario where retrospective spectrum licence boundaries will need to be introduced in order to realise any purported benefits. Optus argues that this would, for all case studies, represent a reduction in the utility and efficiency of use for the spectrum.
- 7.5 Furthermore, as shown in the case studies below, the introduction of retrospective boundaries will have the effect of undermining relevant policy objectives, including those set out under the final MPS Instrument.²²⁵

²²⁵ Radiocommunications (Ministerial Policy Statement – Expiring Spectrum Licences) Instrument 2024

Figure 23 Scenarios Leading to Spectrum Licence Boundary Changes and Policy Failure

Case Study	Policy objectives not met
Pilbara	<ul style="list-style-type: none"> • Sustained investment and innovation • New use cases incl. LEOsat • Regional connectivity and investment • Promoting competition
The Interference Impact of Introducing Spectrum Boundaries for 850/900MHz Bands	<ul style="list-style-type: none"> • Service continuity • Regional connectivity and investment • Promoting competition
The Effect of Incumbents on 3.6GHz Spectrum Licensees	<ul style="list-style-type: none"> • Regional connectivity and investment • Promoting competition • Sustained investment and innovation
Prospective Licensees too close to MNO public network boundary	<ul style="list-style-type: none"> • Service continuity • New use cases incl. LEOsat • Regional connectivity and investment • Promoting competition
Space X and Direct to Mobile Services	<ul style="list-style-type: none"> • New use cases incl. LEOsat • Regional connectivity and investment • Promoting competition • Sustained investment and innovation
Urban Excision	Cautionary – efficiency, utility and public benefit reductions
The Negative Effects of Retrospectively Introduced Spectrum Licence Boundaries	Cautionary – efficiency, utility and public benefit reductions

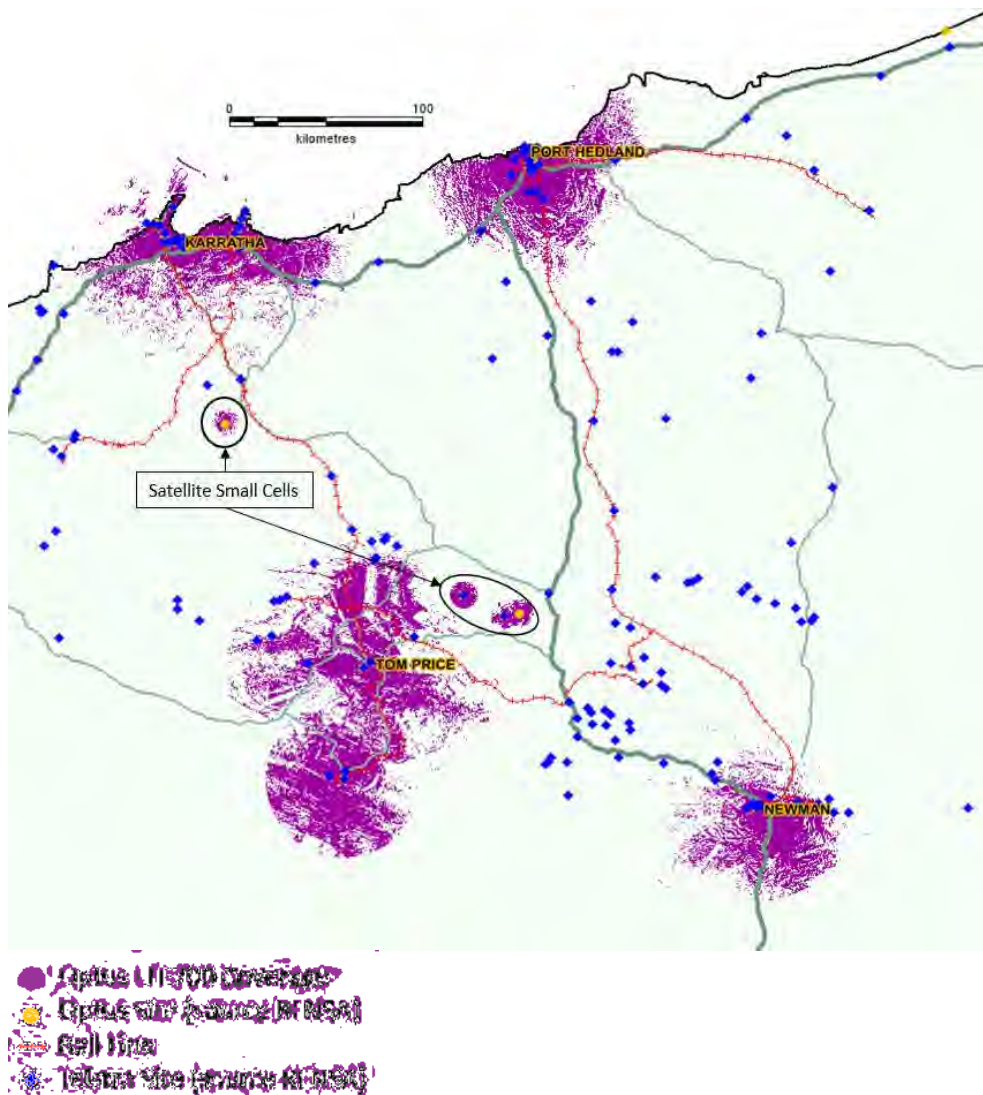
Source: Optus

CASE STUDY: Pilbara

Spectrum licences facilitate competition, innovation and allow, under the right commercial terms, for the provision of services into under- and un-served areas

- 7.6 The Pilbara region in WA is often presented as an example of an area that is underserved or unserved in terms of mobile coverage. The region has low population, and its remote location makes the delivery of services both difficult and costly.
- 7.7 Optus has invested in network infrastructure in the towns in this region, namely Port Hedland, Karratha, Tom Price and Newman. Currently, there are Optus coverage gaps along the main roads and in areas outside the towns. This is illustrated in Figure 24:

Figure 24 Map of Pilbara WA showing Optus sites and low band coverage and Telstra sites



Source: Optus analysis

- 7.8 Port Hedland has a population 4,081 (source ABS 2021). Optus has limited market share in this region. Most of the Optus traffic is from tourism and FIFO workers in the mining industry. To support these customers Optus has deployed 5 macro sites in Port Hedland to deliver coverage, capacity and capability.

Competition with Telstra

- 7.9 Telstra has market dominance in this area and this has enabled them to expand their network. This can be seen by the significantly greater number of Telstra sites in the region, particularly outside of the towns. Further investment by Optus is very difficult to justify due to the low population and high deployment costs. Further investment would be driven by Optus customers who would expect similar performance in this area to that of the metropolitan areas.

Innovation – Satellite Small Cells

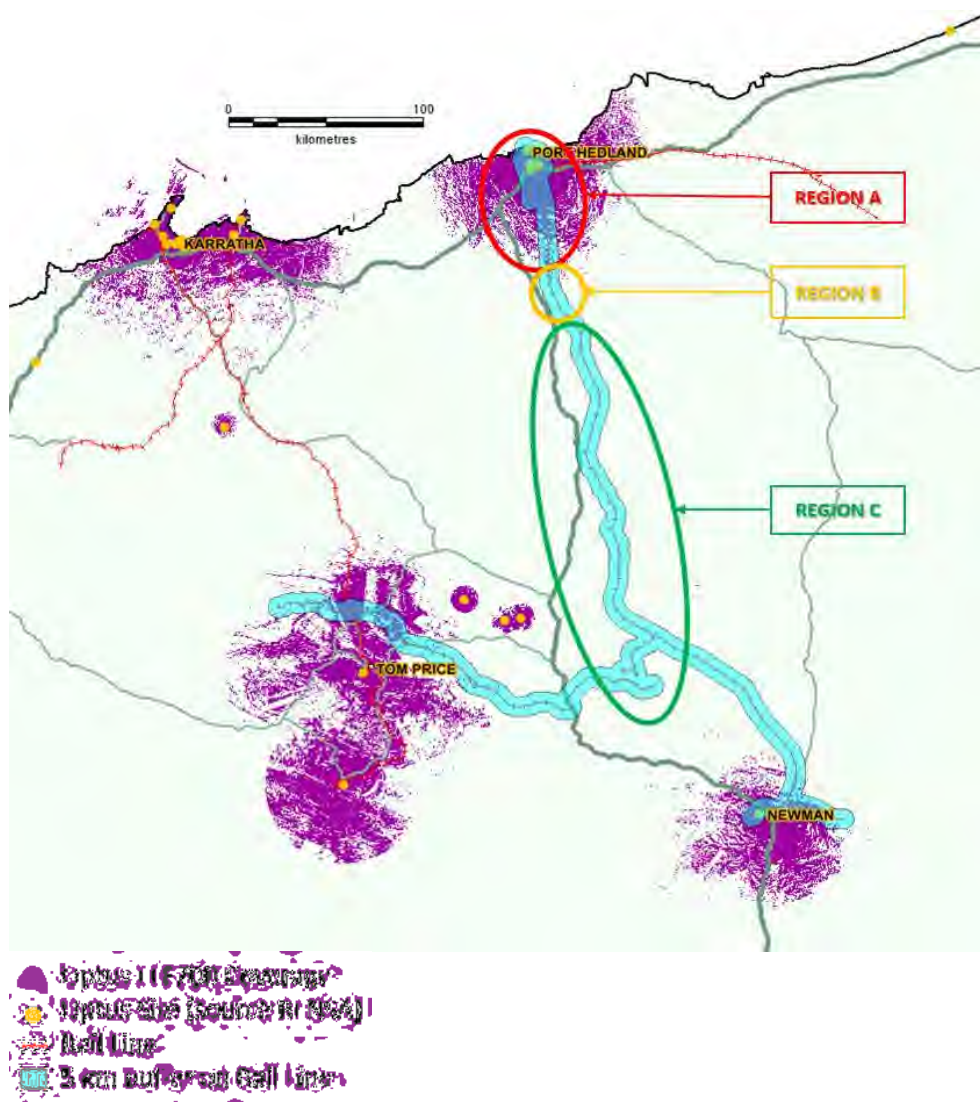
- 7.10 Optus has deployed 4 satellite small cells in the Pilbara region, Millstream Homestead, Karijini Eco Resort, Karijini Visitor Centre and Karijini Campground. Small cells are small units which provide the potential for an inexpensive and flexible alternative to traditional mobile towers, and when used in conjunction with satellite connectivity and backhaul, provides the combined benefits of expanding mobile broadband coverage in a concentrated local area in rural, remote and previously unserved locations.
- 7.11 The small cells boost mobile coverage for locals and travellers and can deliver mobile phone coverage up to a 3 kilometre radius depending on the spectrum bands deployed and the surrounding topography.
- 7.12 As Optus is well established as a provider of satellite networking technology and as a terrestrial network provider we were able to develop and implement this innovative solution which improves customer experience. Optus began deployment of these site types in 2017 and these have been successful in providing mobile and satellite solutions for our customers across the country.
- 7.13 Optus deployed 3G services on these satellite small cells in March and April 2018 and upgraded the Karijini sites to 4G late 2019. Telstra deployed similar satellite services in the Karijini area in 2022²²⁶. This is another example of Optus driving innovation and competition into the market.

Private Network Options – Dedicated Spectrum

- 7.14 There is known demand for low band spectrum using MNO national ESL spectrum , particularly from the mining industry in this area. The mining companies operating in the Pilbara have claimed a need to deploy low band on private LTE networks to enable automated train operations. This could result in spectrum being unavailable for public mobile networks. However, mid band spectrum, particularly 1800MHz and 3.8GHz is also a viable option which can also meet these needs.
- 7.15 Exclusive access to low band spectrum is claimed to be the most cost-effective solution due to the propagation characteristics and their need to cover the hundreds of kilometres of track. A demand for exclusive access to 2 x 10MHz is typical for these types of use cases.

²²⁶ Source: RFNSA Database

Figure 25 Map of Pilbara WA showing Optus sites and low band coverage in Rail Line Regions



Source: Optus analysis

- 7.16 Figure 25 illustrates the likely coverage requirement on a rail line from the Pilbara into Port Hedland. There are 3 key scenarios for network consideration assuming 2 x 10MHz of Optus 700MHz spectrum is used.
- 7.17 Region A is the area in and around Port Hedland where Optus has existing low band coverage providing LTE using the 2 x 10MHz of Optus' 700MHz spectrum. In this example the removal of the entirety of Optus' 700MHz spectrum from the public mobile network in these areas, in preference for a private mobile network will directly and negatively impact existing Optus customers.
- 7.18 Region B is a buffer zone. Co-channel Interference between the Optus network and private LTE network will make the entire Optus 700MHz Band unusable for both Optus and a private LTE network in this area. A very conservative estimate of the range of the buffer zone area (i.e. from the edge of the Optus 700MHz network to the edge of the private network) is ~50km but this could be larger depending on the site configuration. Carving out low band spectrum and introducing new spectrum boundaries results in large areas where no services are available for Optus customers.

- 7.19 A private co-channel network in Region C is unlikely to have impact on the current Optus network. However, there are significant drawbacks with this approach including:
- (a) No public benefit for customers.
 - (b) No ability to make emergency calls.
 - (c) No competition to Telstra.
- 7.20 In this scenario, a request for exclusive 2 x 10MHz of Optus 700MHz Spectrum would generally fail due to the negative impact on the Optus existing network (Region A).

Hybrid Solution

- 7.21 In any commercial request for spectrum, Optus requires that there be no significant negative impact to the Optus public network.
- 7.22 Optus Enterprise Business has a hybrid solution product available, which offers pre-determined dedicated 5G resourcing for a private network, operating alongside the Optus public network. The hybrid model allows for both private and public radio networks to co-exist using the same spectrum. This solution does not require spectrum coordination and so delivers capacity to both public and private networks simultaneously. Further enhancements will be available via network slicing which is planned FY26.
- 7.23 Hybrid networks and network slicing solve the co-existence issue in Regions A and B in Figure 25. These solutions have the ability to deliver on both the MPS objectives, connectivity in regional and remote areas along with facilitating opportunity for new use cases.
- 7.24 To date, private network suppliers have rejected this solution as they seek spectrum which they wish to operate exclusively on their own network.
- 7.25 Where it is demonstrated that a request for access to spectrum may cause harmful interference to our public network, Optus will place priority on maintaining and expanding our public consumer network to benefit Australian end users (consumers, small/medium businesses, wholesale and enterprise customers), rather than diverting spectrum and impacting the coverage and capacity of the existing network to support private use cases.

Conclusion

- 7.26 Small mobile private networks that are allocated dedicated spectrum have a disproportionately detrimental effect on MNOs and at-scale services. This has the effect of denying access to spectrum, reducing spectrum and spectral efficiency and harming customer experience on the public network. This, in turn, has the effect of eroding the public benefit that can be derived from that spectrum.
- 7.27 Private network suppliers' objectives can be best delivered by the existing licences as a partnership between the MNO and corporates rather than between the MNO and a private network supplier.
- 7.28 In order to facilitate this, the existing licences need to be offered for renewal without alteration.

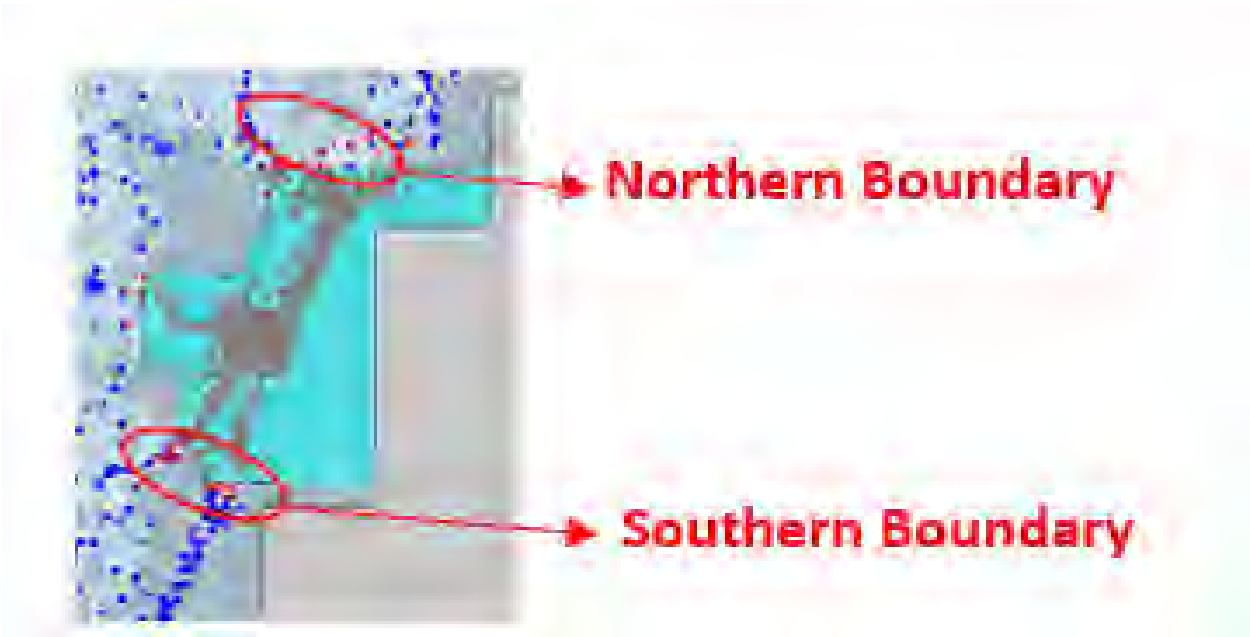
CASE STUDY: The Interference Impact of Introducing Spectrum Boundaries for 850/900MHz Bands

- 7.29 This case study presents the impact analysis performed by Optus in its response submission to ACMA Tune Up on “850/900MHz Product Configuration” in June 2021, whereby ACMA was considering adopting new Metro and Regional licenses for both 900MHz and 850MHz lots for the December 2021 auction.
- 7.30 This case study demonstrates that, introducing new spectrum boundaries over an existing network will create large areas of unusable spectrum. This inability to deliver services undermines the Government policy objective of promoting regional connectivity.

Sydney Metro/Regional Example showing Impact of Existing Boundaries

- 7.31 There is currently an existing low-band spectrum boundary in the 850 MHz Band between Telstra in regional and TPG in metro. The boundary was in place prior to site deployments and therefore site designs can be optimised in order to meet the coordination requirements. The importance of delivering low-band services means that MNOs will endeavour to deploy this technology on all sites.
- 7.32 Figure 26 shows the 850 MHz band Sydney metro/regional licence boundary. Telstra registered 850MHz sites are displayed where blue are 15MHz BW, regional, red 10MHz BW regional and grey 10MHz BW Metro. The sites in red are the sites which could not be registered for the full 15MHz allocation and this represents the area where the 5MHz of co-channel 850MHz is not utilised.

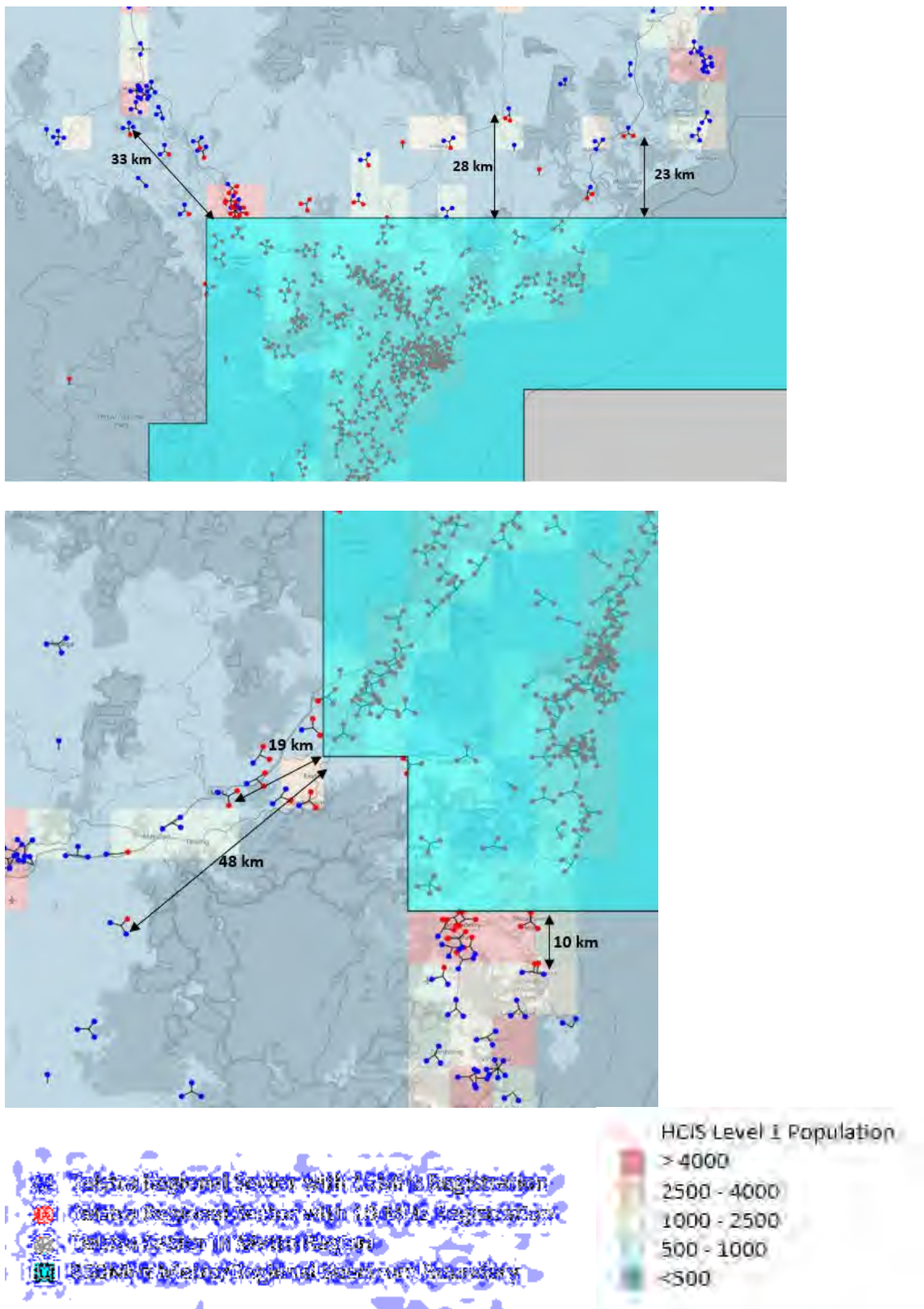
Figure 26 Telstra sites around 850MHz Sydney Spectrum Boundary



Source: ACMA RRL Database, Optus analysis

- 7.33 The northern and southern boundaries are analysed in more detail below.

Figure 27 Telstra site configurations in detail around 850MHz Sydney North and South Spectrum Boundary



Source: Optus analysis

- 7.34 Figure 27 highlight the sectors (red in the regional areas) that are unable to utilise the full spectrum available in order to manage interference across the licence boundary. The distances from the boundary impacted sites also vary due to different site configurations and terrain profiles.

- 7.35 Importantly, these maps demonstrate that boundaries can impact the deployment of 850MHz services up to 30-50 km outside the metro boundaries. It follows that the more 'regional' the area, the larger the area which is compromised. The same effects will be observed in the 900MHz band if sub-national spectrum boundaries are introduced.
- 7.36 Optus also notes that similar impacts will occur in the reverse direction. However, in metro environments, sites can be deployed closer to boundaries due to the smaller site spacing requiring lower site heights. The Sydney-Wollongong boundary is an example of this more metro environment where sites are impacted up to 10 km from the boundary.

Introducing Boundaries has Significant Negative Impact on Regional Coverage

- 7.37 The ACMA proposed 2 scenarios which would introduce new boundaries on the national 900MHz network. For simplicity, Scenario B which is a combination of existing 850MHz Boundaries with a new Metro/Regional split, will be presented in this case study.

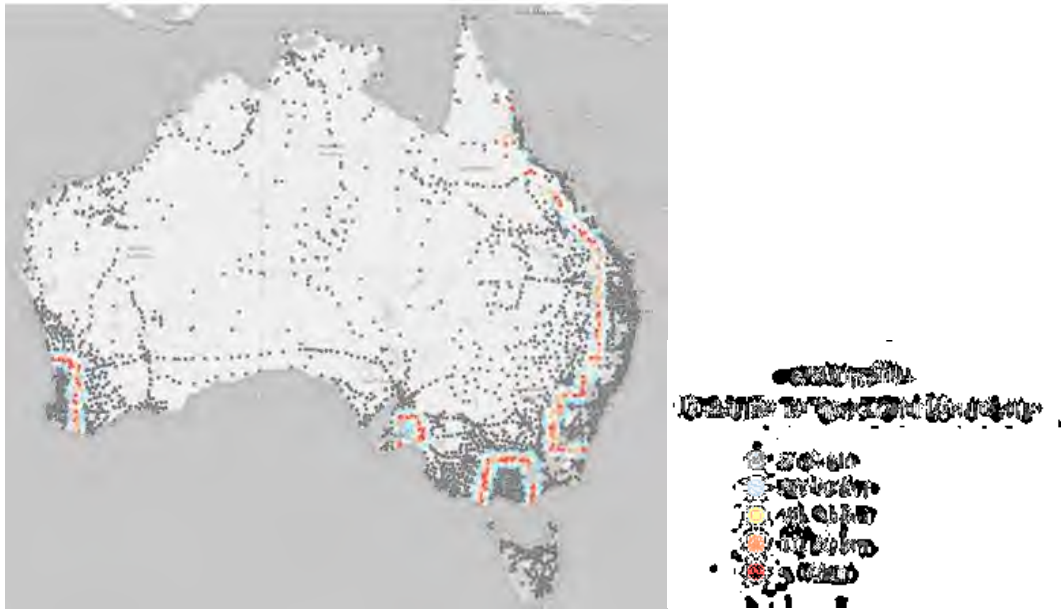
Figure 28 Scenario B: Combination of Existing 850MHz Boundary and Metro/Regional Split



Source: ACMA Tune Up on 850/900MHz Product Configuration

- 7.38 The results from the Sydney 850MHz boundary example were used to quantify the potential impact of the introduction of boundaries. Optus sites were categorised into distances from the new boundary to assess the potential impact to existing services.

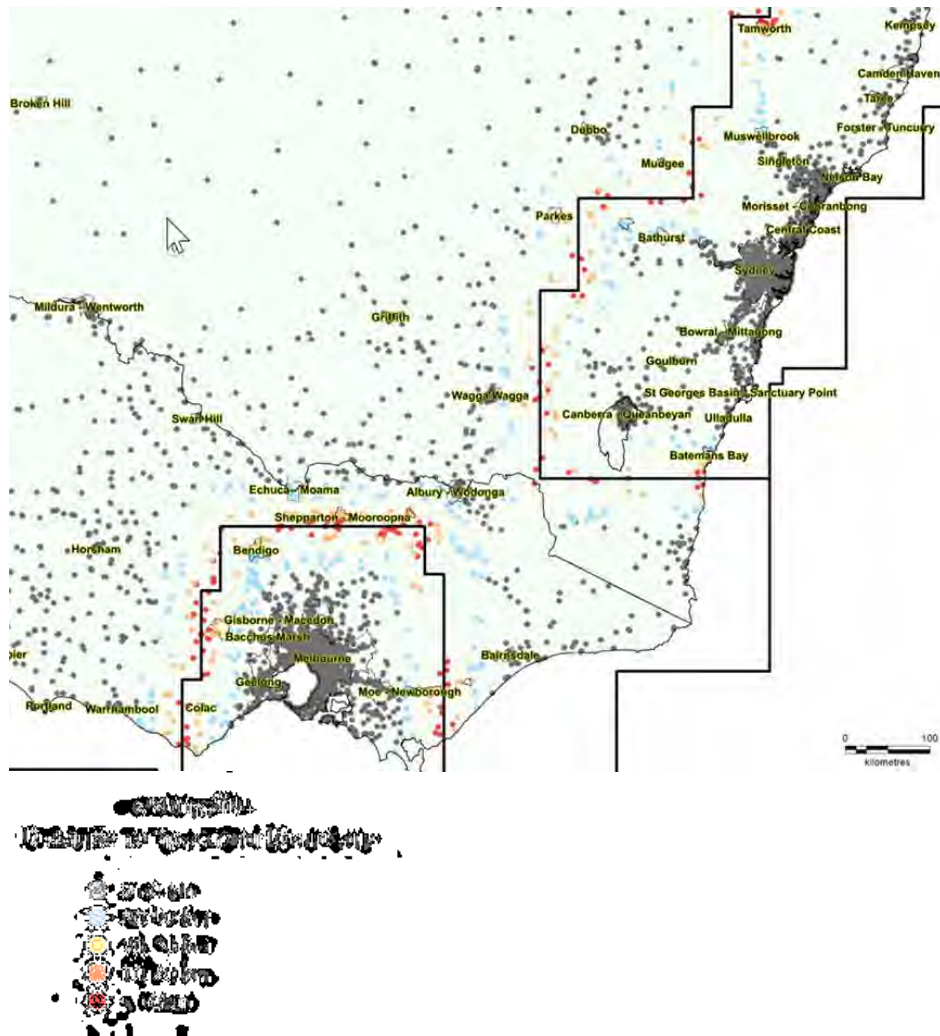
Figure 29 Optus sites within 10km and 50km distance of Scenario B proposed 900MHz boundaries



Source: Optus analysis

- 7.39 Optus sites were categorised from closer than 10km up to 50km from the proposed boundary. Using the less than 10km and less than 50km site lists, this analysis show that 12% to 20% of sites would experience coordination issues that would prevent Optus from registering sites. This covered between 400,000 to 830,000 consumers across regional Australia and Tasmania. This represents between 15% and 30% of the regional population.

Figure 30 Optus Sites and distance to ACMA proposed 900MHz boundary Scenario B



Source: Optus analysis

7.40 Figure 30 illustrates some of the areas in Victoria and New South Wales where Optus would expect to experience interference effects due to the introduction of the licence boundaries under analysis.

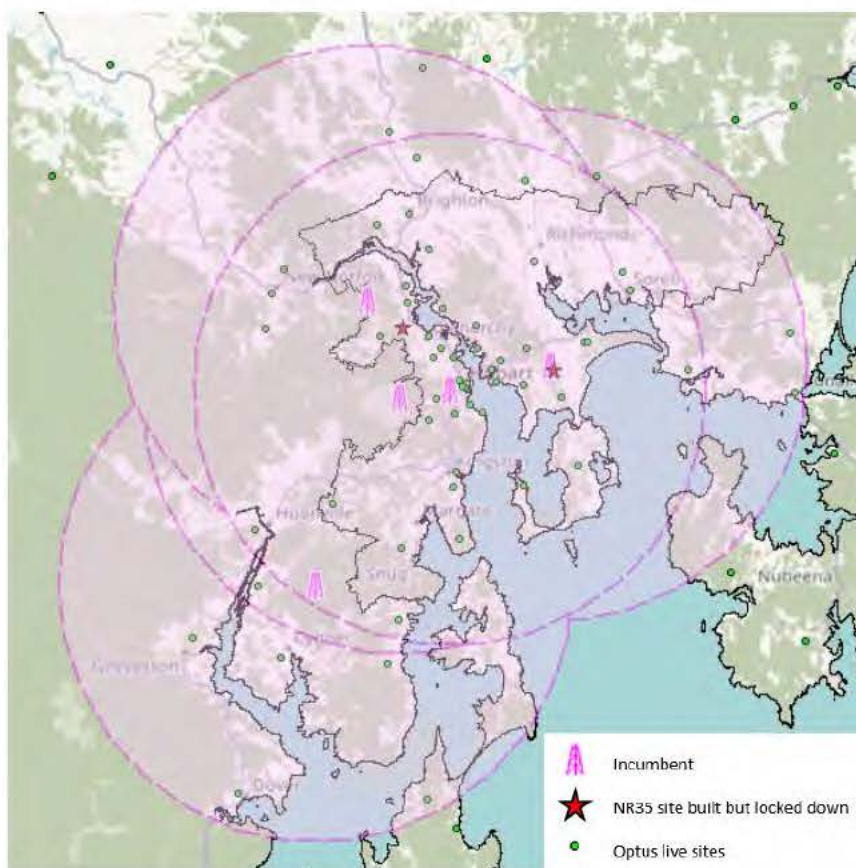
Conclusion

- 7.41 Spectrum boundaries create significant interference 'dead zones' where the spectrum is unusable.
- 7.42 It is important to note that the same effects will be observed no matter where any regional boundaries are drawn. In other words, there are no locations where a new boundary could be drawn that would not have negative impacts on existing sites or consumer experience.
- 7.43 The onus should be on licensees to manage secondary uses or access by third parties and not by licence design. This will encourage the most efficient use of the spectrum allocated and will benefit the long-term interest of end-users.
- 7.44 For the reasons presented above, Optus strongly opposes the introduction of retrospective spectrum licence boundaries as part of the ESL process, whether directly applied as a change to the ESL core conditions or as a consequence of rollout, UIOSI, UIOLI, change of licence type or any other conditions under consideration by the ACMA.

CASE STUDY: The Effect of Incumbents on 3.6GHz Spectrum Licensees

- 7.45 This case study examines the effect of incumbents on Spectrum Licensees. The example taken is in Tasmania where Jettech Networks Pty Ltd and the State Fire Commission registrations are still present. Optus is unable to fully deploy its 5G network using 3.6GHz spectrum in Tasmania due to the presence of incumbents which have until 27th March 2025, when they are obliged to relinquish their apparatus licences and vacate the spectrum. The reallocation period for 3.6GHz is 7 years which commenced from March 2018.
- 7.46 The Optus regional 3.6GHz spectrum was acquired at auction in 2018, and the spectrum licences commenced in 2020, however, as stated above Optus has not been able to deploy 5G using this spectrum in significant population centres of Tasmania to date. Optus has diverted 5G deployment resources to other geographical areas without incumbents. Optus has deployed equipment of providing 5G service on the 3.6GHz spectrum in some areas of Tasmania, however the equipment will not be activated until the incumbents vacate or after 27th March 2025.
- 7.47 During the last 7 years, Optus has already upgraded and refreshed some of these sites in order to meet public mobile demand for coverage and capacity. These sites will require a re-visit and additional upgrade work and cost to Optus to activate 5G services.

Figure 31 Incumbent Registrations impacting Optus in Hobart (Population 238,375)



Source: Optus analysis

- 7.48 Figure 31 illustrates the area in Hobart where the remaining 5 incumbent registrations have prevented Optus from deploying NR35. This has impacted 67 Optus sites and a population of 240,000.

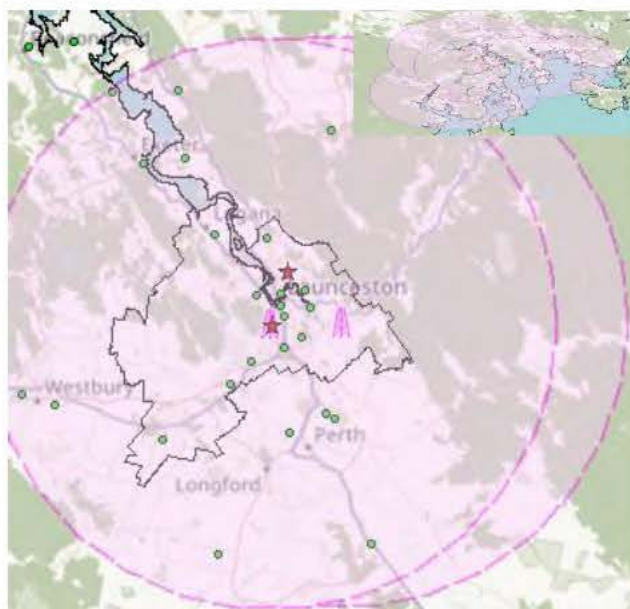
- 7.49 Figure 32 and Figure 33 illustrate the areas in Burnie-Ulverstone, Devonport and Launceston where Optus is unable to activate 5G NR35 due to incumbents. This has impacted 28 sites in Burnie to Devonport and 29 sites in Launceston, with a total overall population of 182,000.

Figure 32 Incumbent Registrations impacting Optus in Burnie-Ulverstone (Population 49,232) and Devonport (Population 47,283)



Source: Optus analysis

Figure 33 Incumbent Registrations impacting Optus in Launceston (Population 85,242)



Source: Optus analysis

- 7.50 Spectrum access is denied to spectrum licensees and 5G networks are not able to be deployed to meet public demand in areas as wide as 30km radius from the incumbent sites in order to mitigate interference. Incumbents that are unable or unwilling to vacate the spectrum, have held spectrum licensees to ransom in this case for 7 years.

- 7.51 This demonstrates the negative impact that a small number of obstructive incumbents can have by depriving large populations and areas access to the latest technology.
- 7.52 In allowing the long reallocation time on the 3.6GHz the ACMA has hampered the deployment of 5G in these areas, to the detriment of public interest. The larger population of Australian public in these areas is deprived of advancement in mobile technology for the sake of a handful of localised private users.
- 7.53 Carving out spectrum for small use cases will have a similar impact as the incumbent scenario. Optus advises that the ACMA should not consider the addition of retrospective boundaries to spectrum licences as this will negatively impact spectrum utility and the public benefit derived from the use of the spectrum.
- 7.54 The table below lists the 10 incumbents that have registrations affecting the deployment of NR35 on Optus sites within a 30km radius of the incumbents. These low site count of the incumbents affect large amounts of spectrum licensee sites and area where technology updates are denied to the general public.

Figure 34 Remaining RRL Registrations in the Optus 3.6 GHz Band

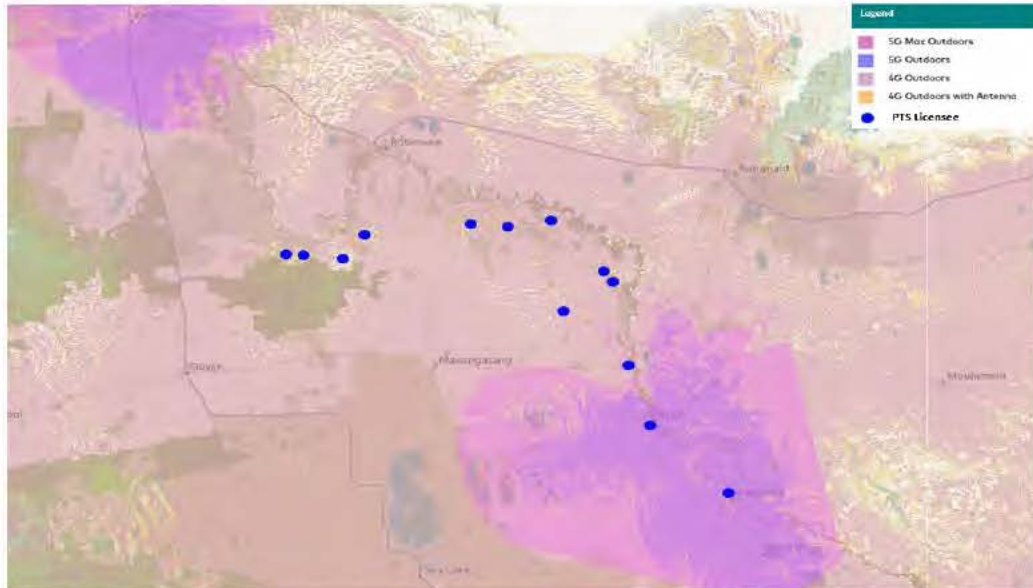
Existing 3.6GHz Incumbents	Site Count	Number of Optus Sites within 30km radius
JETTECH NETWORKS PTY LTD	6	109
Spirit Telecom (Australia) Pty. Ltd.	6	200
Department of Transport and Main Roads	4	104
Isaac Regional Council	4	9
State Fire Commission (TAS)	4	95
CountryToll Management Pty Ltd	2	19
Anglo Coal (Dawson Management) Pty Limited	1	1
Michael Parnell Pty. Limited	1	29
ORIGIN NET PTY. LTD.	1	50
Toowoomba Regional Council	1	39

Source: ACMA RRL Database; Optus analysis

CASE STUDY: Prospective Licensees too close to MNO public network boundary

- 7.55 This case study examines the location of current PTS licensees in correlation to unserved and underserved areas.
- 7.56 The example in Regional Victoria shows that non-MNO PTS licensees (examples) tend to be in areas that are already served by MNOs. The PTS licensees in this region are located in areas with or at the very least close to Optus 4G/5G coverage.

Figure 35 PTS Licensees in Regional Victoria and Optus' 4G/5G coverage



Source: Optus analysis

- 7.57 The locations favoured by the business cases for mobile private networks in regional Australia are generally immediately adjacent to areas with mobile coverage or in areas with unreliable MNO coverage. The location of these registrations would indicate that these are the target markets for at least some of the prospective licensees who have made their views known.
- 7.58 The proximity of these registrations to MNO coverage, if operating on the same spectrum as an MNO, would render both the MNO network and the prospective licensee's network inoperable due to interference. As with all instances of retrospective boundary application to ESLs, if small mobile private networks are allocated dedicated spectrum this would have a disproportionately detrimental effect on large numbers of MNO customers in order to service relatively small numbers of private network customers. This has the effect of denying access to spectrum, reducing spectrum and spectral efficiency and harming customer experience. This, in turn, has the effect of eroding the public benefit that can be derived from that spectrum.

CASE STUDY: Space X and Direct to Mobile Services

- 7.59 In July 2023 Optus announced an agreement with SpaceX to deliver mobile connectivity to cover 100% of Australia using SpaceX's Starlink satellite constellation.
- 7.60 Through this agreement with SpaceX, Optus will work to expand the reach of our mobile network outside the terrestrial footprint to the remainder of Australia's land mass. The solution aims to bring the coverage capabilities of satellites direct to compatible mobile handsets without the need for customers to buy additional equipment. This will be achieved through a phased rollout of SpaceX's satellite capability, starting with SMS in late 2024, with voice and data to follow in late 2025.
- 7.61 Australia's vastness and terrain can make it difficult for any operator to provide mobile coverage everywhere it is needed – especially in remote or hard-to-reach locations where the traditional terrestrial site deployment model does not deliver adequate return on investment.
- 7.62 Direct to mobile (DTM) solutions are an exciting development in the technology roadmap which has the potential of delivering a real solution for connectivity for all Australians.
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- 7.63 As TDD spectrum is not suitable for LEOsat solutions,²²⁷ without access to a flexible, national FDD spectrum licence, Optus and SpaceX could not even contemplate a solution of this nature. The key factors in enabling this solution under the spectrum licence are:
- (a) Technology flexibility: Whilst the ACMA optimises spectrum licences in order to deliver key objectives, these have been deliberately made technology agnostic. This flexibility enables innovation into new areas such as DTM and also supports new generations of mobile services and applications.
 - (b) Protections from interference: The interference protections give certainty to not only the licence holders but also to adjacent users of the spectrum. Regardless of the use case, known limits of interference must be adhered to and the ACMA have sound processes upon which spectrum holders rely in case of dispute.
 - (c) National extent: National licences are important for these types of solutions. Without a national licence, the Optus/SpaceX DTM offering would be severely constrained by the extent of the spectrum licence area available and the coordination criteria at the edge of that licence. Any boundaries of this nature will erode the utility of a DTM solution.
 - (d) Long term certainty of licences: In order to support the significant amount of investment in delivering this solution, long term licences are required. Arrangements of this nature are reliant on this certainty.
- 7.64 As the ACMA contemplates the options available when considering granting renewal for ESLs, it should take careful note of the implications and possible curtailing of future innovation that, uniquely, national spectrum licences and licensees that can operate at very large scale can deliver.

²²⁷ With FDD, the transmit and receive signal can happen simultaneously whereas with TDD they are separated in time on the same frequency band. The round trip delay on the satellite for TDD would be too long therefore inefficient.

Licence Types

- 7.65 Apparatus licences and AWLs are inherently unsuitable for this solution due to the specific nature of the registrations under those licence types and the lack of flexibility conferred to the licensee. Similarly, class licences do not provide licensees with the necessary protections or certainty of operation to be suitable for this type of solution.
- 7.66 This places spectrum licences as the only viable licence type available to the ACMA to enable and encourage such ground-breaking and innovative solutions to overcome the tyranny of distance and isolation that prevails in the provision of telecommunications services to remote and regional Australia.

Large Geographies

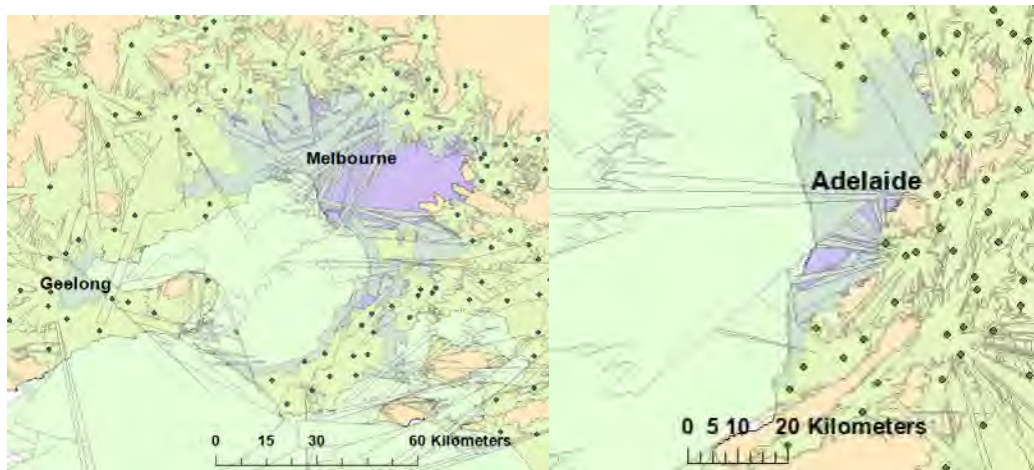
- 7.67 The key advantage of the Optus/SpaceX DTM solution is that it aims to seamlessly combine the existing terrestrial Optus network with the SpaceX satellite solution in areas with no current Optus coverage. There are no issues with managing interference as it is run as one network and so the full geographical area of the spectrum licence can be used.
- 7.68 Carving up spectrum licences (whether national or large area) to facilitate prospective licensees and their use cases is a poor outcome for Australians. This course of action would generate “dead zones” or areas of interference where no services can be delivered and hence fail Australians living in these areas. It would also stifle innovations such as the Optus/SpaceX DTM which require very large scale to be viable, especially in the context of delivering national service. It is crucial that the existing national licences remain intact to provide options for future DTM developments particularly since this technology is still in its infancy.
- 7.69 The only way national service of this nature can be provided is by using a national spectrum licence.²²⁸ Spectrum licences covering very large areas will allow for a large area of service for satellite DTM, but the areas will likely only be on the fringes of the locations where terrestrial coverage is already available, with the last 0.5% - 1% of the population, along with unpopulated areas left without satellite services.
- 7.70 By the very nature of spectrum licence boundaries, the utility of a large area spectrum licence would be diminished at its edges. The licensee would need to comply with the core conditions of the licenses for the spectrum in use, including the DBC. This would require a service area necessarily smaller than the full extent of the licence area to ensure that the s145 DBC is met at the edge of the licence. This has the effect of diminishing the utility of the licence in terms of are served.
- 7.71 The only reasonable conclusion to be drawn is that a national FDD spectrum licence is the only licence suitable to enable a national service. Recourse to smaller licence areas will deliver nothing but a patchwork of small networks with large areas of interference-limited “dead zones” between licensees. This would be a poor outcome from the perspectives of public interest and efficiency of spectrum use.
- 7.72 Optus therefore contends that all spectrum licence boundaries and other core conditions should be left unchanged by the ACMA, and ESLs offered for renewal to existing licensees, at a reasonable and sustainable price, upon receipt of applications for renewal.

²²⁸ This is also the FCC’s position as outlined in its March 2024 Notice of Proposed Rule-making and order

CASE STUDY: ACMA's Analysis in the 3400 – 3575MHz band Demonstrating License Boundaries Restricting Spectrum Utility

- 7.73 The ACMA conducted their own analysis of artificially placed spectrum boundaries as part of *IFC-12-2019-Options-Optimising arrangements for the 3400–3575MHz band*.
- 7.74 As part of the Optus, NBN 3.4 GHz defragmentation project, NBN's PTS licences were converted into spectrum licences. This resulted in new spectrum boundaries being defined in metro areas. The ACMA commenced an analysis on the potential coordination requirements needed to utilise the spectrum areas unused by NBN.
- 7.75 Typically, spectrum licences are coordinated via the existing framework which uses S145 DBC assessments. The ACMA's undertook a detailed analysis on this basis. They concluded, as part of the formation of the Urban Excision areas, that existing s145 DBC is insufficient to provide the necessary protections to users and requires a varied approach to harmful interference mitigation.
- 7.76 As a result of this study, the ACMA has not included this spectrum in the October 3.4/3.7GHz spectrum auction due to the difficulties in defining an acceptable alternative to the current s145 DBC that allows for efficient and effective use of spectrum.
- 7.77 Figure 36 below sets out excerpts from that paper and show the extent to which the DBC restricts the use of spectrum inside the Urban Excision areas, rendering the spectrum unusable for WBB or other traditional, high value uses.
- 7.78 It is evident that inefficiencies will inevitably be introduced by implementing co-channel licence boundaries. They should therefore be avoided at all costs when considering ESLs.

Figure 36 S145 DBC predictions for Urban Excise Areas in the 3.4GHz band



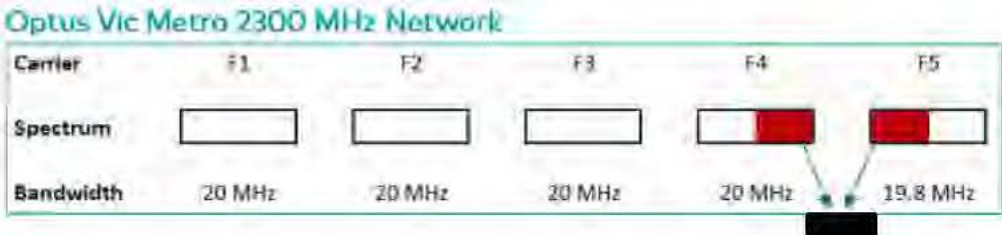
Source: ACMA: *IFC-12-2019-Options-Optimising arrangements for the 3400–3575MHz band*

- 7.79 The ACMA analysis also notes that “the ACMA generally avoids defining area-wide licence boundaries that cross through or are too close to large population centres”.
- 7.80 Such an outcome (the introduction of new spectrum boundaries for existing licences), for ESL, would not be acceptable to Optus as it would represent a significant erosion of spectrum licence rights and protections and result in reduced spectrum efficiency for spectrum users on both sides of any mooted boundary.

CASE STUDY: The Negative Effects of Retrospectively Introduced Spectrum Licence Boundaries

- 7.81 The retrospective introduction of spectrum licence boundaries will lead to a reduction in spectrum efficiency and utility, negatively impacting customer experience and network performance for licensees on both sides of the introduced boundary.
- 7.82 This case study deals with a spectrum lease to a third party operating a co-channel network using part of Optus' 2.3GHz in the northern and eastern parts of Melbourne. The location of the channel in the band is shown in Figure 37.

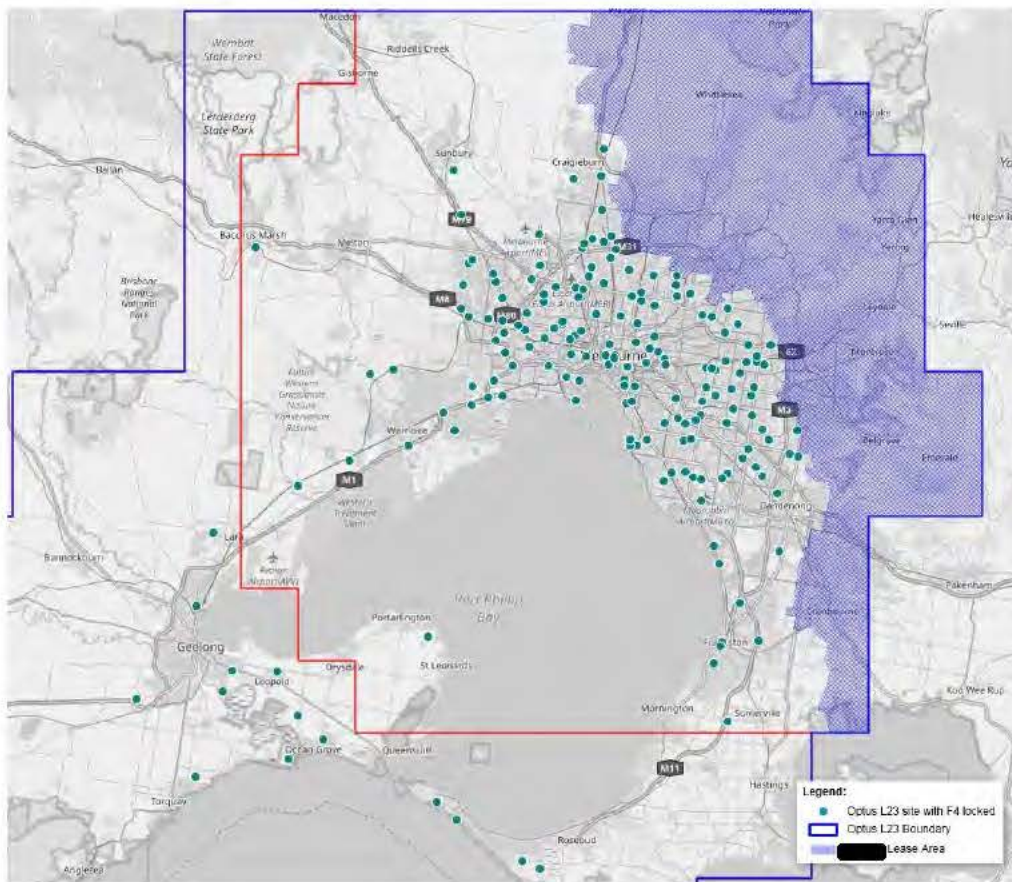
Figure 37 Previous 2.3GHz band arrangement in Melbourne



Source: Optus

- 7.83 The spectrum lease was inherited by Optus upon acquisition of Vivid Wireless in 2013 and was terminated in September 2023. Figure 38 shows the physical extent of the lease area within Optus' 2.3GHz spectrum licence area in Melbourne along with the locations of the Optus base stations that were negatively impacted by the presence of the third party spectrum lessee's sites within the lease area, operating on the channel shown in Figure 37.

Figure 38 Optus L23 sites with some spectrum unusable due to interference with the spectrum lessee



Source: Optus analysis

- 7.84 This example illustrates the effect of retrospectively introduced spectrum boundaries on a licensee’s ability to utilise spectrum within its licence area. This is contemplated in the ACMA’s consideration of carving up national or sub-national spectrum licences to facilitate access to spectrum for prospective licensees in areas immediately adjacent to the areas that would remain for incumbent licensees if such a scenario were to materialise as part of the ESL process.
- 7.85 The blue area described in Figure 38 denotes the spectrum lease area, with the sites identified within the Optus area of operation having compromised access to part of the band due to the requirement to manage interference *into* the lessee’s lease area. The boundary between the leased area and that to the west of it is analogous to and has the same effect as a retrospectively applied spectrum licence boundary.
- 7.86 The combination of the 20MHz portion of the band leased, the physical extent and location of the lease area and the lessee’s network design denied Optus access to the upper ~40MHz of the 98MHz in its 2.3GHz band holdings on a significant number of sites distributed across a wide area of Melbourne. With some sites up to 50km from the spectrum lease boundary being impacted.
- 7.87 In the operation of this spectrum lease agreement and management of boundary issues, Optus and the lessee both experienced interference into each other’s networks due to the technology, network design and equipment constraints with the lessee’s WiMAX network.
- 7.88 Due to the need to prevent harmful interference from Optus sites into the lessee’s network, Optus suffered spectrum denial on >480 sites in the Melbourne metropolitan

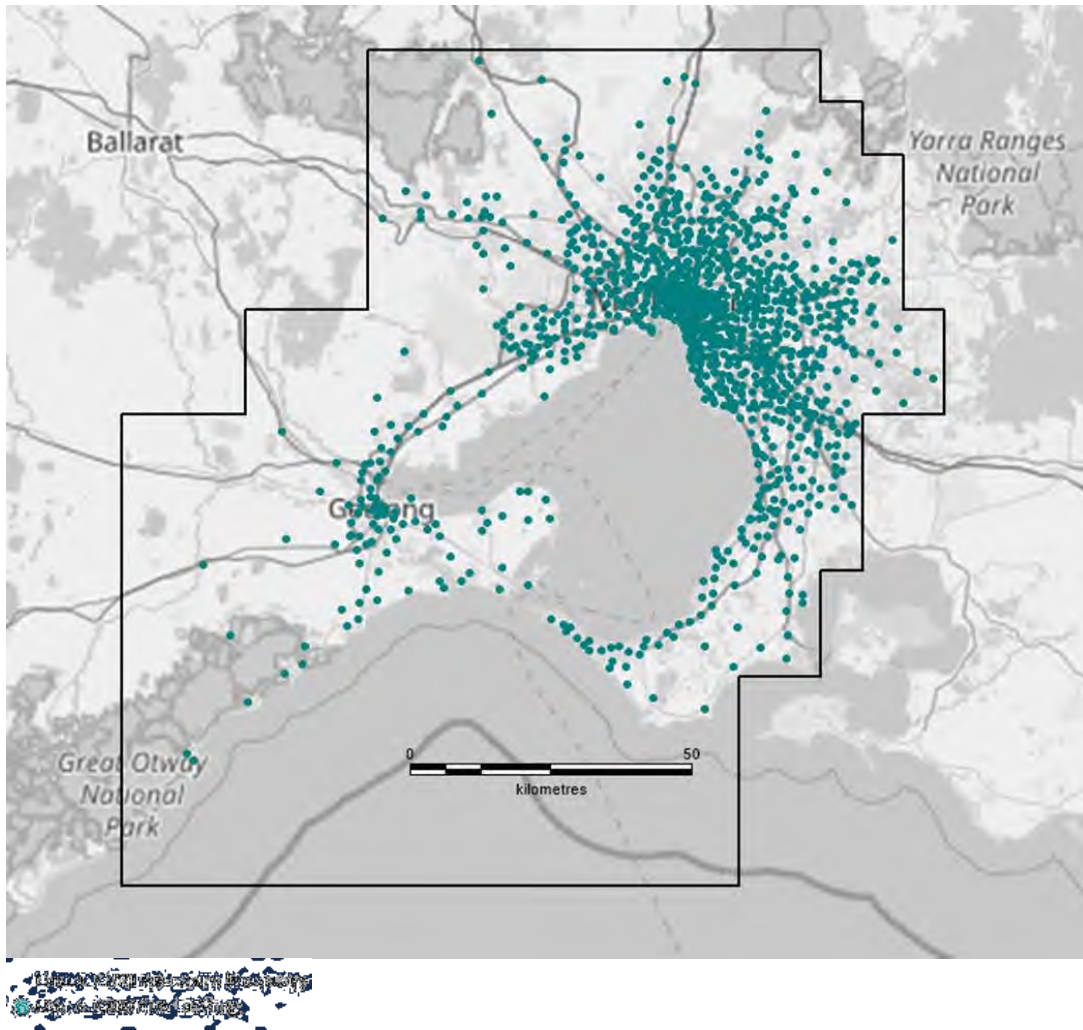
area, where at least 20MHz of spectrum was being denied to 4G, including outside the spectrum lease area, as denoted by the teal dots in Figure 38.

- 7.89 Additionally, Optus experienced interference from the lessee's network into its 5G network operating in the 2.3GHz band, adversely affecting customer experience and speed on sites up to ~50km away from the spectrum lease boundary.
- 7.90 The termination of the lease agreement in September 2023 resulted in Optus being able to make optimal use of the 98MHz of spectrum in the 2.3GHz band to provide service in Melbourne and into the area where the spectrum was originally leased, resulting in a better Optus customer experience and speed outcome on our 4G and 5G networks in this region.
- 7.91 Within the lease area and the 5km zone immediately adjacent to it, vacation of the band resulted in an improvement in customer experience on 27% of Optus' NR23 network in Victoria introducing a performance improvement of 25-35% in NR23 downlink speed. Within the greater Melbourne area the lessee's vacation of the band resulted in Optus being able to deliver NR23 downlink performance improvements on ~394 5G nodes, representing 65% of the Victorian NR23 network, of up to 15%.
- 7.92 It should be noted that the spectrum denial suffered as a result of the imposition of this interference boundary impacted only part of Optus' spectrum in Melbourne in this instance. If the ACMA contemplates taking this approach across an entire ESL band, the effect on spectrum availability could be catastrophic.
- 7.93 Optus believes that this example conclusively demonstrates that introducing new spectrum licence boundaries into existing spectrum licences delivers no efficiency or spectrum utility gains. Rather, it clearly results in the denial of spectrum to one or both parties on either side of the boundary and clearly reduces the spectrum efficiency and fails the public interest test due to worse customer experience outcomes.

Managing interference at existing spectrum licence boundaries can be achieved, but it requires compromise and careful planning

- 7.94 A clear distinction is needed between circumstances where a boundary is imposed *after* a network has been deployed and those where a network is designed and built around a known spectrum licence boundary.
- 7.95 Under the latter circumstances, the licensees on either side of the boundary are able to coordinate to manage interference and design their respective networks to accommodate the constraints that the licence boundaries impose. This is not the case where a new boundary is imposed on an existing licence. Examples of how co-channel licensees can mitigate the effect of a (well located) spectrum licence boundary if the boundaries are known before the networks are designed are shown in Figure 39 which illustrates the location of Optus LTE/NR 2300 Sites in the Melbourne area.

Figure 39 Optus LTE/NR23 sites locations (Source: RFNSA May 2024)



Source: Optus analysis

- 7.96 When spectrum boundaries are created prior to site deployment as is the case with the Optus 2300MHz boundary, then site configurations can be optimised in order to deliver more capability whilst still meeting the coordination requirements of the licence. In order to meet the coordination requirements of the licence, sites which are deployed close to spectrum boundaries are difficult to design and necessitate a compromise on coverage. The utilisation of the spectrum in these areas is reduced by these variations. Sites which are very close to boundaries typically fail the interference assessment. Sites further out from the boundary can have mitigations applied to meet the coordination requirements. These include:
- (a) Partial registration: only those sectors pointing away from the boundary are registered and activated.
 - (b) Azimuth modifications: sectors may be rotated to avoid pointing directly at the boundary.
 - (c) Tilt or power restrictions. Tilts are typically very effective in managing interference requirements for passive antennas. Power restrictions is typically used for active antennas however it has a very limited application.

- (d) Guard space registrations: these have been used extensively by Optus APs to register sites. This mainly includes the consideration of clutter data in the assessment to register.

7.97 Figure 40 illustrates the typical site configurations near spectrum boundaries. As the distance increases from spectrum boundaries, fewer mitigations are required to register sites. The application of these techniques has meant that Optus has successfully implemented sites very close to the boundary. Optus typically has 3 sectors per site.

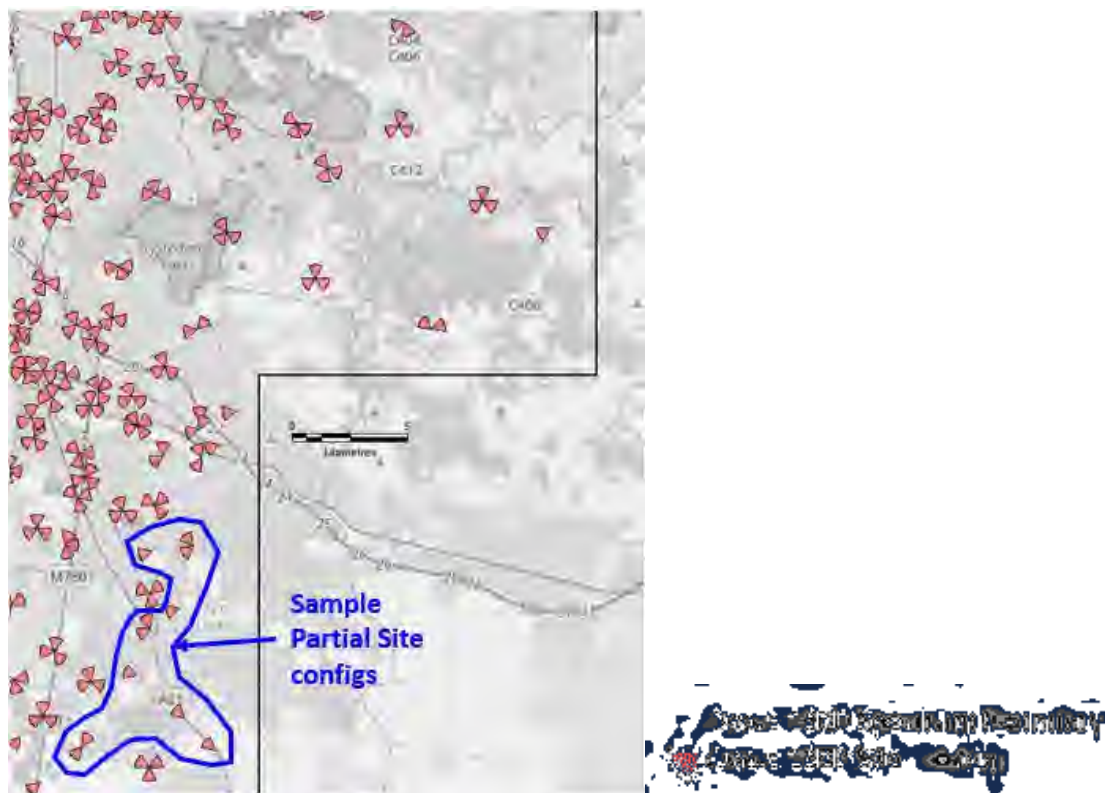
Figure 40 Typical Site configurations near Spectrum boundaries



Source: Optus analysis

- 7.98 Figure 41 illustrates the sector configuration of Optus LTE/NR 2300 Sites on the eastern edge of the spectrum boundary. The sites close to the boundary are configured with 1 or 2 sectors and the other sectors would have failed registration. There are also tilt/power mitigations used extensively in this area as well.

Figure 41 Optus LTE/NR23 sector configurations (Source: RFNSA May 2024)



Source: Optus analysis

Section 8. A LONG TERM APPROACH TO PROMOTE THE PUBLIC INTEREST

- A long-term approach to spectrum pricing will best promote the long-term public interest to be derived from ESL spectrum.
- The long-term socio-economic benefits of lower spectrum pricing outweigh the short-term benefits to Government finances of high prices.
- Allocations of ESL spectrum are already efficient as the spectrum has been previously auctioned/renewed and the existence of a secondary market for spectrum promotes efficiency.
- The two attached expert reports from Coleago Consulting and Dr Chris Doyle provide expert evidence that renewal of Optus ESL at a nominal price will promote the long-term public interest to be derived from ESL spectrum.

- 8.1 Optus welcomes the ACMA’s publication of its ESL “Finalised framework and response to submissions” document in December 2023 in which it sets out its decision-making framework and response to Stage 1 submissions, including in relation to pricing matters.
- 8.2 We note that the ACMA is not seeking any further specific comment in relation to pricing at Stage 2 and has instead indicated that its Stage 3 preliminary view on “spectrum value, pricing [including \$/MHz/pop values] and potential payment terms, if licences in the band are renewed” will be informed by information gathered through this consultation “along with other inputs”.²²⁹
- 8.3 Optus has previously provided comments in response to the ACMA’s discussion of proposed approaches to valuing spectrum and payment arrangements set out in the ACMA’s Stage 1 consultation paper.²³⁰ Optus refers the ACMA to those comments to the extent that they remain relevant to the ACMA forming its preliminary view.
- 8.4 To assist the ACMA to develop a “robustly informed” preliminary view on pricing and spectrum value matters, Optus has engaged two expert consultants; Dr Chris Doyle of Cambridge Economic Policy Associated (CEPA) and Coleago Consulting; to prepare the two attached reports. In summary:
- (a) Dr Doyle finds that holding spectrum auctions for ESLs is not appropriate as the spectrum is already efficiently allocated as all spectrum bands have been allocated by spectrum auction and/or previous renewal and subsequently have been exposed to the spectrum secondary market,
 - (b) Coleago Consulting concludes that a nominal or suitably low price for spectrum will best promote the long-term public interest to be derived from the spectrum relative to other methodologies – and is most appropriate for ESL renewal given the existing allocation must be assumed efficient.

²²⁹ Consultation Paper p.9-10

²³⁰ Optus submission; August 2023

Renewal of ESLs at a nominal price will best promote the long term public interest

- 8.5 Optus acknowledges that the ACMA has indicated that it “would not normally consider that cost recovery-based pricing promotes efficient use of the spectrum”.²³¹ However, Optus submit that where the allocation is already efficient, then cost-recovery based pricing is appropriate. Optus reiterate that renewal pricing and allocation methods should be designed to enable the economic benefits of 5G and 6G to be bestowed on the Australian economy and society. Erring on the side of lower prices is consistent with the Act, given the long-term economic benefits that will flow from greater spectrum utilisation in the form of more infrastructure deployment occurring earlier.
- 8.6 In view of the long-term socio-economic benefits of lower spectrum prices, such as significantly increased network quality and usage, there is a strong case for the ACMA to renew ESL spectrum for a nominal fee that recovers the administrative costs of ESL spectrum management to the ACMA. Renewal confirmation and price certainty, across all ESL bands, will also be crucial for any individual ESL spectrum band valuation due to the inter-related spectrum band layering strategies that exists in all Australian mobile networks. Each spectrum band deployed in mobile networks has an impact on the value of other spectrum bands.
- 8.7 Other points that Optus wish to highlight for the ACMA to consider in its development of its preliminary view to ESL pricing, valuation and payment terms are:
- (a) There is no use case for ESL spectrum that provides greater public benefit than mobile services or WA WBB or fixed wireless access (i.e., there is no “higher value use”).
 - (b) High spectrum prices undermine sustainable competition and investment in 5G and 6G – any short-term benefit of higher renewal fees to public finances should not override broader long term economic benefits that will flow from lower spectrum renewal prices in the form of increased and earlier network investment.
 - (c) Revenues per MHz are falling, so spectrum prices per MHz need to fall in order to ensure a sustainable mobile industry.
 - (d) The more capital spent on spectrum, the less capital is available for network investment, undermining Government objectives for the sector.
 - (e) Market-based allocation mechanisms are only relevant for new spectrum allocations to allow spectrum to be allocated to those who value it the highest (i.e., the most efficient use).
 - (f) Where spectrum allocations have already been allocated by market-based mechanisms and are therefore already efficient, there is no role for market-based allocation mechanisms. For operators that require the retention of their existing spectrum and if there is no change in use, any spectrum fee above administrative cost (nominal cost) recovery is a stealth tax that decreases the public benefit of use.
 - (g) An administrative based price for spectrum, reflecting the cost of administration, should be the default approach to pricing where ESL renewal is deemed to meet the public interest, is of HVU and any alternative interest expressed is for lower value use cases.

²³¹ ACMA “Finalised framework” document, December 2023, p.37

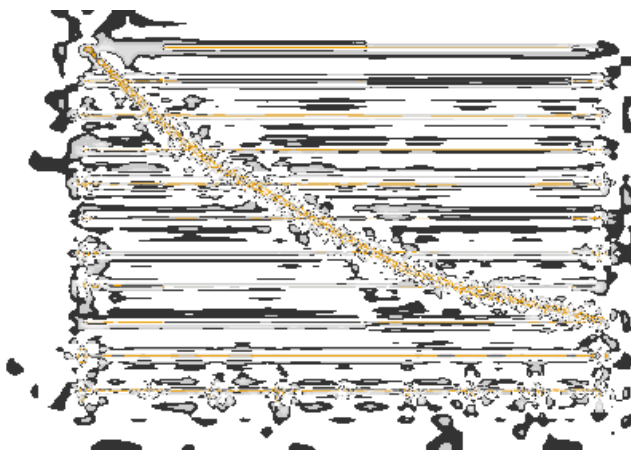
- (h) Nominal spectrum pricing enable lower mobile retail prices to continue to be offered for the benefit of end users.
- (i) Spectrum pricing and allocation methods should be designed to enable the economic benefits of 5G and 6G to flow to the Australian economy by ensuring fair, reasonable and suitably certain long-term access to spectrum.

8.8 The continual use of mobile services is estimated to result in \$37 billion in public benefits each year by 2030. These public benefits assume that mobile operators can continue to invest to deliver the network services needed to drive digitalisation. High spectrum fees undermine this assumption and threaten the realisation of these public benefits.

Lower prices support industry sustainability and help avoid a digital investment gap

8.9 The need for a long-term view is all the more important given the unsustainable financial state of the sector and the emergence of a “digital investment gap”.²³² Data from the ACCC Communications Market Reports shows that between 2014 and 2022 mobile services retail prices in Australia declined by 79% in real terms (see also Figure 42).²³³ During the same period operators’ Return on Invested Capital (ROIC) did not increase. In fact, Optus’ ROIC at 2% is well below its cost of capital. This demonstrates that the value of additional spectrum accrues to end users (consumers, small/medium businesses, wholesale and enterprise) and not to MNO investors.

Figure 42 Mobile retail price decline in Australia since last renewals process



Source: Coleago analysis

8.10 A lower cost per bit allows operators to pass on the benefit of additional spectrum to mobile users in the form of lower retail, wholesale and enterprise prices per bit and higher data speeds. Lower prices per bit reflect the dramatic increases in average usage have allowed more efficient spectrum utilisation. As a result, additional spectrum delivers socio-economic value, far more than private value to operators and far more than revenue to government. A range of academic papers support the view that the benefit from spectrum allocation is derived from its use and not the revenue raised at allocation.

²³² Venture Insights; State of the Telecommunications Industry; June 2023

²³³ See also [Spectrum Pricing April 2024 | GSA \(gsacom.com\)](#) compiling auction data from 60 countries since 2014 and also page 38 of Coleago’s “ESL Pricing Paper”, dated 15 March 2024

- 8.11 Analysts have highlighted that industry revenues have really halved over the last 10 years.²³⁴ However, a situation where the returns are consistently below the cost of capital is not sustainable. Investment will decline and the Australia market will become less competitive. This is a very real danger for Australia. Mobile services have delivered enormous public benefit to Australia and its economy over the last 30+ years. This alone should mean that ESL spectrum should be renewed. Any erosion of the scope of the rights afforded to spectrum licensees to accommodate new use cases must be justified on the basis that such alternative use cases will deliver greater public benefit.
- 8.12 Where this is not established, the ACMA should renew the ESL spectrum at a nominal price. To charge more than this may amount to a tax on incumbent licensees. Such charging is implicitly discouraged under the Act.²³⁵ In the circumstances, and given existing allocations remain efficient, Optus urge the ACMA to reject the use of market-based allocation methods for renewals of ESLs that are already in use. The GSMA note that: “While auctions can work well for initial spectrum assignments, they are almost always inappropriate in the case of renewing mobile spectrum licences that are expiring”.²³⁶

²³⁴ [Consumers furious over telco price hikes that are set to continue due to inflation and rising operating costs - ABC News](#)

²³⁵ section 297 of the Act

²³⁶ GSMA, Auction Best Practice, p.5

Appendix A. OPTUS SPECTRUM ASSETS

Figure 43 High level breakdown of Optus current and planned spectrum use for all licensed spectrum

Band	Licence number(s)	Licensed Bands (Frequencies)	Current use	Current availability	Planned use	Planned availability	Number of radio sites (April 2024)
700MHz (FDD)	9469858	2 x 10MHz (703-713MHz/ 758-768MHz)	4G coverage	National	4G coverage	National	7,848
900MHz	1136358 (apparatus)	2 x 8.4MHz (898.4-906.8MHz/943.4-951.8MHz)	3G/4G coverage	National			7,729
900MHz (Early Access)	Multiple PTS licences	2 x 8.4MHz (890-898.4MHz/935-943.4MHz)	5G Coverage	Selected			2,656
900MHz (FDD)	Spectrum licence (1/7/2024)	2 x 25MHz (890-915MHz/935-960MHz)	5G coverage	National	5G coverage	National	
1800MHz (FDD)	9263448	2 x15MHz (1755-1770MHz/1850-1865MHz)	4G	Metro (5 main capital cities)	4G	Metro (5 main capital cities)	7,226
1800MHz (FDD)	10231258	2 x 20-25MHz (1750-1775MHz/ 1845-1870MHz) 25MHz most	4G	Regional (incl. Darwin,	4G	Regional (incl. Darwin, Tas and Canberra)	As above

Band	Licence number(s)	Licensed Bands (Frequencies)	Current use	Current availability	Planned use	Planned availability	Number of radio sites (April 2024)
		areas except 20MHz in Vic, Tas, Canberra, WA)		Tas and Canberra)			
1800MHz	10278519	Apparatus licence (15MHz max)	4G	Remote Australia (excl RQZ)	4G	Remote Australia (excl RQZ)	As above
2100MHz (FDD)	10143562	2 x 20MHz (1940-1960MHz/ 2130-2150MHz)	4G/5G	Metro (incl Hobart, Darwin, Canberra)	4G/5G	Metro (incl Hobart, Darwin, Canberra)	5,908
2100MHz (FDD)	10143562	2 x 5MHz (1960-1965MHz/2150-2155MHz)	4G/5G	Regional	4G/5G	Regional	As above
2100MHz (FDD)	10094267, 10094268, 10094269, 10094270, 10094271, 10094272	Apparatus licences (Max 10MHz)	4G/5G capacity	Regional and remote	4G/5G	Regional and remote	As above
2300MHz (TDD)	9460720, 9460721, 9460722; 10424532; 9448618, 9448620, 9448621	98MHz (2302-2400MHz) (except Canberra 2330-2400MHz)	4G/5G	Metro (incl Canberra with 70MHz)	4G/5G	Metro (incl Canberra with 70MHz)	4,125

Band	Licence number(s)	Licensed Bands (Frequencies)	Current use	Current availability	Planned use	Planned availability	Number of radio sites (April 2024)
2600MHz (FDD)	9469864, 9469870	2 x 20MHz (2550-2570MHz/ 2670-2690MHz)	4G	National	4G	National	5,439
3.4GHz (TDD)	11286124, 11286125, 11286123	65-100MHz (3475-3575MHz – Sydney and Melbourne) (3475-3547MHz – Adelaide) (3475-3542.5MHz – Brisbane, Perth, Canberra) (3510-3575MHz – ACT west/south and Lorne)	5G	Metro (incl Canberra and Lorne, Vic)	5G	Metro (incl Canberra and Lorne, Vic)	3,067
3.4GHz (TDD)	11286123	65MHz (3510-3575MHz – Regional 32.5MHz (3542.5-3575MHz – Rural WA)	5G	Regional and rural WA	5G	Regional and rural WA	As above
3.4GHz	12250870	Area Wide Licences (AWLs) (3520-3580MHz) (max 60MHz except Pilbara with 40MHz)	5G	Remote	5G	Remote	As above
3.6GHz (TDD)	10917462	30-35MHz (3665-3700MHz except regional and rural SA + NSW with 3670-3700MHz)	5G	Regional and Rural (except WA)	5G	Regional and Rural (except WA)	As above

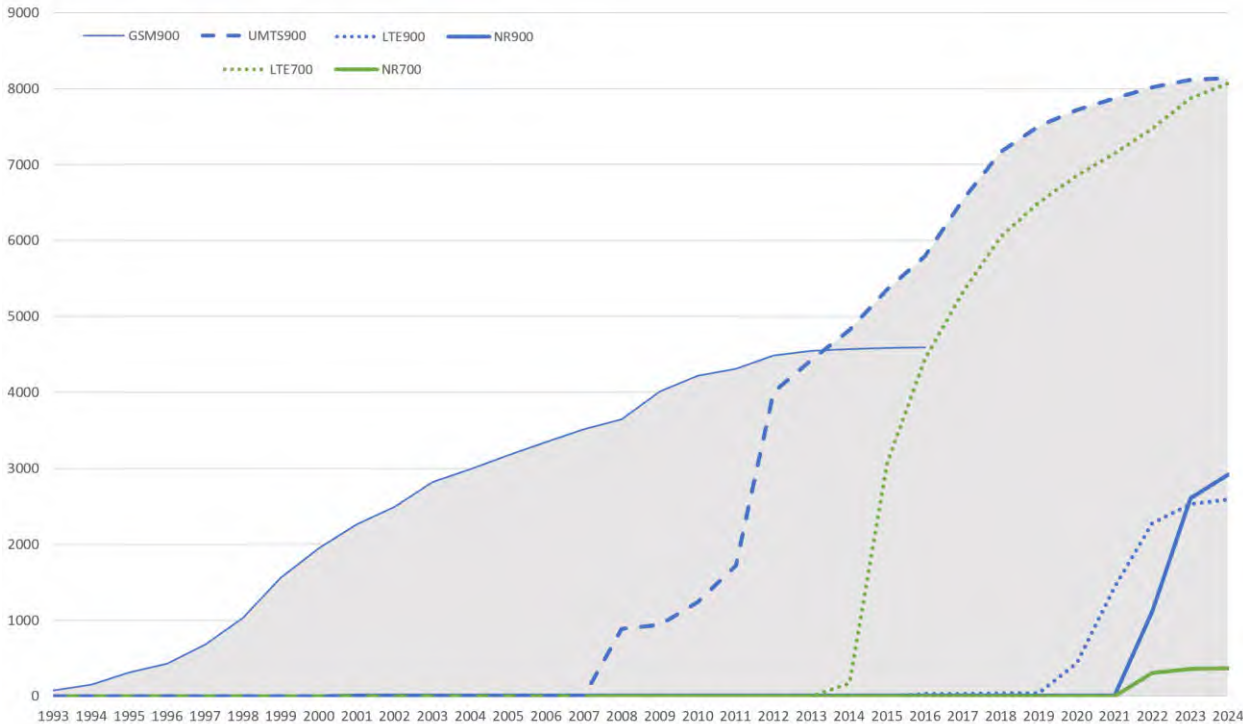
Band	Licence number(s)	Licensed Bands (Frequencies)	Current use	Current availability	Planned use	Planned availability	Number of radio sites (April 2024)
3.7GHz (TDD)	12289656	20MHz (3700-3720MHz)	5G	Toowoomba, Regional QLD, Rural north NSW/South Qld	5G	Toowoomba, Regional QLD, Rural north NSW/South Qld	As above
26GHz and 28GHz mmWave (TDD)	11275967	800MHz (26.7-27.5GHz) (except Perth 26.1-26.9GHz Hobart 25.1-25.7GHz Margaret River 25.1-25.7GHz Launceston 26.7-27GHz)	5G	Metro	5G/6G	Metro	123
26GHz and 28GHz mmWave (TDD)	11290216	Area Wide Licences (AWLs) 400MHz	5G	Regional	5G/6G	Regional	As above

Appendix B. OPTUS ESL NETWORK INVESTMENT

Figure 44 shows the number of technology units per low band deployed in the Optus network from 1993 until 2024.

Low band is important to deliver coverage and this is typically deployed on all sites. The maximum site counts can be used as an estimate on the number of sites in the network. Using 900MHz as an example, the network has evolved from 2G (GSM) to 3G (UMTS) to 4G (LTE) to the current rollout of 5G (NR). This can also be seen on the 700MHz band. The 700MHz LTE layer has reached the 900MHz UMTS site counts as Optus prepares for the 3G Shutdown later in 2024. The maximum site counts can be used as an estimate the total sites in the network which is marked as the grey area under the curve.

Figure 44 Optus Low band (700 MHz and 900MHz) technology site count

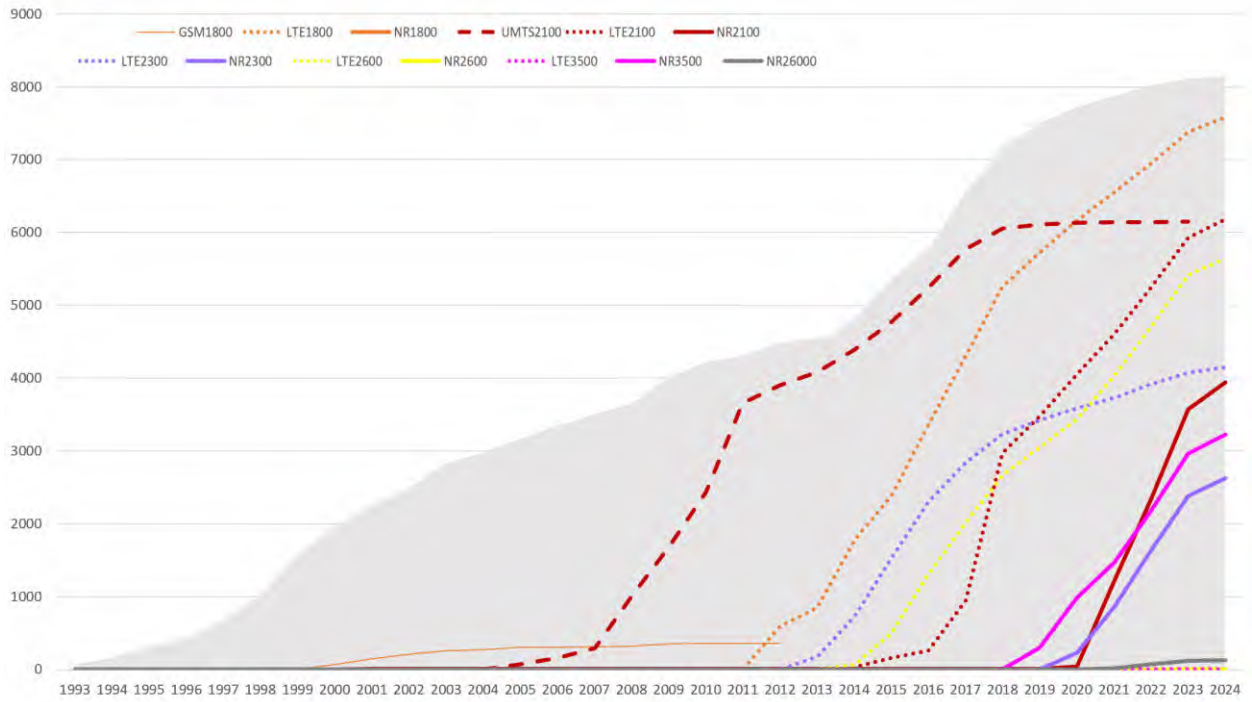


Source: Optus

Figure 45 shows the number of technology units per mid and high band deployed in the Optus network from 1993 until 2024. As with the low band the introduction of new technology can be seen across the years.

The site counts are typically less than low band because (i) Spectrum licences are not national (except for 2600) so there are fewer sites available and (ii) Mid and high band propagation characteristics will limit the available coverage so these bands may not be suitable for sites which are too far away from the mobile traffic. Regional highway sites are a good example of this.

Figure 45 Optus Mid Band and High Band technology site counts



Source: Optus

Appendix C. EXPERT REPORTS

To assist the ACMA to develop a “robustly informed” preliminary view on pricing and spectrum value matters, Optus has engaged two expert consultants; Dr Chris Doyle of Cambridge Economic Policy Associates (CEPA) and Coleago Consulting.

In summary:

- Dr Doyle finds that holding spectrum auctions for ESLs is not appropriate as the spectrum is already efficiently allocated as all spectrum bands have been allocated by spectrum auction and/or previous renewal and subsequently have been exposed to the spectrum secondary market,
- Coleago Consulting concludes that a nominal or suitably low price for spectrum will best promote the long-term public interest to be derived from the spectrum relative to other methodologies – and is most appropriate for ESL renewal given the existing allocation must be assumed efficient.

The two separate expert reports that form part of this submission include:

Attachment 1: CEPA report

Cambridge Economic Policy Associates (CEPA), Renewing expiring spectrum licences: By Dr. Chris Doyle for SingTel Optus Pty Limited, 24 May 2024

Attachment 2: Coleago Consulting report

Coleago Consulting, ESL Pricing Paper, 15 March 2024

Renewing expiring spectrum licences:

By Dr. Chris Doyle for SingTel Optus Pty Limited



24 May 2024

FINAL

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EXECUTIVE SUMMARY

This short paper addresses an important issue forming part of the ACMA's process regarding expiring spectrum licences (ESLs). A significant number of licences within the ESLs are held by mobile network operators, with the first set of licences in the 850 MHz and 1800 MHz frequency bands due to expire on 17 June 2028. The earliest date incumbent licensees can apply to renew spectrum licences is two years before the date of expiry.

The ACMA has three options in arriving at its decisions with regard to any renewal applications: (i) renew an ESL without varying the spectrum access conditions, (ii) partially renew whereby an ESL is renewed with substantive changes to the spectrum access conditions – that is, the frequency bands and geographic area included in the licence, and (iii) refuse to renew which could result in a reallocation of the spectrum frequencies

Under the Radiocommunications Act 1992 (the Act), the ACMA has the object of managing spectrum in the long-term public interest. In this paper I assess the three options set out above against this criterion, and also opine on whether the use of auctions in a renewal process is in the long-term public interest.

In my opinion, where existing spectrum licence holders have made long term investments and the spectrum assets are being used to provide services in the market, there is no basis to reallocate spectrum licences. In other words, the current allocation of licences is in the long term public interest. This is further enhanced where there is an effective secondary market in place – so that alternate users of the spectrum (whether national or sub-national) have the opportunity to acquire spectrum during the existing licence term.

I find that the frequencies used by the incumbent mobile network operators are not being sought by challengers. Indeed, the most recent challenger to the incumbents in the Australian telecoms market, Dense Air, sold its business to Telstra in 2023 and previously sold its 3.6GHz assets to TPG in 2021. And in the 2023 auction for frequencies in the 3.7 GHz band, the only bidders and winners were the incumbent mobile network operators. Further, the possibility to exchange spectrum rights facilitates efficiency enhancing trades among the ESL licensees. I also note that the existence of alternative licence types (like area wide licences (AWLs)) could be used by prospective licensees to enter markets.

Additionally, there is little to suggest that technological change will have a marked effect on how low and mid-band frequencies are used by incumbent mobile network operators. If anything, rising demand for mobile data will continue to put pressure on the incumbent mobile network operators to demand more spectrum and to densify further their networks.

As there is no obvious uncertainty about future usage of the frequencies in the ESLs, and given the highly unlikely emergence of new challenger networks, reallocation by auction would serve largely to amplify uncertainty and delay investments. Given the incumbent mobile network operators can trade spectrum rights, it is unlikely any reallocation would be superior to current holdings.

I observe that there have been some calls for auctions to be used to 'test' the market and ensure that the current allocation of spectrum is efficient. The argument is that auctions are a way of ensuring allocative efficiency; those who value spectrum most receive spectrum. However, secondary trading of spectrum allows efficiency gains to be achieved after initial allocation by auction. Therefore the primary argument in favour of an auction of the ESLs rests on whether there are challengers who could deliver higher long-term public interest. There is no clear evidence to suggest the latter.

Dr. Chris Doyle, May 2024

1. INTRODUCTION

Radio spectrum is an essential resource and its use contributes significantly to well-being and value added in Australia.¹ Its use for mobile broadband and related services is critically important in helping to drive forward economic growth and social cohesion.²

Competition for radio spectrum in many frequency bands and the possibility of harmful interference between uses and users requires spectrum management in every country. In Australia this is performed by an independent Commonwealth statutory authority the ACMA (Australian Communications and Media Authority).³

In managing radio spectrum, the ACMA oversees use and users across frequency bands through a policy of licensing. The procedures the ACMA follows for allocating radio spectrum licences are set in the [Radiocommunications Act 1992](#) (the Act). Section 60 of the Act gives the ACMA considerable discretion; licences can be allocated by auction, tender, for a pre-determined price or a negotiated price, by direct allocation or by a combination of these. Notwithstanding, the allocation procedures followed by the ACMA must be framed with the object of promoting “the long-term public interest”, as set out in section 3 of the Act.

Most in-force spectrum licences in Australia used for mobile broadband and related services are due to expire between June 2028 and October 2032. The ACMA is currently undertaking a review and consultation on addressing these expiring spectrum licences (ESLs).

In 2020 the Act was amended by the [The Radiocommunications Legislation Amendment \(Reform and Modernisation\) Act 2020](#) (the Modernisation Act), introducing new provisions for dealing with ESLs. In the ACMA’s Five-year spectrum outlook 2023–28 (FYSO 2023–28)⁴, it identified progressing activities relating to ESLs expiring between 2028 and 2032 as a key priority. These ESLs cover a range of bands, and are used to deliver wireless broadband, rail safety communications and certain electronic news gathering for broadcasting services.

Any uncertainty surrounding renewal applications of the ESLs is likely to impact adversely on public well-being and nationally economic value-added – in other words, the long-term public interest. In this short paper I emphasise how uncertainty regarding the renewal of ESLs is costly and if a policy decision were made to reallocate and auction the frequencies, this would damage investment incentives and adversely affect the long-term public interest.

To help mitigate uncertainty, the ACMA started its review of the ESLs five years before the first licences were due to expire. Notwithstanding, decisions with regard to licence renewal applications can only be made up to two years prior to the date of expiry of an ESL, so at the earliest from June 2026 onwards for the 850/1800MHz spectrum bands. Incumbent licensees therefore face a possibility that applications for renewal may be refused and current frequencies be reallocated by auction. This presents additional uncertainty and is likely to have a profound “chilling” effect on business decisions, especially on longer-term investment decisions. The ACMA is in a position to address this uncertainty, for example, by presenting a clear policy statement in regard of the use of auctions for licence renewals.

¹ In Commonwealth of Australia (2015) “[Spectrum Review](#)” it was noted radio spectrum’s “role as an economic driver, and the value it returns to society, is increasing.”

² For a good discussion on the impact of mobile services in Australia see Deloitte Access Economics (2022) “[5G Unleashed: Realising the potential of the next generation of mobile technology](#)” for the Australian Mobile Telecommunications Association. On the importance of radio spectrum in a modern economy more generally, see Frontier Economics (2022) “[Ensuring optimal value from spectrum](#)”, a report for DSIT (Department of Science, Innovation and Technology), UK government, June.

³ See <https://www.acma.gov.au/>

⁴ See https://www.acma.gov.au/sites/default/files/2023-10/five-year_spectrum_outlook_2023-28.docx

The additional uncertainty regarding the ESLs and renewal is taking place against a backdrop in which mobile network operators are facing challenging conditions. Although increasing use of data by consumers on mobile networks⁵ may imply a healthy commercial environment for mobile network operators, in recent years networks have experienced declines in average revenues per user⁶ and in many cases reductions in the return on capital employed (ROCE)⁷ significantly below the weighted average cost of capital (WACC). In the submission made by Optus to the ACMA in the first stage of consultation on the ESLs, it was shown that the return on invested capital (ROIC) has declined for all three main mobile networks in Australia since 2017.⁸ Some commentators have also expressed caution about the period over which networks will recover the costs of investing in new 5G networks.⁹

In my opinion, any probability of licence renewal application refusal only serves to undermine incentives for longer-term investments

I discuss why it would be in the long-term public interest to renew the ESLs and not to reallocate the frequencies by auction, and to make this a policy goal as soon as possible. In managing risk, it would be in the long-term public interest to make clear that the ESLs used for public mobile services will be renewed.

This short paper has the following sections. In section 2, I set out the spectrum strategy framework and spectrum management in Australia. I discuss in brief the duty for ACMA to pursue policies consistent with the long-term public interest. In doing this, I discuss how the ACMA applies a public interest test in which the focus is the attainment of economic efficiency. I set out what economic efficiency means and how the ACMA chooses its policies to reflect this.

In section 3, I discuss spectrum auctions, spectrum trading and the public interest. In this section I argue that auctions do have a role to play, but in the allocation of *newly released* frequencies rather than frequencies already in efficient use. I also make clear that the complementary policies of spectrum trading and spectrum leasing, both of which are part of the Australian spectrum management landscape, are necessary to ensure that initial efficient allocations achieved by auction remain efficient over time.

Section 4, looks at the option of setting renewal prices by auction and argues that this is not a good public policy for the ACMA. The purpose of auctions is to achieve efficient spectrum allocations and not revenue maximisation for government. In section 5, I present a short discussion on how the possibility of auctioning frequencies in the ESLs could lead incumbent mobile network operators to play a costly wait-and-see strategy. This risk can be mitigated by the ACMA announcing that it will renew the existing ESLs.

I conclude the paper by reaffirming my position that auctioning the frequencies in the ESLs is not in the long-term public interest and the ACMA should announce sooner, rather than later, a policy to renew all the ESLs.

⁵ Ericsson (2023) "[Ericsson Mobility Report](#)" November forecasts that globally, average monthly mobile data usage per smartphone is set to rise from 21 GB in 2023 to 56 GB in 2029 (see Figure 9: Global mobile network data traffic, page 12). Sarwat Zeeshan, a Telecom Analyst at GlobalData, has commented in regard of data usage and forecasts in Australia: "The average monthly mobile data usage in Australia is expected to increase from 14.4 GB in 2023 to 28.7 GB in 2028", see [Advanced Television \(2024\)](#) 26 March 2024.

⁶ Telecoms.com "[Telecoms revenue per user is falling despite 5G and fibre rollouts](#)" 13 October, 2022 Recently Ericsson (2024) "[Ericsson Mobility Report: Business Review](#)" has noted that globally ARPU has grown at a CAGR of 1.7 percent per year, or over 5 percent in total, since 2020. However, this increase in ARPUs reflects in part surging inflation over the period.

⁷ Ericsson (2024) "[Ericsson Mobility Report: Business Review](#)" notes "the financial landscape is hardening, with surging inflation and increasing costs of operating and maintaining networks. The economic situation is putting pressure on margins,..." p.5. For example, in the United Kingdom the regulator Ofcom has calculated that ROCE has been static or has fallen for the mobile operators since 2019, see Figure 6.2, p.60 in Ofcom (2022) "[Ofcom's future approach to mobile markets](#)" Discussion paper, 9 February.

⁸ See Figure 1 in Optus (2023) "Approach to expiring spectrum licences", submission to ACMA consultation paper, Public Version, August.

⁹ For example, a number of commentators express concerns in "[Operators' 5G investments show no clear signs of paying off](#)" Light Reading, 13 December 2022.

2. STATUTORY FRAMEWORK AND SPECTRUM MANAGEMENT

The ACMA is responsible for managing use of and access to radio spectrum in Australia. Under the Act and the Modernisation Act the ACMA has a duty:¹⁰

“to promote the long-term public interest derived from the use of the spectrum by providing for the management of spectrum in a manner that:

- a) facilitates the efficient planning allocation and use of the spectrum
- b) facilitates the use of the spectrum for:
 - a. commercial purposes; and
 - b. defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes); and
- c) supports the communications policy objectives of the Australian Government.”

In short, the object of the Act is the promotion of *the long-term public interest*. However, the Act does not define the long-term public interest. In practice it is understood economic efficiency is equivalent in general to the long-term public interest. Economic efficiency is when resource allocation is such that well-being is maximised, implying there does not exist another allocation that makes one or more persons better off without harming the well-being of at least one other person.¹¹

2.1. PUBLIC INTEREST TEST

In respect of the ESLs the ACMA proposed in ACMA (2023a) five criteria in regard of the public interest and the ESLs:¹²

1. Facilitates efficiency
2. Promotes investment and innovation
3. Enhances competition
4. Balances public benefits and impacts
5. Supports relevant policy objectives

The ACMA set out in detail its reasoning for the above criteria in stage 1 of the ESL process.

Facilitates efficiency

The ACMA applies a standard approach to describing efficiency, relying on economic concepts. In alignment with earlier guidance provided by the Productivity Commission (see footnote 11), the ACMA uses three relevant concepts for economic efficiency:¹³

- **“Productive efficiency** – occurs when inputs such as spectrum, equipment, capital and labour are deployed in a manner that generates the most output for the least cost. Technical efficiency is related to productive efficiency as it seeks to achieve the least spectrum used to provide the most output.

¹⁰ Section 3 of the Act.

¹¹ In economics this interpretation of efficiency is referred to as Pareto efficiency and is: “attained when individuals in society maximise their utility, given the resources available in the economy”, see Productivity Commission (2013) ‘[On efficiency and effectiveness: some definitions](#)’ Productivity Commission Staff Research Note May 2013.

¹² Pages 18-21, ACMA (2023a), *op cit*.

¹³ Pages 18-21 ACMA (2023a), *op cit*.

- **Allocative efficiency** – occurs when inputs (such as spectrum) are allocated in a manner that generates the most value or benefit for society. This is generally achieved at the initial time of allocation, but may change over time as consumer demands and technologies change.
- **Dynamic efficiency** – a spectrum management regime promotes dynamic efficiency if it enables technologies and allocations to change so that allocation and productive efficiency are maintained over time as technology and preferences change.”

When awarding licences and managing the use of spectrum, the ACMA will take account of both static and dynamic efficiency. Static efficiency is satisfied when spectrum is allocated to the highest value uses (allocative efficiency) and users (the licensees) provide services at lowest possible costs (productive efficiency) – with competition among users ensuring that prices paid by consumers for services tend towards cost (allocative efficiency).

Dynamic efficiency is satisfied when spectrum users undertake desirable investments in spectrum related technologies and processes ensuring that consumers have good quality services at the lowest possible prices. It is enabled by competition in the market for services and more generally in the capital markets providing the source of funding for investments.

The ACMA affirmed the public interest criteria and provided stakeholders with greater detail on each criterion. On the allocation of licences the ACMA stated:

“For allocating licences, we typically use a range of instruments, including guidelines, where we have expressly decided to make spectrum available by issuing apparatus or spectrum licences. These allocation exercises – especially for spectrum licences – are often price-based, where the ACMA has formed the view that the most efficient allocation of the spectrum resource is likely to be achieved by the market. In such circumstances, the Act provides for making and establishing a variety of tools (procedures, marketing plans, applicant information packs and auction guides) to assist prospective licensees to participate in a competitive allocation process.”¹⁴

It was made clear that should ACMA receive a request to renew a licence for 10 years or more it must “be satisfied that it is in the public interest to do so.” In assessing the public interest, the ACMA retains discretion to consider a wide range of matters, including the long-term public interest, the potential impact on competition and downstream markets, and the planned future use of the spectrum.

In deciding whether to renew a spectrum licence, ACMA must have regard to the matters it considers relevant to the renewal, and the effect that the renewal will have on radiocommunications. Subsection 77C(8) outlines in further detail what ACMA may have regard to, including any outstanding liability to pay an apparatus licence tax, spectrum licence charge, spectrum access charge or interim tax, compliance with conditions of the licence, and previous licence history for both the applicant and any third-party users. However, these serve only as an example, with ACMA also having the discretion to consider matters such as the potential impact on competition and downstream markets, whether renewal of the licence would be in the long-term public interest, the planned future use of the spectrum, or any additional matters it considers relevant.

¹⁴ Pages 15-16, ACMA (2023b), *op cit*.

3. AUCTIONS, SPECTRUM TRADING AND THE PUBLIC INTEREST

As stated above, the ACMA makes use of various interventions to determine how best to allocate radio spectrum resources. Modern spectrum management involves interventions ranging from command and control through to market mechanisms, as enshrined in section 60 of the Act.¹⁵ The ACMA usually auctions licences for newly allocated frequencies suited for public mobile services.¹⁶ Many of the ESLs used for public mobile services were initially allocated by auction.¹⁷

Auctions for newly released frequency bands are used by the ACMA because, while it is known there is competition for the spectrum, the agency does not know what amounts of newly released frequencies should be allocated to competing prospective users by geographical area to ensure an allocation is in the long-term public interest. Further, demand and the willingness to pay for newly released radio spectrum are not readily apparent and auctions are an effective way for both productive and allocative efficiency to be achieved.^{18,19}

In a well-designed spectrum auction, where bidders benefit from price discovery, each winning bidder pays a price no higher than their willingness to pay. Significantly, unsuccessful bidders reveal they are not willing to pay the closing prices in the auction process. More often than not, auctions adopt or incorporate in their design a second price rule where the winner pays the maximum willingness to pay of the second placed bidder – this calculates the opportunity cost of spectrum and ensures an efficient outcome. This means spectrum is allocated, at the end of an auction, to those who are willing to pay the most. This outcome is efficient and in the public interest.²⁰

The use of spectrum auctions by the ACMA can be interpreted as the application of mechanisms (i.e., a set of rules) designed to yield an efficient allocation of spectrum licences and achieve the long-term public interest. Spectrum auctions are regarded by economists and policymakers as the most effective way in the presence of competing users to achieve efficiency when awarding licences for *newly released* frequencies.

However, circumstances may change after an auction has concluded and an allocation that was efficient at the time of an auction may no longer be efficient. To maintain efficiency and the long-term public interest, modern spectrum management makes use of complementary policy tools to ensure that spectrum licences won in auctions are, over time, held by those who deliver the highest value. The primary tool is spectrum trading: allowing licensees to exchange in part or full licences with others. For example, if users' valuations change over time and/or technology changes, trading allows for welfare improving reallocations and is in the long-term public interest.

¹⁵ Spectrum management is discussed at length by Cave, Martin, Doyle, Chris and William Webb (2007) *Essentials of Modern Spectrum Management* Cambridge University Press.

¹⁶ See CEPA (2023) [Spectrum Auctions: Thirty years in the making](https://www.acma.gov.au/spectrum-auctions), CEPA Briefing Paper and <https://www.acma.gov.au/spectrum-auctions>

¹⁷ Several of the ESLs have been previously renewed subsequent to their allocation by auction.

¹⁸ Radio spectrum is a resource that commands value, but unlike other commodities it does not feature a high-volume secondary market. This means that market spot and forward prices for different frequencies are not directly observable.

¹⁹ On auctions and efficiency see Zhan, R.L. (2008). *Optimality and Efficiency in Auctions Design: A Survey*. In: Chinchuluun, A., Pardalos, P.M., Migdalas, A., Pitsoulis, L. (eds) *Pareto Optimality, Game Theory And Equilibria*. Springer Optimization and Its Applications, vol 17. Springer, New York, NY. https://doi.org/10.1007/978-0-387-77247-9_16

²⁰ In economics this outcome is formalised in what is known as the First Fundamental Theorem of Welfare Economics, which asserts that in a competitive economy, not subject to distortions, market determined prices will lead to decisions that result in a Pareto optimal outcome (in the sense that no further exchange would make one person better off without making another worse).

Spectrum trading is an example of a policy consistent with the Coase Theorem in economics. This states that under ideal economic conditions (specifically full information), where there is a conflict of property rights (e.g. use of spectrum by one party imposes a cost on the use of spectrum by another party) the involved parties can bargain or negotiate terms that will accurately reflect the full costs and underlying values of the property rights at issue, resulting in the most efficient outcome.

For efficiency to be maintained over time, the Coase Theorem suggests that it must be possible for parties to bargain or negotiate trades in spectrum licences. For example, a licence holder successful in an auction might choose to sell some or all of its spectrum licences to another party at some future date. Such spectrum trading is possible in law and has occurred in Australia.²¹

Indeed, it is relatively straightforward to broker a spectrum trade or arrange a spectrum lease in Australia, as the ACMA has a well-organised set of procedures in place.²² There have been a range of trades which have included all the large national spectrum licensees – Optus, Telstra, TPG Telecom and NBN – as well as Dense Air. While many of these trades were for the purposes of defragmentation (e.g., recent trade between NBN Co and Optus of 2.3GHz and 3.4GHz spectrum), it is still evidence that market mechanisms can and are used to promote efficiencies. It is also to be remembered that while the market may be characterised as relatively "thin" in term of volume, these are trades of high value assets, access to which informs significant downstream investment decisions by the licensees. The trading activity is itself evidence of a secondary market that moves spectrum towards its highest value use. The low volumes of trades suggest that the allocation is largely efficient.²³

Given the ease by which spectrum can be traded in Australia, the limited number of spectrum trades involving frequencies used for public mobile services indicates that the allocation of spectrum licences at the time of auctioning has achieved efficiency and these allocations remain efficient. Further, as demand for frequencies to support public mobile services has grown in Australia year on year and data use on all networks has continued to rise,²⁴ it would seem unlikely that trades involving these frequencies would yield overall net gains. There are some exceptions where reauctioning may be justified, however, for example where the original allocation is no longer fit for purpose and has resulted in complex arrangements that inhibit gains from trade because of 'transaction

²¹ In November 2023 it was reported that Telstra had acquired radio spectrum licences held by Dense Air (see <https://insidetowers.com/telstra-acquires-dense-air-australian-operations/>), including nationwide licences in the 2.6 GHz band that Dense Air acquired from TPG in exchange for city licences in the 3.6 GHz band in August 2021 (see <https://denseair.net/dense-air-acquires-new-spectrum-to-build-neutral-host-shared-wireless-networks-in-australia/>).

²² See <https://www.acma.gov.au/trade-your-spectrum-licence> and <https://www.acma.gov.au/buy-or-lease-spectrum-someone-else>

²³ See further ACCC discussion at p.20 of ACCC determination in TLS/TPG MOCN - which characterising the market as thin, but does not list defragmentation trades and notes that "TPG by contrast has disposed of spectrum licences in the secondary market, selling its holdings in the 2.5 GHz band to Dense Air Networks Australia, and concurrently buying Dense Air Limited's licences in the 3.4 GHz band. TPG (as Vodafone) has also historically had a spectrum access agreement in place with the sub-national MNO Pivotel, allowing Pivotel access to licensed 'LTE' spectrum. TPG and Telstra also have a separate spectrum access agreement in the 3.4 GHz band, with Telstra operating equipment at greater bandwidths than are licensed to them in selected capital cities."

²⁴ Reported data use on mobile phone services in Australia has risen every year since 2018, see Figure 23 in ACCC (2023) "[Communications market report 2022–2023](#)", December 2023.

costs'.^{25,26} Where there is inefficient spectrum fragmentation, priority should be given to reducing the costs that prevent efficient trading of this spectrum before using an auction to re-allocate.

The policy environment needed to ensure spectrum allocations are efficient – which lies at the core the long-term public interest – requires:

- i. Competitive auctions to oversee initial allocations of *newly released* frequencies; and
- ii. Spectrum trading and spectrum leasing/sharing arrangements to enable parties to negotiate gains from reallocations.

Australia has this policy environment in place which I believe means there is no benefit to re-auction the ESLs. However, the re-auctioning of the ESLs would make sense if technological change has rendered the current licensees as inappropriate holders of the frequencies. I do not see any evidence to suggest that this type of technological change has or is taking place or will in the future.

²⁵ A transaction cost is the cost associated with making an economic trade when participating in a market, and is entirely separate from production costs. Where frequency allocations have resulted in complex arrangements with potentially many primary and secondary users holding one or both of spectrum licences and apparatus licences, bargaining and negotiating trade involving potentially many parties can be time consuming and resource intensive (these would be the transaction costs). See Williamson, Oliver (1979) “Transaction-cost economics: The governance of contractual relations” *Journal of Law and Economics*, 22, 233-261.

²⁶ The ACMA has previously undertaken consultations on some frequency bands where apparatus and spectrum licences coexist and where past allocations have led, as a result of technological progress, to subsequent fragmented holdings and the presence of a multitude of licences and licensees which present substantial transaction costs militating against obtaining more efficient allocations. For example, the ACMA consulted in 2019 on optimising arrangements for the 3400–3575 MHz band, see [Options Paper](#), April 2019. In the Options Paper (p.11) the ACMA noted that such complexities may inhibit efficiency enhancing efficiency gains: “Under current arrangements in the band, any trades to support a defrag would require at least one licensee to trade all or part of a spectrum licence for an apparatus licence (and vice versa). Most licensees value the flexibility and tenure of a spectrum licence over that of an apparatus licence and will not make such a trade, particularly if the move is to site-based apparatus licensing arrangements. This issue appears to be what is inhibiting the use of third-party authorisations to affect an equivalent outcome. It is likely that the use of third-party authorisations would only be considered by licensees as a stop-gap solution if a defrag of actual licence holdings to the same or equivalent licence type is guaranteed to occur in the future.” For the frequencies concerned, the ACMA concluded that an auction was the best course of action in the 3.4 GHz band and this occurred in 2023, see [auction results](#). The licence term was set at approximately 7 years, to align with the 13 December 2030 expiry date of existing spectrum licences in the 3.4 GHz band. Thus these licences fall within the ESLs.

4. LICENCE RENEWALS PRICING THROUGH AUCTIONS

Spectrum licences allocated in Australia and those allocated in many other countries tend to be awarded on a fixed-term basis although some are in perpetuity.²⁷ Towards the end of a fixed-term, a process starts which determines the policy of renewal – this policy may or may not be known ahead of the renewal period. In some countries, it may be stated that there is a ‘strong presumption of renewal’ (e.g. Canada and United States).

However, when considering the renewal of licences, there is always an option to re-allocate frequencies by auction. The case for doing this rests on evidence that the current allocation of frequencies is inefficient, as discussed above. In Australia this would amount to strong evidence showing an inefficient allocation among current users, or the existence of prospective users or uses that would deliver higher benefits than current users. In my view neither of these conditions are apparent.

If the current allocation were inefficient, spectrum trading and leasing, as well as spectrum sharing, ought to enable licensees to exploit gains from exchange and trade. If new uses were evident, there would have been clear instances of new entities outbidding incumbent MNOs in spectrum auctions in Australia and elsewhere.²⁸ As concluded above, in my opinion there is no evidence to support claims that auctions are required to ensure ongoing efficient use of spectrum assets.

However, it might be argued by some that reallocating spectrum by auction usefully identifies the market price that should be paid by incumbent licensees. The only justification for such an argument in the presence of the spectrum management policy environment would be to raise revenue.

But if the purpose of an auction is to discover prices with a view to raising revenue for government, this goes directly against the long-term public interest. This is because the initial allocation and the availability of mechanisms to support secondary market activity, and the fact that there have been few trades and limited effect of technological change (i.e., it can continue to be used to upgrade to next generation mobile technology) on the future use of ESL spectrum means the allocation of spectrum within the ESLs is efficient.

Further, given the spectrum in the ESLs is efficiently allocated, it would be a challenge to design an auction process for the ESLs that would easily reveal prices or valuations. This is because bidders would very likely bid on lots identical or very similar to what they previously held and this would result in little competition at the margin. This has occurred in a number of recent auctions, including Ofcom’s 2021 auction for frequencies in the 3.6-3.8 GHz band.²⁹

The views above have also been echoed in GSMA (2014), in which the authors set out international best practice in relation to the renewal of mobile spectrum licences.³⁰ While they recognised that auctions can be useful where there is uncertainty over the best use of the spectrum, they argue that auctions may bring unnecessary costs where

²⁷ Most countries allocate fixed-term spectrum licences, with varying terms up to typically no more than 25 years. The United Kingdom is an exception, it grants indefinite licences having an initial term (often as long as twenty years) and beyond the initial term the spectrum manager Ofcom applies spectrum charges in the form of annual licence fees. See Ofcom (2024) [Review of Ofcom’s market-based approach to mobile spectrum management: Response to Government](#) 11 January. However, Ofcom proposes to depart from indefinite spectrum licences in mobile in future spectrum awards.

²⁸ In all mature economies where spectrum auctions have occurred in recent years, spectrum has been acquired by incumbent licensees. For example, see <https://www.spqglobal.com/marketintelligence/en/news-insights/research/upcoming-global-spectrum-auctions-to-diversify-mid-band-options-for-5g>

²⁹ In the simultaneous multi-round ascending price auction, Ofcom offered 24 5 MHz lots in the 3.6-3.8 band and set a reserve price for each lot of £20 million. Four incumbent mobile operators qualified as bidders. Three bidders succeeded after limited competition, each winning 8 lots. Two bidders paid £21 million per lot and one bidder paid £22.05 million per lot. See Ofcom auction 2021 [results](#).

³⁰ GSMA (2014) “[Best practice in spectrum licence renewals: A toolkit for licensing authorities](#)”, December.

it is clear that the existing licence holders with established networks and customer bases value the licences more than others and if the best use of the spectrum is certain (which it is) then there is no need.

More recently the GSMA (2021) reiterated this position on the auctioning of renewal licences, stating that³¹ “While auctions can work well for initial spectrum assignments, they are almost always inappropriate in the case of renewing mobile spectrum licences that are expiring. The key focus for renewals should be to provide the predictability licence holders need to invest heavily in their networks throughout the term of the licence. If expired licences may be re-auctioned – and thus operators may lose access – then it becomes rational to limit investment in the network in the years preceding expiry. This can in turn negatively impact mobile coverage and broadband speeds and if the operator ultimately loses the spectrum can lead to sudden drops in network quality. Auctions are suitable for expired licences if the licensee does not want to renew the spectrum or if they have breached the terms of the licence. In cases where spectrum assignments are deemed to be unbalanced or inefficient then the market should be allowed to correct itself by facilitating spectrum trading. Laws which prevent expiring licences from being automatically renewed should be revised to better protect network investment and quality of service.”

Rather than auction and reallocate the frequencies in the ESLs, a better approach would be for the ACMA to determine the appropriate price when renewing the ESLs.

³¹ GSMA (2021) “[Auction Best Practice: GSMA Public Policy Position](#)”, September.

5. AUCTIONS AND THE COST OF WAIT-AND-SEE

The ACMA is currently leaving open the possibility of reallocating the frequencies in the ESLs by auction, either as consequence of a decision to partially renew or refuse to renew an ESL. This inevitably presents uncertainty for the mobile network operators, as there is a probability spectrum assets held by a mobile network operator would be lost at auction. This risk could lead to operators playing a *wait-and-see* strategy before committing substantial spectrum related irreversible investments, resulting in lost consumer surplus and hence against the public interest.

This response on the part of incumbent operators is echoed in the academic literature, which predicts that as uncertainty grows firms' business conditions become increasingly unclear, causing them to anticipate higher future cash flow dispersions (Bernanke, 1983; Dixit & Pindyck, 1994).³²

Biljanovska *et al.* (2017)³³ present a thesis that this form of uncertainty makes corporate decisions less likely to be implemented today, as firms fear that uncertainty increases the probability of costly mistakes.³⁴ Understandably in the face of elevated uncertainty, firms prefer to adopt a wait-and-see approach and withhold (perhaps even indefinitely) critical business decisions that can be postponed until much of the uncertainty is resolved.³⁵

Dreyer and Schulz (2022) argue “highly irreversible capital expenditure, hiring, and share repurchase decisions tend to experience sharp declines in periods of uncertainty”.³⁶ In a recent detailed econometric assessment of around 25,000 manufacturing plants in the US, Bloom *et al* (2022) conclude “investment is strongly and robustly negatively associated with higher uncertainty, with a two standard deviation increase in uncertainty associated with about a 6% reduction in investment”.³⁷

If the ACMA were to adopt a policy of auctioning the frequencies in the ESLs, this would present risks for the incumbent operators that would be managed by playing a wait-and-see strategy. The consequence of this would be to undermine the long-term public interest.

By contrast, if the ACMA were to renew the frequencies in the ESLs on terms to be settled, the risk of losing frequencies would largely be eliminated and there would be little need for the incumbent operators to play a wait-and-see strategy.

³² Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment. *Quarterly Journal of Economics*, 98(1), 85–106. <https://doi.org/10.2307/1885568> and Dixit, A. K., & Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton University Press.

³³ Biljanovska, N., Grigoli, F., & Hengge, M. (2017). Fear thy neighbor: Spillovers from economic policy uncertainty. International Monetary Fund.

³⁴ Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3), 623–685 presents an empirical validation.

³⁵ Many papers have emphasized this aspect of real option theory, for example see Grenadier, S. R., & Malenko, A. (2010). A Bayesian approach to real options: The case of distinguishing between temporary and permanent shocks. *Journal of Finance*, 65(5), 1949–1986. <https://doi.org/10.1111/j.1540-6261.2010.01599.x> and Schwartz, E. S., & Trigeorgis, L. (2004). *Real options and investment under uncertainty: Classical readings and recent contributions*. MIT press.

³⁶ Dreyer C, Schulz O. Investor horizons and corporate policies under uncertainty. *Rev Financ Econ*. 2022; 40: 5–19. <https://doi.org/10.1002/rfe.1129>

³⁷ Nicholas Bloom, Steven J. Davis, Lucia S. Foster, Scott W. Ohlmacher and Itay Saporta-Eksten (2022) “[Investment and Subjective Uncertainty](#)” NBER Working Paper Series number 30654.

6. CONCLUSION AND RECOMMENDATION

The debate surrounding ESLs has been framed around identifying public interest criteria. These were set out by ACMA in December 2023 following public consultation in May last year. The Minister has also endorsed the criteria and emphasised that “the ACMA explore future arrangements to reduce the barriers to entry for new users of spectrum for either new use cases or existing uses, as a dynamic and competitive telecommunications market is most likely to promote the public interest.”³⁸

In both instances, auctioning the ESLs is not given and there is an open question about public interest objectives regarding competition and entry versus continuity of service. In March 2024, the ACMA have invited prospective licensees “to supply their own market intelligence and analysis...(and) frame their submissions with reference to the public interest criteria and relevant guidance”. The final Ministerial Policy Statement Instrument published on 30 April 2024, to which the ACMA is to have regard in its decision-making on ESLs, recognises “the importance of the expiring spectrum licences to continuity of existing service coverage, the ACMA should consider where there may be scope to strengthen service offerings by enabling access for new entrants, smaller providers or innovative applications.”³⁹

In my opinion, unless compelling evidence were presented to suggest otherwise, I do not see any long-term public interest gain by refusing to renew the ESLs and choosing to reallocate frequencies by auction. Australia’s spectrum management policy environment is entirely consistent with an efficient allocation of the frequencies in the ESLs, making a reauction of the frequencies in the ESLs pointless.

Further, the cost of auctioning the ESLs could be substantial because of the risk associated with additional uncertainty. This risk can be mitigated by the ACMA if it clarified its policy regarding renewal applications and committed to a process of renewals.

I also see no merit in using auctions to discover renewal prices. Instead, the ACMA would do better to determine appropriate renewal fees based on the principle of at least covering its cost of administering the licences.

³⁸ Section 7, [Ministerial Statement Radiocommunications \(Ministerial Policy Statement – Expiring Spectrum Licences\) Instrument 2024](#), March 2024.

³⁹ Section 7, Ministerial Statement (2024) *op cit*.

Table 1: Summary of ESLs

Band	Licensees	Current primary use	Renewal application period begins	Expiry
850 MHz	TPG, Telstra (original band) Optus (downshift)	WBB	18 June 2026	17 June 2028
1800 MHz	TPG, Telstra, Optus RailCorp (NSW); VicTrack; Queensland Rail; Department of Planning, Transport and Infrastructure (SA); Public Transport Authority of Western Australia	WBB Rail safety and communications	18 June 2026	17 June 2028
2.5 GHz	Telstra, Optus	WBB	1 October 2027	30 September 2029
2.5 GHz mid-band gap	ABC, Channel 7, Nine Network, Network 10	ENG (for example, television outside broadcast)	1 October 2027	30 September 2029
700 MHz	TPG, Telstra, Optus	WBB	1 January 2028	31 December 2029
2.3 GHz	NBN, Telstra, Optus	WBB	25 July 2028	24 July 2030
3.4 GHz	NBN, Telstra, Optus, TPG	WBB	14 December 2028	13 December 2030
2 GHz	TPG, Telstra, Optus	WBB	12 October 2030	11 October 2032

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ESL Pricing Paper

15 March 2024

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1 Executive summary

Background to this report

The ACMA started the Expiring Spectrum Licence (“ESL”) process for licences in seven mobile spectrum bands with the publication of a Consultation Paper on its “Approach to expiring spectrum licences” (ESL Consultation) in May 2023¹. The seven bands will expire between June 2028 and October 2032 and comprise 700 MHz, 850 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz and 3400-3600 MHz.

This paper sets out preliminary views on renewal pricing for ESLs. While the ACMA did not publish a separate consultation on renewal pricing, pricing issues were raised in outline in its initial ESL Consultation and December 2023 ESL Finalised Framework², and have been taken into account in this paper.

Renewal pricing is important because there are different pricing methodologies that can be considered for spectrum renewal. Each offers different investment incentives, which may support different policy outcomes, and will have different downstream implications for end-users.

The paper sets out a compelling argument for using “nominal pricing” for ESL renewal in the context of the ACMA decision making framework for ESL – i.e. the long-term public interest – and the role of mobile as an essential service in Australia. It also sets out why renewal prices should be set conservatively given that high renewal prices undermine the socio-economic benefits of efficient spectrum allocation.

The long-term public interest guides the ACMA’s approach to renewing ESLs and setting renewal fees

To renew a spectrum licence for more than 10 years, the critical assessment that the ACMA has to make under the Act is whether renewal is in the long-term public interest, according to Section 77C(5) of the Radiocommunications Act 1992. The ACMA proposed five criteria to guide its considerations: efficiency; investment and innovation; competition; balancing public benefits and impacts; and supporting relevant policy objectives.

These public interest criteria will also guide the ACMA’s approach to pricing, including assessment of which approach is most appropriate for setting renewal fees.

The degree to which the existing allocation of ESLs may be efficient is critical and affects the assessment of the options for renewal pricing

There is a fundamental difference between awards of new spectrum and reallocating ESLs, which affects the assessment of the options for ESL pricing against the long-term public interest, in particular the criterion of efficient spectrum use.

Global mobile markets including the Australian mobile market, are now mature, having gone through several rounds of consolidation and achieved high levels of coverage and performance (as recognised by the GSMA regarding 5G³). As a result, since ESLs have already been assigned by auction, and provided ESL spectrum is still in productive use, the allocation of the spectrum should be considered efficient by default, barring exceptional circumstances.

¹ <https://www.acma.gov.au/consultations/2023-05/proposed-approach-expiring-spectrum-licences>

² <https://www.acma.gov.au/sites/default/files/2023-12/Expiring%20spectrum%20licences%20-%20Finalised%20framework%20and%20response%20to%20submissions.docx>

³ https://www.gsma.com/get-involved/gsma-membership/gsma_resources/5g-speeds-in-australia-are-almost-twice-the-global-average/

Further, there is little evidence to suggest that the underlying competitive dynamics in the industry have fundamentally changed since the previous allocations, or that a sustainable new market entry is possible. Nor is there any evidence that other uses of the spectrum may be more efficient than mobile given the outcome of the Australian mobile spectrum auctions since the last ESL process in 2012.

Hence, ESL renewal fees do not need to be set to encourage efficiency, because strong incentives to maintain and improve efficient spectrum use already exist through competition, the need to meet growing data demand, and rapid advances in technology. Moreover, a further auction to promote efficiency would be unnecessary. In effect, any price above a nominal level could be regarded as an inefficient tax that will need to be recouped through lower spending/investment or higher prices.

This implies that renewal pricing may depend significantly on the importance the Government places on raising revenue versus delivering higher quality mobile services. Therefore, renewal fees could be set anywhere on a continuum between:

- Nominal pricing: A minimum charge needed to provide an ongoing incentive for operators to continue to use spectrum efficiently; and
- Enterprise value: An amount that would fully extract the incremental economic value of the spectrum to a representative operator.

The structure of the rest of the paper is as follows. First, four main approaches for renewal pricing are assessed against the public interest, in light of the view that the current allocation of ESL is efficient by default:

- Nominal pricing (Public interest pricing);
- Cost avoidance (plus and minus);
- Enterprise value; and
- Price benchmarking.

Second, another implication of the view that ESL spectrum is already efficiently allocated is that it is unlikely to be in the public interest to re-auction ESLs.

[A nominal \(public interest\) pricing approach to renewal fees would take into account the overall return to the community from both fees and the socio-economic impact of mobile.](#)

In the ESL Consultation (May-August 2023), the ACMA raised the principle of renewal prices taking into account public interest considerations and noted some examples of such pricing in the re-issue of spectrum licences for rail safety purposes. The ACMA also stated in the ESL Finalised Framework that it would not normally consider that cost recovery pricing promotes efficient spectrum use.

However, the scope of nominal (public interest) pricing is much broader than indirect benefits such as rail safety and is conceptually different from cost recovery pricing. In fact, public interest pricing reflects that spectrum is a public resource and should secure the best overall rate of return to the community from its use, i.e. support the Government in meeting community service obligations more broadly.

For ESLs, the rate of return depends not only the benefit to public finances arising from the level of “tax” raised directly through renewal charges, but also the broader public benefit to the community through the economic and social value generated from high quality, affordable services.

Hence, this pricing approach should take into account the benefits to the community relating to all the public interest criteria: investment; innovation (e.g. digital transformation through 5G and 6G); and competition will be particularly important. These criteria are part of the ACMA’s policy and decision-making framework as set out in the ESL Consultation: such as Criterion 4, “balances public benefits and impacts”.

[Low spectrum charges enable greater mobile network investment](#)

High spectrum prices make the business case for mobile network investment less viable, since operators face a trade-off between acquiring/retaining spectrum licences (which is a significant expense), capital expenditure on network infrastructure and/or retail pricing for end customers.

The potential conflict between high spectrum fees and the overall return to the community from mobile is even more pronounced given the substantial investment requirements that may be needed to deliver advanced 5G to support innovation and the digital economy of the future. This could coincide with a period in which operators face other significant challenges to earn their costs of capital.

Moreover, the risks to the public benefit are asymmetric, being greater for higher spectrum fees than lower, e.g. evidence from auctions when the fees were too high risk the spectrum being unsold and not used. Hence, the public benefits of ESL could be increased by setting nominal renewal fees.

[EU markets demonstrate that low spectrum charges contribute to high socioeconomic benefits](#)

An inverse relationship between annualised spectrum fees and average mobile data consumption (taken as a proxy for socio-economic benefit) was identified across 12 EU countries. Strikingly, Finland – which has pursued an approach to spectrum assignment that has led to proportionately much lower spectrum fees than elsewhere – leads most countries in terms of both low spectrum costs and high socio-economic benefits. For example, monthly usage was 16x higher in Finland than Germany, and mobile data much cheaper, whereas annualised spectrum fees as a proportion of mobile revenue were much lower in Finland (1.4%) than in Germany (9.5%).

[In Australia, lower renewal fees could also promote market competition, by reducing Telstra's historic competitive advantages](#)

Telstra maintains significant market share across the country and particularly in regional Australia. Telstra's legacy network advantages have delivered it economies of scale (network and customers) which has led to superior financial performance compared to Optus and TPG over the last 30+ years.

The ACMA has identified competition as a public interest criterion in its ESL decision making framework. Competitive intensity will also be affected by the level of renewal charges, especially given the challenges of maintaining effective competition in Australia, due its geography and the predominance of fixed costs. High renewal charges would significantly increase the share of fixed costs in relation to total costs in Australia since the amount of spectrum to be renewed between 2028 and 2032 is substantial. This would amplify the disparities in the economies of scale of the three MNOs and weaken competitive intensity, especially in rural and regional areas.

As well as promoting competition, lower renewal prices would free up more funds for investment in regional and remote areas (given the challenging investment environment for the sector), a policy objective specifically highlighted in the ESL Finalised Framework paper.

[Cost avoidance pricing is not necessary to promote efficient spectrum use for ESLs and would not be in the long-term public interest](#)

Cost avoidance approaches such as calculating Optimal Deprivation Value (ODV) seek to estimate the value of spectrum in terms of the additional costs operators would incur if they did not have access to a certain amount of spectrum. Typically, the rationale for using cost avoidance to set spectrum fees is to incentivise efficient spectrum use. As explained above, since the main function of pricing is to promote efficient use of the spectrum and the existing allocation of ESL spectrum is likely to remain efficient, the justification for renewal pricing other than nominal pricing approaches, is weak.

Moreover, cost avoidance has significant methodological drawbacks, for example:

- Cost avoidance does not produce one unique spectrum price and setting a uniform price may lead to material unintended consequences;
- Cost avoidance is a theoretical construct which does not reflect actual business practice in a number of important ways which undermine its legitimacy as a regulatory instrument;
- The assumption that operators can continue to densify their networks with no limit is likely to be invalid, due to geographical or planning and timing constraints.

[Enterprise value pricing generates major disincentives for investment, innovation and efficiency and is not in the public interest](#)

Enterprise valuation estimates the total discounted value of future cash flows that are made possible by holding spectrum over the licence duration. Setting prices this way would capture the full value from holding spectrum. If spectrum prices were set higher than this level, an operator would go out of business.

Enterprise value pricing for ESL is not in the public interest for several reasons. It penalises success because anything that increased the value of an operator, e.g. more intense use of spectrum or service innovation leading to higher revenues, would ultimately be clawed back through higher spectrum fees. As a result, incentives to innovate and invest would be low.

Another disincentive arises because enterprise value pricing does not take into account downside risks to operators. Operators would not achieve a return on their investment if the underlying forecasts for the enterprise valuation were not met. Hence, operators may scale back investment in spectrum and network if market conditions are uncertain.

[Auction price benchmarking is also not an appropriate method for setting renewal fees and is not in the long-term public interest.](#)

Benchmarks seek to estimate spectrum prices by comparing a sample of representative spectrum fee information, usually auction prices, from other countries and within a certain time period and adjusting where necessary for factors such as licence duration and frequency differences.

Using benchmarks from prices paid for spectrum at auction in other countries in the past to assess the value of spectrum in Australia is misguided because:

- Essentially benchmarking relies on calculating an average price paid in different countries, at different times, by different operators under different conditions. The vast majority of prices are for new spectrum awards and not renewals, so they do not take into account the specific circumstances of renewals.
- Prices paid at auction are in a large part driven by spectrum public policy which can vary considerably from country to country and over time. Coleago's analysis of auction prices shows that spectrum prices tended to remain round the same level over the last 15 years for any particular jurisdiction, while prices fluctuated much more between jurisdictions.
- Moreover, Coleago's analysis of spectrum auction prices found no discernible upward or downward trend in over the last 15 years. This runs counter to Telstra's response to the ESL Consultation which argues that benchmarking can accurately reflect its view of the spectrum market that per MHz spectrum prices are falling and due to the rapid expansion of the supply of spectrum in recent years.
- Prices paid at auction are rarely the equivalent of spectrum value to a representative operator, e.g. reserve prices may be set too high resulting in unsold spectrum (often where competition in an auction is limited – allocation limits or genuine lack of demand), the supply of spectrum may be artificially restricted by the spectrum manager.
- Furthermore, benchmarking is backward looking, hence not appropriate for the (2028-2032) timeframe of ESLs and lacks objectivity given the need to standardise the data and potential exclusion of outliers.

An additional implication of the view on efficiency is that it is unlikely to be in the public interest to re-auction ESLs.

Given mobile markets are now mature and the strong link between low spectrum fees and socio-economic benefits as set out above, the role of auctions is being questioned by some regulators for spectrum renewals or even new spectrum. In the context of ESLs, re-auctioning the spectrum is unlikely to be in the public interest given that:

- There is little evidence that re-auctioning ESLs is necessary to secure the efficient use of spectrum – provided that the spectrum continues to be in productive use.
- Similarly, the justification for setting aside spectrum to support new entrants or innovation is questionable given doubts around the sustainability or efficiency of new market entry.
- Re-auctioning ESLs could impose significant economic costs in terms of further entrenching the incumbent's (Telstra) dominance, distorting competition and the risk of unexpected and unintended auction outcomes. The uncertainty created from re-auctioning could also have a chilling effect on network investment.
- The spectrum is expected to either remain with the incumbents or not be fully allocated if the reserve/competitive price is too high and therefore this would result in a failure of the auction/s as part of the renewal process, with no further opportunity for efficiency gains.

In conclusion, offering ESLs for renewal to existing holders combined with nominal (public interest) pricing will maximise the public interest.

Auctioning ESL spectrum is not in the public interest. In determining the renewal price, it is recommended that the ACMA have regard to, among other matters, that mobile is an essential service and critical to society; the productivity benefits of mobile services to the economy; and that sustainable competition at a retail and infrastructure level will benefit consumers in the long term. Having regard to the ACMA's public interest criteria, it is recommended that all ESLs be offered for renewal to the existing spectrum holders and that ESL pricing is set at nominal administrative levels.

2 The regulatory context

2.1 Purpose of this report

The ACMA started the process for the renewal of licences in seven mobile spectrum bands with the publication of a Consultation Paper on its "Approach to expiring spectrum licences" (ESL Consultation) in May 2023⁴. The seven bands will expire between June 2028 and October 2032 and comprise 700 MHz, 850 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2600 MHz and 3400-3600 MHz.

The ACMA set out a 4-stage approach in the ESL Consultation in May 2023:

- Stage 1: design and consult on the proposed process (that is, this consultation)
- Stage 2: finalise the process and request relevant information from incumbent licensees to assist in developing an assessment framework
- Stage 3: consult on preliminary views on a range of ESL and spectrum matters, such as planning and licensing arrangements, licence conditions, pricing and issues affecting the relevant band
- Stage 4: finalise and undertake the renewal application and decision-making processes. This stage is specific to the consideration of individual licences.

In December 2023, the ACMA updated the approach in the document "Expiring spectrum licences, Finalised framework and response to submissions" (ESL Finalised

⁴ <https://www.acma.gov.au/consultations/2023-05/proposed-approach-expiring-spectrum-licences>

Framework)⁵ which brought forward some elements of Stage 2 – ACMA responses to submissions to the ESL Consultation, and confirmation of the overall ESL process and the framework based on the proposed public interest criteria. The document also set out a revised timetable:

- Stage 2: start Q1 2024
- Stage 3: consult on preliminary views Q4 2024
- Stage 4: respond to submissions 2025; renewal applications and decisions 2026-32

Hence, stages 1–3 and the first part of stage 4 (response to submissions) will have been completed before the first renewal application period for the 850/1800 MHz spectrum (that is, in advance of Q2 2026),

This paper specifically relates to Stage 1 in responding to issues raised in the ACMA’s initial ESL consultation paper and the ESL Finalised Framework, and feeds into Stage 2 information gathering which will inform the ACMA’s development of preliminary views on the future arrangements for ESL, including pricing, in Stage 3. The ACMA states that, in developing its preliminary views, “we will consider information provided by incumbent licensees and other stakeholders in stage 2 and other sources. We will examine ... spectrum value and pricing - identifying the value of spectrum and payment terms, if licences are to be renewed” Optus expects to provide further input on pricing and other issues in response to the ACMA’s information requests and consultations in Stages 2, 3 and 4.

The paper seeks to identify the best option for ESL pricing within the framework set out in the ESL Consultation, i.e. which option will lead to the greatest public benefit through the long-term public interest.

2.2 Considerations for ESLs and pricing

Criteria for determining the approach to ESLs and pricing

The regulatory framework for spectrum licence renewal is set out in the Radiocommunications Act 1992 (the Act)⁶ and the ACMA’s public interest policy and decision-making framework.

Broadly speaking the ACMA has the power to decide whether to offer ESL holders the opportunity to renew licences on payment of a charge determined by the ACMA, or to not renew the licences and re-assign them, most likely by auction⁷. However, the Minister for Communications, Urban Infrastructure, Cities and the Arts can provide guidance on relevant policy objectives through Ministerial Policy Statements (MPS).

To renew a spectrum licence for more than 10 years, the critical assessment that the ACMA has to make under the Act is whether renewal is in the long-term public interest, according to Section 77C(5) of the Act. The public interest is broadly defined in the Act as “providing for the management of the spectrum in a manner that:

- facilitates the efficient planning, allocation and use of the spectrum;
- facilitates the use of the spectrum for:
 - commercial purposes;
 - defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes); and
- supports the communications policy objectives of the government.”⁸

⁵ <https://www.acma.gov.au/sites/default/files/2023-12/Expiring%20spectrum%20licences%20-%20Finalised%20framework%20and%20response%20to%20submissions.docx>

⁶ Section 77C on the ACMA’s power to renew a spectrum licence

⁷ The ACMA could also decide to partially renew licences to the existing holders

⁸ Section 3 of the Act as revised by the Modernisation Act 2020

The ACMA consulted on and then finalised a set of five public interest criteria that constitute its policy and decision-making framework for ESLs:

- facilitates efficiency (allocative, productive and dynamic efficiency);
- promotes investment and innovation (also encouraging and dynamic efficiency);
- enhances competition⁹;
- balances public benefits and impacts;
- supports relevant policy objectives.

The ACMA has also provided some high-level explanation and context for the criteria to guide stakeholders on how they may frame their responses to Stage 2 and how the ACMA may approach its preliminary views at Stage 3.

Section 294 of the Act gives the ACMA the power to set charges for spectrum licences and provides the ACMA with considerable discretion on how to set those charges. Furthermore, the Minister has the power to give directions to the ACMA on setting charges and this may cover include setting charges that “reflect the amount that the Minister considers to be the value of the spectrum”.

[The long-term public interest is the relevant measure for determining the best approach to setting renewal fees.](#)

The options for ESL pricing, assuming that existing licence holders are offered the option to renew their licences, will be assessed against the above criteria to determine which best meets the long-term public interest.

Structure of the paper

In the following sections, this paper:

- Examines the crucial difference between the ESL process and awards of new spectrum in terms of the need to incentivise efficient spectrum use;
- Defines and assesses the options for ESL pricing – public interest pricing, price benchmarking, cost avoidance and enterprise value – against the long-term public interest, assuming the ACMA offers the existing licence holders the option to renew the ESLs; and
- Discusses a related issue arising from the differential need to incentivise efficiency for ESLs compared to new spectrum awards, i.e. whether it is likely to be in the long-term public interest to use auctions to renew ESLs in Australia.

⁹ Taking into account the potential of the Australian market to support a limited number of sustainable operators, the maintenance of effective competition, and the realistic prospect of sustainable entry

3 Efficiency incentives differ significantly between ESLs and new spectrum awards

Promoting optimal spectrum use, i.e. allocative efficiency, is important for new awards of spectrum but is a less of a requirement for ESLs as already auctioned licences are efficient by default – this has far reaching implications for renewal pricing

Over the last 30 years or so, auctions have become acknowledged as the best mechanism to allocate new releases of spectrum efficiently¹⁰ (where there are competing demands on its supply). Together with spectrum trading, this marked a shift to relying on the market to identify who valued spectrum the most as opposed to administrative allocation.

However, the need to take active measures to ensure efficient spectrum allocation in the ESL process is much weaker. Since ESL spectrum has already been assigned by auction and or a previous renewal, it has already been exposed to incentives for efficient use. Therefore, the distribution of mobile spectrum should be considered efficient by default unless there is credible evidence to the contrary. This assumes that spectrum continues to be in productive use (the information gathering exercise in Stage 2 will verify this) and excludes exceptional circumstances – e.g. the emergence of new uses with a potentially higher value for the spectrum – which can be assessed if evidence is presented during the ESL process.

Moreover, there have been multiple rounds of spectrum auctions in Australia which have provided opportunities for the market to respond to any inefficiencies in the allocation of spectrum between mobile operators that might have developed in the interim. Along with technology neutral spectrum licences, the opportunities to acquire spectrum in new bands have promoted not only allocative efficiency, but also dynamic efficiency – i.e. responding to the changes in technology and promoting innovation.

Additionally, mobile communications are the most valuable use of this spectrum given that it is very unlikely a user would be prepared to pay more for ESLs for a non-mobile use case. In fact, mobile communications has proven to be the most valuable use for these and similar spectrum bands in competitive awards around the world, and there is no evidence to suggest the contrary.

Individual mobile operators also face continuing incentives to use their spectrum efficiently

It is also unnecessary to incentivise efficient spectrum use in terms of the distribution of spectrum within the mobile market. First, the scope for significant misallocations of spectrum to arise is limited, because:

- Mobile has become an essential service with high levels of coverage in developed countries, where network investment is focused on supporting cycles of enhancements and innovation rather than revolutionary change.
- Markets have also consolidated¹¹ and a consensus has formed that markets can support three or four sustainable and profitable networks, while maintaining effective competition, depending on the population density of the country. The low population density in parts of Australia has meant that even sustaining three national operators faces challenges

Second, the secondary market provides the means to trade spectrum if another party values the spectrum more highly. It thus exposes operators to the opportunity cost of the spectrum. Hence, following the initial assignment of spectrum, the secondary

¹⁰ Here allocatively efficient is meant in the sense that the way spectrum is distributed generates the maximum economic benefit from its use

¹¹ Similarly, in its ESL Consultation submission, Telstra cites the 2020 merger of TPG Telecom and Vodafone Hutchinson as evidence that a fourth operator is not viable in Australia.

market transmits price signals which ensure that the assignment of spectrum remains efficient over time. Licences can be traded by frequency and geography enabling a fine-tuning of spectrum in response to market and technological change. This can promote allocative and dynamic efficiency as the ACMA recognised in the ESL Finalised Framework.

Spectrum trading has been applied in many countries and there are many examples which support the view that the secondary market is facilitating efficient mobile spectrum use in Australia, particularly in recent years (and the ACMA has not published evidence to the contrary, i.e. of operators refusing viable trades of spectrum):

- Hutchison's acquisition of AAPT's unused 800 MHz spectrum in 2007;
- Optus' acquisition of Qualcomm's unused 2100 MHz spectrum in 2010;
- NBN Co's acquisition of Austar's 2.3 and 3.4 GHz spectrum in 2011;
- Optus' acquisition of Vividwireless in 2012, which was primarily driven by the desire to acquire its 2300 and 3400 MHz spectrum;
- Dense Air's acquisition of nationwide 2600 MHz spectrum from TPG in 2021;
- TPG's acquisition of metro 3600 MHz licences from Dense Air in 2021;
- TPG's acquisition of Sydney/Melbourne 26GHz (200MHz) from Dense Air in 2022;
- Telstra's acquisition of Dense Air in November 2023, which gave it additional nationwide 2600 MHz spectrum.

One limitation of the secondary market is that complex transactions involving multiple parties – such as a substantial defragmentation of a spectrum band (for example, c-band) – are less likely to arise. This is because the costs of forging an agreement, e.g. negotiation and coordination, may exceed the benefits. However, complex band realignments can and have been addressed administratively. It is not necessary to re-auction whole spectrum bands to resolve such issues.

Third, given that mobile spectrum is scarce, the profit motive provides a strong incentive for operators to use their spectrum efficiently in order to minimise their costs (which is the counterpart of profit maximisation). For example, maximising the utilisation of spectrum helps lower unit costs and maximise profits. Operators will also want to deploy their spectrum resources effectively so that they can provide a competitive level of network performance to their customers.

Conclusions

Renewal charges do not need to be set at the economic value of the spectrum for the allocation of ESLs to remain economically efficient¹². As a result, any charge for ESLs that exceeds the administrative costs associated with the licence is essentially a “tax” on the use of the spectrum resource¹³. There is no other economic rationale for its imposition. Moreover, this tax may ultimately be borne by the public if passed on to retail prices for end customers.

Instead the rationale for renewal charges should stem from the fact that spectrum is a public resource. Indeed, the COS Determination from the previous renewal process of 2012, mentions the criterion of “determining an appropriate rate of return to the community” alongside other public interest criteria, which are still very relevant today and similar to those proposed in the ESL Consultation:

- Promoting the highest value use;

¹² Similarly, NBN's ESL Consultation submission notes that where spectrum is already allocated to its highest value use, there is no efficiency benefit from setting renewal prices above cost recovery

¹³ And according to section 297 of the Telecommunications Act, a spectrum access charge (determined by the ACMA) must not be such as to amount to taxation

- Investment and innovation;
- Competition; and
- Consumer convenience.

As a result, when determining an appropriate rate of return to the community, it is not only the amount of “tax” raised that matters. The public interest criteria above *also* provide a return to the community through the economic and social value generated from high quality and affordable services and the key question becomes how to maximise the overall rate of return to the community.

Optus, Telstra, TPG and NBN, in their ESL Consultation submissions, all stress the importance of considering the rate of return to the community (including the public benefit from mobile services) when setting final renewal prices.

4 Options for ESL pricing

A range of different pricing methodologies can be considered for spectrum renewal. Each offers different investment incentives, which may support different policy outcomes, and will have different downstream implications for end-users. In this report, four main options for renewal pricing are assessed against the long-term public interest, namely:

- Nominal (Public interest) pricing;
- Cost avoidance;
- Enterprise value; and
- Benchmarking.

These four options were chosen for detailed review because: they have all been used as inputs to valuing spectrum by leading regulators; depending on the specific context, they can each have economically beneficial properties; and they demarcate an upper and lower band for setting economically rational spectrum prices.

On balance, the public benefit of low (nominal) spectrum renewal prices in the ESL context outweighs any benefit from the other approaches and their likely higher renewal prices. Cost avoidance, enterprise value and benchmarking, which attempt to calculate an economic value for spectrum, are not valid for ESL because, as explained in the previous section, the rationale for basing renewal prices on economic value is not justified. Furthermore, cost avoidance and benchmarking may not accurately measure the economic value of ESL spectrum in any case due to methodological issues analysed in this section.

Other issues arise in spectrum valuation which were not considered relevant to ESLs and therefore were not considered in detail:

- “Revenue protection” i.e. the value associated with being able to provide the capacity and quality needed to maintain market share and thereby maintaining revenues is not considered because substitutable spectrum is available and network densification is also an alternative to maintain service levels.
- Option value is particularly important when a company has flexibility in how it can use assets, particularly when a market is volatile. The option to scale back or accelerate deployment, if available, confers a benefit. However, options values are private and difficult for regulators to estimate. It would also be difficult to separate the option value of ESLs from the other spectrum that operators hold. Further, ESL spectrum has already been deployed, so the value of flexibility is limited to potential future redeployment, e.g. to new technologies.
- Strategic value is also private to the operator and depends on commercial objectives and future market positioning. As such, strategic value is not directly observable and difficult for external parties to estimate.

4.1 Nominal (Public interest) pricing

In the ESL Consultation, the ACMA raises the principle of renewal prices taking into account public interest considerations and notes some examples of such pricing arrangements including the minister previously directing the ACMA on pricing for the re-issue of spectrum licences for rail safety purposes.

In this context, the public interest refers to potential wider benefits to consumers and/or industry beyond those accruing to the spectrum user. Clearly rail safety has direct wider benefits to the public over and above the operation of the railway.

However, the scope of public interest pricing is much broader than indirect benefits such as rail safety. Public interest pricing must also take into account the importance of mobile communications as an essential service to participate in society today and as a driver of digital transformation and socio-economic development through 5G and 6G

(as recognised by the ACMA¹⁴) over the next ten to twenty years, the time period under consideration for the renewal of ESLs.

[A public interest pricing approach to renewal fees can take into account the overall return to the community from both fees and the socio-economic impact of mobile.](#)

Depending on the relative priorities attached to generating tax revenue for the government on the one hand, and investment, innovation and competition on the other, a (standardised¹⁵) renewal charge could be set anywhere on a continuum between:

- The minimum charge needed to provide an ongoing incentive for operators to use the spectrum; and
- The amount that would fully extract the incremental economic value of the spectrum to the existing licensee who valued spectrum the least, typically the one with the least market share. Arguably, the assignment of ESL spectrum is efficient, so this is the theoretical maximum a regulator might consider. Above this level, the existing licence holder operator with the lowest value would actually give up spectrum to the detriment of its ability to maintain service levels. There is no economic principle, however, to suggest that charges should be set at this maximum, and although it would maximise the tax revenues from renewal it would have a detrimental impact on public benefit.

The following sections assess nominal (public interest) pricing against the relevant criteria of investment and innovation, competition, and supporting relevant policy objectives relating to rural, regional and remote areas (assuming that the existing allocation of ESLs is likely to be efficient). In addition to the ACMA's policy objectives, other considerations may also be relevant, e.g. under a Ministerial Policy Statement. An important piece of evidence in this assessment is the strong relationship between lower spectrum fees and higher public benefit for mobile in terms of its socio-economic benefits, i.e. because of the potential for greater capital investment into mobile networks, as discussed in the next section. This strongly implies that the balance of the public interest lies in setting renewal charges conservatively, towards to lower end of the continuum.

[Research indicates a strong relationship between low spectrum charges and the public benefit of mobile.](#)

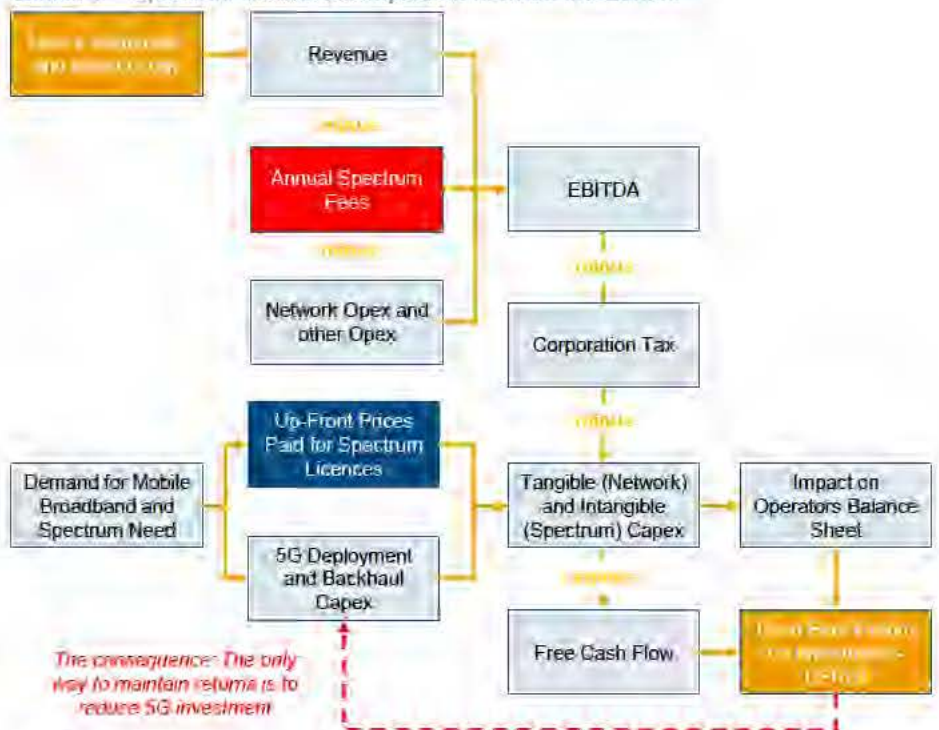
In general, spectrum licence fees are a significant cost for mobile operators. In most countries spectrum is auctioned and operators have to make large up-front payments for spectrum. The cost has to be recovered over time, including the cost of capital for the initial investment.

Operators need to generate cash to compensate investors or they would not be able to finance the investment in spectrum and network. Apart from raising retail prices – which may have a knock-on effect on market share or usage – the only other lever open to operators is to reduce tangible capital expenditure. I.e., operators could invest less in the network to bring overall capital expenditure to a level that can be financed. The diagram below illustrates these trade-offs.

¹⁴ ESL Finalised Framework (p20)

¹⁵ The ACMA would probably set a reference price per unit of spectrum per head of population which could be adjusted according to each licence

Exhibit 1: Spectrum licence fee impact on network investment



Source: Coleago

In short, high spectrum prices make the business case for mobile network investment less viable. This is all the more important because the outlook for investment in mobile is challenging in most countries given the ongoing pressure to expand capacity in line with fast growing demand and deliver innovative services over 5G and beyond. This is particularly challenging for non-incumbents due to the high level of fixed costs in the industry. Further, financially healthy and sustainable competitors are critical to constrain the incumbent's capacity to raise prices towards monopoly levels.

In addition, the risks to the public benefit are asymmetric, being greater for higher ESL renewal fees than for lower¹⁶. For example, if the spectrum prices are too high, spectrum risks crowding out investment, or being unused (evidence from spectrum auctions supports this, as set out in section 5). On the other hand, the efficiency losses if ESL prices are low are limited given the existing incentives on MNOs for efficient spectrum use¹⁷. This reinforces the argument to set spectrum fees conservatively.

The value of spectrum accrues to society and not to investors in mobile operators

A fundamental fallacy is to equate the prices operators paid for spectrum with the value of spectrum without stating to whom the value ultimately accrues. In a competitive market, prices decline to the point where operators just earn their cost of capital. There is no evidence that low spectrum prices increase enterprise value.

However, data from the ACCC Communications Market Reports shows that between 2014 and 2022 mobile services retail prices in Australia declined by 79% in real terms. During the same period operators' Return on Invested Capital did not increase. In fact, Optus' ROIC at 2% is well below its cost of capital. This demonstrates that the value of additional spectrum accrues to consumers and not to investors.

A situation where the operator returns are consistently below the cost of capital is not sustainable. Investment will decline and the Australian market will become less competitive. This is a very real danger for Australia.

¹⁶ As also noted by TPG and Telstra in their ESL Consultation submissions

¹⁷ Hence, TPG's concern in its ESL Consultation submission, that lower ESL prices may lead to inefficient spectrum use, is misplaced if there is evidence that ESL spectrum is in use

[Setting renewal prices conservatively can deliver substantial public benefit through innovation and investment in essential services, particularly mature 5G and 6G](#)

The potential conflict between high spectrum fees and the public benefit of mobile is even more pronounced given the substantial investment requirements that may be needed to deliver digital development in the future. As 5G matures through enhancements such as Standalone 5G, and as the commercialisation of 6G begins, mobile networks will provide even higher performance and a range of new services, some of which may be difficult to extrapolate from present trends. This is relevant as the licence periods of ESLs will fall into the early years of 6G.

Whilst forecasting precisely what the world of mobile communications will look like in 2030 is difficult, it may be quite different from what is currently envisaged in operator business plans. The design requirements for mature 5G are likely to include delivering a fibre-like experience with 100 Mbit/s downlink as well as low latency and cater for high traffic densities. A scenario where operators sell speed-based tariffs and compete on quality of service is plausible. If this is the case, then operators will have to cater for far higher traffic densities than today.

All this could require considerable investment at a time when operators are under significant financial pressure to earn their costs of capital, i.e. the PMP (“price per MHz Pop” of spectrum), including renewal prices, should fall to enable the major innovations that are expected to occur in 5G and 6G.

Furthermore, the new mobile use cases that will be supported by 5G/6G+ may be transformational in areas such as manufacturing and health services. For example, supporting low latency, massive machine type communications will facilitate smart cities that improve the quality of life for citizens and may deliver significant environmental benefits e.g. through supporting energy efficiency, environmental monitoring, precision use of pesticides in agriculture and connected cars.

As a result, there is a strong public benefit in aiming to keep spectrum fees as low as possible, and allocate as much spectrum to the market as possible.

[The experience of Finland suggests that low spectrum charges have considerable socio-economic benefits.](#)

The Finnish approach to spectrum assignment has led to spectrum licence fees being proportionately much lower in Finland than other countries as shown in the graph below – annualised spectrum fees as a proportion of mobile revenue were significantly lower in Finland (1.4%) than in many comparable EU countries, e.g. Germany (9.5%) and in Australia (6.9%). This reflects setting relatively low reserve prices in Finland and a policy to maximise the amount of spectrum available to operators thus reducing excess demand.

The graph below shows the impact of setting relatively low spectrum of mobile data use. Across the 12 EU countries in the sample, it shows an inverse relationship between annualised spectrum fees and average mobile data consumption, with 80% of the variation in data consumption between countries explained by differences in the annualised cost of spectrum. Mobile data consumption per head is a good proxy for the socio-economic value generated from spectrum. Hence, Finland leads most countries in terms of both low spectrum costs and socio-economic benefits.

Exhibit 2: Cost of spectrum and mobile data traffic (EU & Australia)



Source: Coleago. For Australia the data is 2022 revenue and cost of spectrum

The difference between Finnish and German performance is even more pronounced considering that Germany has a much larger population of 80 million compared to Finland's 5.5 million. As a result, German operators can achieve much better economies of scale. Secondly, Germany has a much higher population density compared to Finland, making it less costly to build coverage. Australia is similar to Finland in this respect, with a low population density. Finland has a large land mass with a population concentrated in major coastal cities and correspondingly low population density. As a result, economies of scale are poor and national coverage is more costly to provide. This also limits the number of viable competitors that the market can support, as discussed in section 5.

As well as higher data usage, the three Finnish operators also deliver 5G at more favourable prices given their lower spectrum costs. As the exhibit below shows, mobile users in Finland get unlimited 5G data and voice for €31.90 (AUD 43 excluding VAT) per month. German mobile users have to pay €84.95 (AUD 119 excluding VAT) per month for unlimited usage. Even for a mere 6 Gbytes, at €39.95, Germans still pay more than Finns pay for unlimited data.

Exhibit 3: Cost of spectrum and impact on consumers

Finland, annualised cost of spectrum 1.4% of operator revenue

elisa Unlimited

Carfise 5G 500M

- 500 Mbit / s maximum speed
- Unlimited internet: Finland, Nordic, Baltic countries
- 20 GB / month in the EU
- Unlimited speech and messages
- 5 Glocal Roam

31,90 € / month

Germany, annualised cost of spectrum 9.5% of operator revenue

Magenta Mobil XL **T-Mobile**

unbegrenzt

5G-Netz inklusive

84,95 € mtl.

24 Monate Vertragslaufzeit
zzgl. 30,95 € einm. Bsp.

Source: Coleago

Lower renewal fees will also generate public benefit through strengthening competition

The level of competitive intensity in Australia will also be affected by the level of renewal charges. As noted in section 3 above, the tendency of mature mobile markets to consolidation, due to the predominance of fixed costs, combined with the

geographical challenges of providing mobile coverage in Australia makes maintaining more than a three MNO mobile market in Australia a challenge.

High renewal charges would significantly increase the share of fixed costs in relation to total costs in Australia since the amount of spectrum to be renewed between 2028 and 2032 is substantial. This would amplify the fixed cost problem and the disparities in economies of scale of the three network operators. As a result, the market would be further skewed towards Telstra and competitive intensity would weaken, especially in rural and regional areas.

How might such a weakening of competitive intensity affect end-users?

The following types of negative impacts on service provision, network performance and consumer benefits from mobile can be expected:

- Telstra's (incumbent) rivals may be forced to try recouping high spectrum charges through increasing retail prices (subject to the impact on their market share) – so any tax on spectrum becomes a tax on the wider public if prices rise overall;
- TPG and Optus will also exercise less of a competitive constraint on Telstra, so it is likely that overall retail prices will go up in any case. Put differently, the price premium Telstra enjoys over other operators will increase because lower unit costs will translate into better financial performance and enable Telstra to increase its brand strength by investing more in its network, marketing and sales;
- Instead of increasing retail prices, TPG and Optus may be forced to divert fewer resources to network investment in order to earn their cost of capital. Again, this would predominantly affect regional and rural areas. Over time, network performance would decline and congestion increase. An operator may find this preferable to increasing prices in the short term because it is generally harder for end-users to compare differences in network performance than price. However, in the longer term, such a strategy would have an impact on market share. Two related actions to reduce costs could be to:
 - Deploy new technologies more slowly than they otherwise would and be more risk averse in their attitude to innovation;
 - Consider again options for network and spectrum sharing, such as the TPG-Telstra deal that was rejected by the ACCC and then this decision was upheld by the Competition Tribunal in 2023, with attendant risks to competition;
- Finally, if the main effects of high spectrum fees were concentrated in regional and rural areas, whether on prices or service quality, the digital divide could potentially increase.

Nominal (Public interest) pricing properly applied is unlikely to lead to inefficient spectrum hoarding.

Concerns over using pricing to incentivise efficient use or to disincentivise inefficient spectrum hoarding are also largely misplaced in the renewal context, particularly where the secondary market provides ongoing incentives for efficiency. Moreover, under-utilisation of spectrum in the short term does not necessarily indicate spectrum hoarding. Operators may strongly expect that the spectrum resource will be needed in the future as data demand increases in general or to cater for an expected increase in technology specific traffic, e.g. as the uptake of 5G capable end-user devices grows.

Hence, the risk of hoarding is likely to be low¹⁸. Moreover, if the ACMA were to set higher spectrum fees to combat hoarding, any benefit is likely to be outweighed by the negative impact on competition. If further protection against hoarding is considered necessary, it can be addressed through the ACMA's current ESL framework.

¹⁸ The risk of hoarding will also vary with the size of the operator because the opportunity cost of hoarding is likely to be proportionately higher for smaller operators than larger incumbents.

Specifically, the information gathering exercise in Stage 2 should provide the ACMA with the evidence to assess if spectrum is being hoarded.

Similarly, although windfall gains could in theory arise under public interest pricing, the fact that renewal is judged as being in the public interest means that such licences are essential to meeting existing and future demand for services and are unlikely to be resold unless market conditions change. Further, as stated above, there are asymmetric risks attached to the level of spectrum prices. Hence, concerns that public interest prices could be “too low are significantly outweighed by the benefits of taking into account the overall return to the community in setting renewal prices.

In contrast, operators will need to carry out spectrum valuations to assess whether to take up offers to renew spectrum. Operators will calculate the incremental value of spectrum on the business applying discount risk factors to the value, however, this does not imply that renewal fees should be set on the same basis for the reasons set out in this section and in the discussion of cost avoidance pricing in section 4.2 below.

Furthermore, It is essential that operators know which spectrum is able to be renewed and which is not, prior to conducting any internal valuations. This is because value of one spectrum allocation critically depends on the other spectrum resources that an operator holds. With potentially seven bands to consider, the number of combinations would be considerable and unmanageable – the risk operators under or over value spectrum would be correspondingly huge in this scenario.

Conclusions

In summary, reissuing ESLs and setting renewal charges conservatively, on the basis of nominal pricing, will maximise the overall return to the community by promoting network investment, network performance, competition and efficient spectrum use. Hence, nominal pricing for ESL will best satisfy the long-term public interest.

Since ESLs were exposed to incentives for efficient spectrum use when initially allocated and face ongoing incentives e.g. through spectrum trading, it is unnecessary to duplicate these incentives by setting ESL prices according to economic value. ESL allocation should be considered efficient by default.

ESL prices should therefore be set as low as possible given that low spectrum fees drive higher network investment and mobile usage, as shown by the leading performance of countries that pursued low spectrum fees as part of public policy such as Finland in relation to their European peers.

Other research also shows that the public benefit from mobile communications will be significantly higher in terms of mobile data usage and that network performance (data speeds and quality of experience) will be better with lower spectrum fees:

- A 2016 NERA Consulting report demonstrated that, lower spectrum fees in Australia would forego \$18USD/pop but would result in \$83USD/pop increase in consumer welfare¹⁹.
- Academic research shows that the welfare benefits of allocating spectrum to the market at lower costs outweighs any foregone government revenue²⁰.

It is also important to note that the risks in ESL pricing are asymmetric. Setting prices “too high” risks crowding out the investment that delivers wider public benefits to the community. In contrast, the risks of hoarding and inefficient spectrum use if ESL prices are set “too low” are limited given the various incentives for efficient spectrum use.

Competition will be healthier and more sustainable. This will help reduce the digital divide in regional and rural areas as well as reduce the risks to competition in the challenging domain of delivering of 6G services.

19 NERA, Effective Spectrum Pricing: Supporting better quality and more affordable mobile services, Report for the GSMA, February 2017, p.35

20 Hazlett & Munoz, 2009, A welfare analysis of spectrum allocation policies, RAND Journal of Economics, Vol. 40, No. 3, pp. 424–454

Moreover, the government finances will benefit substantially from the tax revenues brought in by the additional economic activity that setting renewal charges at a similar level to Finland would stimulate. Hence the longer-term socio-economic benefits from setting low renewal charges significantly exceed any short-term benefits of high renewal charges for the public finances.

4.2 Cost Avoidance – capacity and/or coverage

Cost avoidance approaches such as calculating Optimal Deprival Value (ODV) seek to estimate the value of spectrum in terms of the additional costs operators would incur if they did not have access to a certain amount of spectrum. Typically, the rationale for using cost avoidance to set spectrum fees is to incentivise efficient spectrum use.

However, because the allocation of ESL spectrum is already likely to be efficient, there is no justification for basing renewal fees on willingness to pay in order to incentivise efficient spectrum use.

Consequently, setting renewal fees on the basis of cost avoidance pricing is unlikely to be in the public interest. In addition, there are two major practical downsides of a cost avoidance approach.

- The cost avoidance methodology does not produce one unique spectrum price;
- Cost avoidance is a theoretical construct which does not reflect actual business practice in a number of important ways which undermine its legitimacy as a regulatory instrument.

Absence of a unique price under cost avoidance

Spectrum value as determined by cost avoidance depends on a number of factors, hence if a cost avoidance methodology is applied to each operator, it will produce a different result. These factors include the following forecasts of:

- Number of cell sites and site density;
- Existing spectrum holdings and possible future acquisitions of spectrum;
- Spectrum utilisation;
- Size of the customer base;
- Network traffic
- Technology/technology specifications
- Use cases
- Economies of scale of the network;
- Network coverage
- Commercial strategy and market positioning;
- Equipment vendor costs.
- Weighted average cost of capital

The interaction between these factors is complex and may work in different directions for any one operator. For example, larger operators may have greater economies of scale and lower unit costs than smaller operators – this might reduce cost avoidance. However, larger companies might position themselves as providing higher network coverage and quality which could work in the opposite way in terms of cost avoidance. Additionally, most of this information is confidential, operators are likely to be unwilling to share it with a regulator, and are likely to be subject to contractual restrictions to maintain confidentiality from vendors.

Another complication is that fees based on cost avoidance should be specific to each operator if the objective is to replicate the outcome of a competitive spectrum market (though such an aim is not valid for renewal fees). However, asymmetric pricing could

be challenged on the grounds that it is unfair and discriminatory for spectrum licence renewal. It could also lead to perverse outcomes where an operator is penalised for success by incurring higher renewal fees. For example, high data usage could lead to higher network utilisation which could increase the level of network densification required to compensate for a loss of spectrum in the cost avoidance calculation and thus a higher renewal fee.

One approach would be to calculate a uniform renewal fee based on the cost avoidance for a "standardised" operator. Although some operators would arguably benefit more than others in terms depending on how they related to the standard operator. However, this introduces a great deal of subjectivity in the design of the standard operator and could lead to unintended consequences. For example:

- If an average of the industry players is chosen as the standard, the renewal fee may be too high for the smallest operator to have a viable business case for renewed spectrum (though given the complexity of the calculation this is not certain).
- The standard could also be that of a (reasonably) efficient operator taking into account the economies of scale in the network. If the reasonably efficient operator were based on Telstra, this could intensify Telstra's competitive advantage and in turn widen disparities between the operators' economies of scale. Taken to its logical conclusion, this could over time force the other operators to exit the market leading to a Telstra monopoly. Clearly this would result in a failure in public policy with no competition, higher retail prices for consumers and less infrastructure investment and resilience.

To illustrate the differences in economy of scale, the table below shows two high level indicators of the economies of scale for all three operators in Australia using the number of subscribers per MHz and per site (presented as an Index for easier comparison). Each measure is a proxy for the unit cost of serving customers, hence the higher the Index for subscribers per site or per MHz, typically the lower the unit cost and the higher the economies of scale/cost advantage enjoyed by the operator. The table therefore provides evidence to support the view that setting spectrum prices on a cost avoidance approaches carries significant risks for competition due to the fact that Telstra's economies of scale are much higher than those of Optus and TPG.

Exhibit 4: Economy of scale measures

	TPG	Optus	Telstra
Index: subscribers / MHz	100	112	233
Index: subscribers / site	100	126	151
Spectrum excluding mmWave (metro areas)	225	380	280
Sites	5,728	8,632	11,002
Mobile subscribers	4,719,740	8,959,652	13,695,000

Source: Coleago, Optus, Mobile Infrastructure Report 2022; ACCC

The limitations of cost avoidance as a (theoretical) construct

Commonly used methods used by regulators to calculate fees based on cost avoidance such as optimal deprivation value (ODV) are theoretical constructs which do not reflect business decisions taken by companies in the real world.

Hence, there is no guarantee that setting prices based on cost avoidance will have the desired effect on efficiency or maximising the benefit from use of the spectrum and it may have unintended consequences.

To examine this in more detail, it is necessary to consider the key elements of an ODV calculation. ODV asks what would be the impact of taking away an increment of an operator's spectrum holding.

- Removing spectrum that is being productively used by an operator is unlikely to be in the public interest as this would reduce network quality. Operators can in theory densify their networks (deploy more sites) in the medium term, but quality would be affected until new sites came on stream. The company's ability to compete would also be damaged. There may be exceptional cases where the business case is unsustainable, but if the operator is at risk of failure, the best solution may be for spectrum or the entire business to be traded to another operator.
- Operators may not be able to densify their network. In (dense) urban areas, it may not be possible to deploy new sites to replace lost spectrum – there may be a lack of suitable sites, particularly in dense urban areas, and it may not be possible to gain permission to access those sites that are suitable (planning rules are making it increasingly harder to deploy sites in many urban areas). Deployment could be constrained and have a negative commercial impact on the operator.
- If spectrum is removed from one operator, who should the spectrum go to and what would the impact on the market? In the case of the 2nd and 3rd operators, it is most likely that any clawed back spectrum would go to the market leader (often the incumbent) further reducing competition. In Australia, this would further Telstra's spectrum holdings and entrench Telstra's market power.
- The impact depends on the size of each operator's spectrum holdings which may differ. For example, removing 2x5 MHz of 700 MHz spectrum would represent a much lower share of Telstra's spectrum holding (2x20 MHz) than Optus' (2x10 MHz) Therefore, the impact on Telstra would be much smaller than Optus in terms of the reduction in network capacity and the cost to Telstra for deploying additional sites in order to make up for the hypothetical reduction in spectrum would also be lower as a result.
- Densification allows the operator to re-establish quality in the medium term, but it also has a cost and the cost is typically even higher than the spectrum price if the spectrum price is based on cost avoidance. This would exacerbate fixed cost issues and could further undermine competition in Australia.

The auction avoidance variant is also unlikely to be in the public interest

An extension of the cost avoidance option – auction avoidance – has similar disadvantages to cost avoidance and its own specific downsides. Auction avoidance involves estimating the value to the licensee of ESLs and adding the value of avoiding the uncertainty and the potential costs of gaining access to the spectrum via an auction.

Since auction avoidance sets prices above the economically efficient price, it is effectively extracting a monopoly rent from ESL holders based on sunk costs of their existing infrastructure as discussed by NBN in their ESL Consultation submission.

Furthermore, as Optus noted in its ESL Consultation submission, operators do not inherently place any value on avoiding an auction, as auction participation will always carry the risk of incurring high auction prices. It also seems counter-intuitive to recognise that auctions have negative economic impacts, such as delays and disruption to investment due to uncertainty over future spectrum holdings, and that this could be avoided by setting spectrum renewal prices at a premium. Finally, Optus noted that the use of set-asides priced at a premium according to this methodology failed in the 2021 900 MHz auction as no operator took up the set-aside option.

Additionally, the prior application of the auction avoidance methodology in the 2012 renewal process was very unsatisfactory, as Telstra highlight in their ESL Consultation submission. Inviting operators to make confidential sealed bids (setting some prices on the basis of the highest sealed bid) was economically inefficient and the use of valuation modelling by Plum Consulting was opaque. However, even if the methodology were improved, setting renewal prices with reference to the overall return to the community will better satisfy the long-term public interest than the auction avoidance approach.

4.3 Enterprise value

An enterprise value or full enterprise valuation of spectrum estimates the total discounted value of future cash flows that are made possible by holding the spectrum over the duration of the licence. Setting prices this way captures the full value from holding spectrum. If spectrum prices were set higher than enterprise value, an operator would go out of business.

Future cash flows can be estimated by projecting forward end-user traffic demand and revenues and the associated network operating and deployment costs needed to serve them and comparing the value of the business with and without spectrum²¹. An alternative approach is to disaggregate the market capitalisation of business into its component parts (e.g. mobile, fixed, satellite) and attribute the value across spectrum and the other assets of that business component.

Similar to cost avoidance, enterprise valuation will not be in the long term public interest for ESL pricing because the allocation of ESLs is already efficient which removes the need to set ESL pricing to promote economic efficiency. There are also a number of specific reasons why enterprise value is not in the public interest.

Firstly, applying enterprise valuation to ESL penalises success, since anything that increases the valuation of the business, for example more intense use of spectrum or service innovation leading to higher revenues, ultimately feeds through into higher spectrum fees. If all the extra profit is simply clawed back through a spectrum fee, incentives to innovate and invest are low. Competitive intensity may also be lower as the profits from any competitive advantage would also ultimately be appropriated by spectrum fees.

Another disincentive to arises because enterprise value pricing does not take into account downside risks to operators. Operators would not achieve a return on their investment if the underlying forecasts for the enterprise valuation were not met. Hence, operators may scale back investment in spectrum and network if market conditions are uncertain.

Enterprise value pricing may also disincentivise efficient spectrum use. If enterprise value exceeds cost avoidance, operators would have an incentive to substitute additional sites for spectrum. Although it would lower their total costs, it would be highly wasteful and inefficient as it is very unlikely there would be a higher value use of the spectrum.

Finally, enterprise valuation can be challenging if a detailed financial modelling exercise is undertaken, given the complexity and uncertainty in predicting future cash flows such as future technology and demand trends. Disaggregating market capitalisation is also challenging because a number of subjective assumptions need to be made to divide the value of a business across its tangible and intangible assets.

4.4 Price Benchmarking

Benchmarking seeks to estimate spectrum prices by comparing a sample of representative spectrum fee information, usually auction prices (as renewal prices are not always available), from other countries, within a certain time period and adjusting where necessary for factors such as licence duration and frequency differences.

[There are major difficulties in using historical global \(or domestic\) price benchmarking to set future renewal prices.](#)

Renewal pricing is often unavailable and only auction pricing is public to be benchmarked so in fact benchmarking auction prices to determine renewal prices is inaccurate. Benchmarking renewal prices in other countries would be more appropriate.

²¹ Assuming there would be a subsequent ESL process at the end of a renewed licence term, it would not be necessary consider the terminal value of the business.

Further, operator spectrum valuation in an auction situation often does not only include cost avoidance, but can also include terminal value, revenue protection, incremental revenue (new use cases) while taking to account the operator financial situation and option value. These values also can be discounted by execution risk, operator margin, financial situation/affordability scale back to ensure share price and financial situation is not negatively impacted by the acquisition/renewal.

Benchmarked auction prices also do not take into account other elements of the overall return to the community such as investment, innovation and competition, there are a number of other challenges to benchmarking, both in general and in its application to renewal pricing.

Another reason why auction prices can be misleading is that speculative or new entrant bidding using the full enterprise value usually has little basis on operator values. For example, in the 2017 auction of unsold 700 MHz spectrum, TPG paid \$1.26bn for 2x10 MHz at a PMP of \$2.75. This was more than double the PMP of \$1.25 paid by Vodafone in the same auction (totalling \$286m for 2x10 MHz), or the reserve price of \$1.36 that Telstra and Optus paid for the 700MHz spectrum in 2013. Pro-rating or averaging the PMPs makes little sense and merely smooths out the extremes.

Additionally, using benchmarking to set renewal prices is also problematic because it is backward looking and hence not appropriate to use for pricing spectrum licences with licence terms extending forward from 2028²².

Benchmarking requires a large number of subjective assumptions to be made

Using benchmarks from prices paid for spectrum at auctions in other countries in the past to assess the value of spectrum in Australia is misguided. Essentially benchmarking relies on calculating an average price paid in different countries at different times, but the value of spectrum in a particular set of circumstances says nothing about the value of spectrum in another set of circumstances.

As a result, benchmarking lacks objectivity and a number of essentially arbitrary decisions have to be made on how benchmarks should be adjusted and used:

- Addressing differences in value arising from the number of sites deployed because the more sites deployed the lower the value of additional spectrum and the more existing spectrum available the lower the value of additional spectrum;
- Whether to benchmark outputs against the arithmetic mean or the median;
- Inclusion or exclusion of outliers and exclusion criteria, e.g. 3 standard deviations from the mean;
- Adjusting for macroeconomic factors such as GDP and exchange rates;
- Adjusting for licence specific factors such as duration, payment by instalment or lump sum, coverage obligations and technical licence conditions;
- Adjusting for difference in auction rules such as allocation limits.

Prices paid in spectrum auctions are in a large part driven by domestic market context

In addition to the many country specific factors listed in the previous sub-section, prices paid at auction are also highly driven by national spectrum policy/public policy factors. The Australian 3.4/3.7 GHz auction of 2023 illustrates the impact of spectrum policy decisions on prices paid..

- In the 3.7 GHz auction, most of the lots (77%, 200 out of a total of 260 lots) were sold at reserve price with 7 lots left unsold. As a result, the final auction price was largely set by the government in the form of the reserve price rather than the value placed on it by the operators. The lack of demand was driven by many factors, including the quantity of substitutable spectrum already allocated, allocation limits,

²² Conversely, backward looking and current data are more useful in considering whether spectrum has been in productive and efficient use and whether it is in the public interest to re-issue ESLs to the holders, as TPG suggest in their ESL Consultation submission

and the financial status of the participants. The only competition was in high population areas of Sydney, Melbourne, and expansion Brisbane, which are highly served markets by all three operators. There was no competition for spectrum in un/under-served markets.

- In the 3.4 GHz band, nearly half of the lots were sold at reserve price and nearly all were sold either at reserve or in round 1, again with 7 unsold lots.
- In the 3.7 and 3.4 GHz auctions, new entrants showed no demand for spectrum at the reserve price in either auction in under-served markets.

To summarise, this recent Australian example demonstrates that spectrum sold at reserve price is an outcome of public policy with the reserve price set by the regulator/government. Spectrum sold at reserve price demonstrated the reserve price was too high to encourage competition in the auction, with only one bidder willing to pay the reserve price. This was mainly Telstra who was only limited by the allocation limits.

Unsold spectrum is a sign that the reserve price was too high for any bidder. It should also be noted that Telstra, dominated the 3.7 GHz auction, acquiring 79% of all lots, spending 77% of the total auction price and acquiring up to the maximum of their allocation limits in nearly all products. In the 3.4 GHz auction, Telstra and NBN Co acquired all the spectrum.

To use auction benchmarks partially based on outcomes with significant public policy failures, where spectrum is unsold and high reserve prices have choked off competition for spectrum (allowing the incumbent to dominate the auction), distort efficient spectrum use and is not appropriate for setting ESL renewal prices.

Italy provides another example of intervention in spectrum prices. Italian operators paid three to seventeen times more for the 700 MHz spectrum than operators in Finland. Adopting the Finnish approach to making spectrum available for a near nominal price would in effect mimic spectrum policy in Finland, whereas adopting the Italian approach to maximise auction revenues would align Australia with spectrum licence fee policy in Italy. Calculating an average of the two is pointless.

In this way, price benchmarking depends heavily on the benchmarks used and runs the high risk of failing to reflect the context in which the spectrum is being allocated. The pricing of ESL spectrum must reflect careful consideration of how ESL spectrum can promote the long-term public interest for Australia.

Other public policy choices that have an impact on auction prices, hence complicating the use of benchmarking are as follows:

- Allocation limits (competition caps) have a significant impact on the final price, as seen in the 3600 MHz 2018 auction in Australia when regional spectrum sold at a price / MHz / population (PMP) many multiples higher in regional than in metro which went at reserve price, because one operator was not allowed to bid in metro. This was a direct impact of public policy and had little relationship with value.
- Technological specification and technology maturity also has a significant impact on PMPs. For example, TDD spectrum was priced at a PMP of \$0.03 in 2012 prior to specification for 5G, but was multiple times higher in the 3.6 GHz auction in 2018, post 5G specification.
- Reserving spectrum for new entrants can create artificial scarcity that can result in inflated prices for the operators and low prices for the new entrants, again as a result of public policy.

Prices paid for similar spectrum show a wide variation. There is an over 100-fold difference between the lowest and highest prices paid for similar spectrum. Even within a relatively homogenous set of countries spectrum prices for the same band in the same timeframe vary by a factor of 73. To calculate and average is meaningless.

Benchmarking is not appropriate to set renewal prices in Australia.

The Australian Government has a policy of developing digital Australia and recognises connectivity as a key tool to achieve this societal goal. Using benchmark prices from past spectrum auctions in countries which may not have, or still do not share, Australia's policy objectives is not appropriate.

If the ACMA decided that a benchmark were to be used, it should be that of Finland, where very low spectrum prices in combination with indefinite licence terms delivered four times higher data usage per capita compared to its peers which charged considerably higher fees for spectrum licences.

5 Re-issuing ESLs will further the public interest more than re-auctioning ESLs

This section discusses the reasons why the case for re-auctioning ESLs is weak and that the current allocation is likely to remain the most efficient use of spectrum.

5.1 Incentivising the efficient use of ESL spectrum through auctions is unnecessary

As stated above in section 3, ESLs have already been auctioned so their assignment should be presumed efficient by default, barring exceptional circumstances and provided spectrum is actually in use – i.e. it is unnecessary to re-auction ESLs to promote efficiency. Thus, ESLs are qualitatively different from new releases of spectrum for which auctions have become the default over the past 30 years and are seen as the best way to promote economically efficient spectrum assignment.

Exceptional situations could include a need for detailed replanning or defragmentation of one or more relevant bands, e.g. to consolidate assignments into larger contiguous blocks. However, even in these cases, an auction might not be the most appropriate mechanism:

- It would be much faster and more cost effective for the ACMA to work with industry to replan / defragment a band, and this could commence now and not wait until stage 4. While spectrum trading may help in very simple cases, in cases such as C-band, this is unlikely. For example, the many variations in spectrum boundaries between 3.4, 3.5, 3.6 and 3.7 GHz will make it difficult to reach a commercial solution to defragmentation and intervention will be necessary.
- Attempting to replan one or more spectrum bands through an auction might require a highly complex auction design to cover all the possible combinations of spectrum on which each participant might want to bid. There are limits to the extent to which auctions can effectively handle such levels of complexity and they increase the risk of auction failure²³.

Furthermore, as set out in section 3, the secondary market can also incentivise efficient spectrum use with the mobile market. Hence, there is little justification for re-auctioning ESLs from an efficiency standpoint given the existing incentives on MNOs to use spectrum efficiently.

[The extent to which auctions are essential to maximising the public benefit of mobile has changed in light of mobile market maturity and consolidation](#)

Although auctions have become widely used for mobile spectrum awards, mobile is much more mature now compared to when 3G networks were rolled out 20 years ago. Mobile networks in advanced countries have achieved high levels of coverage. Although the pace of technology change has not dimmed, it is now more a matter of long-term network investment supporting cycles of network enhancements and innovation rather than revolutionary changes to the network.

Similarly, markets have consolidated over the past 30 years and a consensus has developed (in terms of the outcome of merger control decisions. e.g. in Europe and America) that the number of players that best balances effective competition with the sustainable and profitable networks is three or four, depending on the population density of the country. Hence, while maintaining effective competition is important, spectrum assignment is seldom used directly to engineer new market entry.

²³ For example, package auctions – the type that would be needed to allow bidding on multiple combinations of bids – give rise to the so-called threshold problem. This refers to the difficulty for multiple small bidders to coordinate their bids in an auction. Although they collectively may value spectrum more than a single large player, they cannot express this in the auction and the spectrum ends up misallocated.

Further, mobile phone ownership is now near ubiquitous and is the primary means by which people communicate, consume social media, access government services and pay for goods. Mobile services are increasingly transforming business processes from agriculture to manufacturing to logistics. In other words, mobile communications has become an essential service for individuals and society.

Given that mobile communications markets have substantially changed since spectrum auctions were first introduced, the extent to which they remain essential to achieving the maximum public benefit from assigning new mobile spectrum has been challenged. This evolution in preferred methods of spectrum assignment is illustrated in the diagram below.

Exhibit 5: Evolution of mobile spectrum assignment approaches

	1985	1995	2005	2015	2025
Market demand		Mobile services are expensive used by the few	Mobile services affordable for all		Mobile services are an essential tool
Spectrum assignment focus		Focus on facilitating new market entry	Focus on additional spectrum for existing operators		Focus on licence renewal & additional spectrum
Operator profitability		Mobile networks are highly profitable	Mobile network profitability declines due to competition		Low profitably drives consolidation among operators
Assignment method		Comparative tenders (beauty contests) are common	Auctions dominate		Auction orthodoxy is being challenged

Source: Coleago

Finland is one example where regulators have taken a different approach when assigning new spectrum. Although auctions are used in Finland, promoting sustainable investment and maximising the socioeconomic benefits from mobile data are key public policy priorities. This is manifest in the setting of relative low reserve prices and reducing spectrum scarcity by releasing as much spectrum as possible per auction (which also tends to reduce competition for spectrum) in line with public policy. For example, in 2020, significant amounts of spectrum – 800 MHz – were auctioned in the 26 GHz band, and the licences were sold at the reserve price at the lower range of international prices on a like for like basis. Similarly, the 700 MHz licences auctioned in 2016 were also sold at the reserve price.

5.2 Re-auctioning ESL may exacerbate competitive distortions

Mobile markets are characterised by high levels of fixed cost which dominate the overall cost of providing services²⁴. In such markets, it is difficult to sustain more than a limited number of competitors because total fixed costs will increase for each firm in the market, but total revenues will stay the same. After a point, total revenues will cease to cover total costs. As a result, mobile markets tend towards concentration as they mature. Three or four players is widely regarded as striking the difficult balance between effective competition and enabling sufficient investment in networks and services to deliver digital economy objectives.

Australia, with a population of 26.3 million, is a relatively small market with a relatively high urban population across a large land mass: significant differences population density have manifested in distinct differences in levels of commercial investment and competition between urban and regional areas.

Areas of low population density exacerbate the fixed cost problem so that it is particularly difficult for operators with a lower market share to earn their cost of capital.

²⁴ According to Coleago Ltd. Research, the ratio of fixed to variable costs is 70:30 for a typical mobile operator

They enjoy lower economies of scale than their larger rivals and hence they suffer a competitive disadvantage.

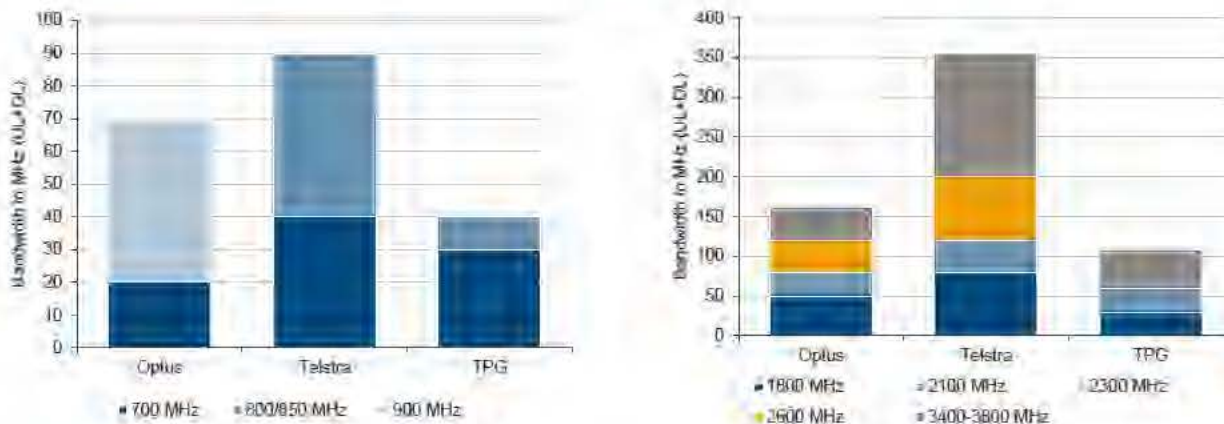
It is unlikely to be sustainable to support more than three mobile network operators in the Australian market in the long term. The history of consolidation in the sector over the last twenty years supports this view. However, while the Australian market supports three MNOs, Telstra maintains significant market share and enduring market power in the national mobile market.

Telstra has significant legacy network advantages, maintains more than 50% of useable spectrum in many regional areas and has been the recipient of the greatest proportion of Government funding directed to improving regional network coverage. Telstra is able to leverage these advantages to benefit from significant economies of scale, which enable it to charge a premium on its retail price without affecting market share²⁵.

The rejection of the MOCN arrangements was not a lost opportunity for regional Australia – if implemented, the agreement would have entrenched Telstra’s dominance in the 60-98.8% coverage zone, unconstrained by TPG which would have effectively become a Telstra reseller unable to effectively differentiate its service offerings. Policy should seek to address the distortionary effects of Telstra’s network advantage and promote improved coverage quality within the existing competitive footprint.

Given Telstra’s market dominance, there is a risk that re-auctioning ESLs would allow it to entrench this dominance and further undermine effective competition²⁶. For example, Telstra’s willingness to pay for spectrum may be increased by the prospect that gaining a higher share of spectrum will consolidate its competitive advantage and enable it to increase the retail price premium it currently enjoys in regional areas. This is illustrated by the 2023 3.4/3.7 GHz auction; Telstra won 79% of the 3.7GHz lots offered, more spectrum than Optus and TPG combined and was responsible for 75% of the total auction fees raised²⁷, acquiring close to the maximum allowed under the allocation limits. The table below illustrates Telstra’s spectrum dominance.

Exhibit E: Distribution of low and mid band regional spectrum²⁸



Source: Optus

²⁵ <https://www.accc.gov.au/media-release/accc-declines-not-to-grant-authorisation-for-telstra-and-tpg-regional-network-deal>

²⁶ Even Telstra, in its ESL Consultation submission, states that non-renewal of ESLs is likely to lead to an increase in market concentration and weaker competition

²⁷ <https://www.acma.gov.au/allocation-summingry-3437-ghz-bands-2023>

²⁸ Note, the 3400-3800 MHz spectrum quantities are an average weighted by the population within each licence area (based on 2021 census). The Telstra and TPG spectrum quantities are adjusted for 3rd party authorisations granted by TPG to Telstra

A reduction in competitive intensity would also have a knock-on effect on investment – the ACCC’s ESL Consultation submission emphasises the importance of competitive dynamics for investment and innovation. The reverse may not be true, i.e. attempting to promote competition and innovation by new entry will not be in the public interest if entry is not sustainable and if it weakens either or both of the existing competitors with respect to the incumbent. Facilitating failed new entry could ultimately result in spectrum remaining unused.

5.3 The justification for re-auctioning ESL to promoting new entrants is weak and will not maximise the wider public interest

The ACCC notes in its ESL Consultation submission that “This expiring spectrum licences process provides an invaluable opportunity for prospective new entrants to potentially access 7 bands of spectrum (for mobile use)”. However, it also states that it is not aware of any potential new entry into the mobile market²⁹.

The ACCC then summarises two examples of where spectrum was set aside, for new entrants to mobile or other uses, from New Zealand and Singapore.

These examples are not compelling. Where companies have successfully entered the market as MNOs, this has mostly been through new awards of spectrum rather than renewals. Further, re-auctions of ESL often fail to lead to new entry, for example the Irish multi-band spectrum auction of 2012³⁰ and the 2015 renewal of 900 and 1800 MHz spectrum in Germany³¹.

In the case of New Zealand, in 2019, 1800 and 2100 MHz licences were partially renewed. 30 MHz of 1800 MHz spectrum that had been in use was not renewed and held back for potentially alternative users or uses. 20 MHz of this spectrum was directly allocated to the Emergency Services Network and not a new mobile entrant. The other 10MHz at 1800 MHz was ultimately renewed to Vodafone³². Hence, the New Zealand renewal process did not lead to a new entrant either, and no evidence of new entrant demand for renewal spectrum emerged.

In the case of Singapore, the 4G auction of a number of spectrum bands (700 MHz, 900 MHz, 2.3 GHz and 2.5 GHz) in 2016 included a New Entrant Spectrum Auction (for frequencies reserved in the 900 MHz and 2.3 GHz bands). This was won by TPG, now trading as Simba (the company was EBITDA positive in financial year 2023 but has a long way to go to catch up with the other MNOs). Although this example shows that new entry may be possible via the re-auction of renewal spectrum, it is specific to Singapore and of limited relevance to Australia – Singapore is a city state and network is much easier, cheaper and quicker than a country the size of Australia where national coverage is king.

In conclusion, the precedents for using ESL to promote new entry appear limited. Furthermore, while the ACMA could reserve spectrum in the hope of encouraging new entry, it would have downsides for the public interest in terms of its impact on investment and service continuity (which would not be in the best interests of consumers). The ACCC has not presented any evidence to show that it would be in the overall public interest, consistent with all ACMA’s public interest criteria, to encourage new entry through ESL spectrum.

29 ACCC ESL Consultation submission, p.4

30 <https://www.comreg.ie/industry/radio-spectrum/spectrum-awards/multi-band-spectrum-award-2012/>

31 https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/DE/2015/150619_Frequenzversteigerung.html

32 <https://www.rsm.govt.nz/projects-and-auctions/completed-projects/renewal-of-management-rights-in-1800-and-2100-mhz-bands/>

5.4 Re-auctioning ESLs also risks delaying or reducing investments in 5G and 6G

Another risk from re-auctioning ESLs arises from the potential impact of further developments in 5G and 6G. This may require substantially larger contiguous holdings of spectrum than before, as quality of experience becomes more important. Already some commentators expect that 6G will have to deliver a fibre like experience. However, if an auction carries a strong risk of resulting in a more asymmetric distribution of spectrum and further consolidation, operators that are “underweight” in spectrum might be unable to match the quality of experience their rivals could offer. Hence, competitive distortions would be even greater as 5G and 6G develop.

The ACMA is likely to place allocation limits to mitigate all the above risks, however this is challenging and carries further risks in terms of regulatory failure. Moreover, the lower allocation limits that would be imposed in such an auction, the less competitive bidding is likely to take place and the weaker the justification for holding an auction.

[Re-auctioning ESL creates related uncertainty which is not in the public interest and is ultimately not in the best interests of consumers](#)

Re-auctioning spectrum would inevitably create some uncertainty over continued spectrum access, even though the ACMA has taken the decision to start the renewal process five years before the first licence expiry. This will be followed by an extended period prior to any renewal application being accepted since licensees may only apply for renewal two years before expiry of the licences. Further, indicative pricing will be needed for all bands so as to not to add to uncertainty, given the level of substitutability between certain ESL bands

This uncertainty over spectrum access will chill investment (delaying or scaling down plans) because mobile network investment requires long term planning, and there may be knock-on effects on network innovation. This could also affect operator bid strategies in auctions of new spectrum, because acquiring new spectrum while there is uncertainty over ESL renewal would feed into bidders’ valuations.

This brake on investment is particularly important in the context of the high level of investment required to mobile data demand and wider policy objectives for digital development through 5G and 6G networks, which will require substantial additional investment and carry their own technology related uncertainty.

There is also a risk to service continuity and quality because if an operator were to lose access to part of its spectrum holdings, this could impact its ability to maintain a consistent level of service, causing noticeable disruption to consumers in the short term. Operators would seek to respond as quickly as possible to maintain or reestablish service levels to their customers, but this would inevitably take some years to achieve.

Additionally, operators require a portfolio of low, mid and high band spectrum in order to offer a consistent quality of experience to their customers in all environments. Hence, it is important to consider the potential disruption to operators’ ability to provide high quality coverage (low band) as well as providing uncongested network capacity (mid band) and its impact on consumers.

Moreover, if re-auctioning ESL leads to a fragmentation of spectrum holdings, national coverage and service quality will be disproportionately affected to the detriment of consumers. This is because of the potential for increased interference due to the additional boundaries created between licensees. Operators may also cherry pick the most attractive areas, exacerbating fragmentation and further constraining the national network business case.

5.5 Auction design can be challenging and lead to unforeseen consequences: this also applies to ESLs

Auctions are inherently risky for all stakeholders, the ACMA included, as a mechanism for information discovery (about demand) and efficient spectrum allocation. The risk is disproportionate when information about demand is already evident and there are ongoing incentives for efficient spectrum use.

Firstly, if auctions are poorly designed, they carry a high risk of failure, typically characterised by a failure to sell all of the spectrum being auctioned. In a number of auctions, attempts to maximise revenues through high reserve prices have led to most bidders pulling out of the auction leaving most of the spectrum unsold and enabling the remaining bidders to gain a dominant position in the market, e.g. the Nigerian 2.6 GHz auction of 2016, the Indian 700 MHz auction (part of a multi-band award) of 2016.

Secondly, regulatory failure has also happened in auctions where the stated objective has been to promote efficient use of the spectrum, but the result was further consolidation of spectrum in the market, often with the incumbent gaining the greatest share and new entrants being unsustainable illustrating the challenges faced, for example:

- In the Australian 700 MHz auction of 2013, Vodafone did not apply, bid or hence win spectrum in the auction because the reserve price was set too high. This also illustrates how the value of spectrum can vary significantly depending upon the situation of the operators and may not promote competition since Telstra was the only MNO able to afford to buy 2x20 MHz in the auction and the other winner Optus only bought 2x10 MHz leaving 2x15 MHz unsold³⁵ and unutilised for a number of years.
- In New Zealand in 2014, a three-operator market, the regulator auctioned the 700 MHz, setting a cap of three 2 x 5 MHz blocks per operator. However, reserve prices for the 700 MHz auction were too high for the smallest operator, 2degrees, to acquire its fair share of three blocks. Following a second-round auction, one of the two larger operators ended up with four blocks.
- In the Canadian AWS auction in 2008, 2x20 MHz out of the 2x45 MHz spectrum being sold, was reserved for new entrants. However, most of the new entrants who acquired significant spectrum did not put it to good use: two went bankrupt and one later sold its spectrum to one of the previous incumbents.
- In the 2019 German 5G auction, former MVNO 1&1 Drillisch, a new entrant to the market acquired 3.6 GHz spectrum. However, it failed to meet the regulatory target of deploying 1,000 sites by end 2022, which some commentators believe reflects the fact that it could not afford / paid too much for the spectrum.
- In the Nigerian 2.3 GHz auction of 2013, the spectrum was won by new entrant Bitflux against one other bidder. A high reserve price discouraged others from bidding. However, Bitflux took three years to initiate a very limited rollout and its viability is doubtful given it only operates in a handful of locations.

Regulatory failure in auction design has also had significant consequences for spectrum licence renewal in some countries. Two examples are set out below.

Spectrum renewal in Norway

In 2013, the Norwegian Communications Authority (NPT) sought to renew 900 and 1800 MHz licences as part of a combined 4G auction alongside newly available 800 MHz spectrum. The licence duration was set for 20 years. However, NPT selected a first price, sealed bid combinatorial design for the auction. One of the features of first

³⁵ Vodafone's decision not to bid given the reserve price was likely also influenced by the fact that it had spectrum at 850 MHz. In contrast, Optus did not.

price sealed bid auctions is that bidders must bid strategically based on their understanding of competitor strategies, rather than on their true value.

This auction design did indeed have dramatic consequences. Tele2, Norway's then third largest mobile operator, won no spectrum at all, while a new entrant Telco Data (now Lyse) won a substantial portion of the spectrum on offer. Tele2 Norway struggled to maintain its competitiveness and exited the market in 2015 when it was bought by competitor Telia.

The new entrant Lyse had achieved a 12% market share by 2022³⁴ and had not established itself on the same level as Tele 2 Norway whose market share was 17% when acquired by Telia³⁵. Hence, competition in Norway has lessened substantially as a result of the poorly designed auction and the exit of Tele2, and consumers have lost out in terms of higher prices and lower service quality.

Spectrum renewal in Ireland

Ireland has consistently used auctions to renew spectrum licences. For example, the 2012 multi-band spectrum award re-auctioned expiring 900 and 1800 MHz licences alongside new 800 MHz spectrum.

A multi-band auction allows operators to determine their optimal holdings across a range of bands when a substantial amount of spectrum is coming to market in the same timeframe as other similar licences are expiring. However, the justification for re-auctioning the 900 and 1800 MHz spectrum in 2012 was weak given subsequent developments. First, new entrants did not acquire any of the re-auctioned frequencies. More importantly, the Irish market consolidated from four to three players soon after in 2013 (while this and spectrum trading might have been sufficient to correct any long term inefficiencies in the distribution of this spectrum between the incumbents).

Leading regulators assume that ESL spectrum use is likely to be efficient by default with the reissue of the licences to the existing spectrum holders as standard.

There are several different approaches to renewing mobile spectrum licences internationally, including reissuing licences to the holders, auctions and administrative re-assignments and hybrid approaches. However, the GSMA note that: "While auctions can work well for initial spectrum assignments, they are almost always inappropriate in the case of renewing mobile spectrum licences that are expiring"³⁶.

Moreover, a number of leading regulators with a strong track record for successfully auctioning new spectrum licences (the US, Finland, Canada, New Zealand) take the view, when it comes to renewal, that the public benefit is maximised by reissuing licences to the existing holders. They consider that spectrum assignments are likely to remain efficient by default, provided certain conditions have been met, e.g. that spectrum is in use and licence conditions complied with. Some countries, such as the UK and Japan (where reissue is based on service continuity and compliance with regulatory and licence conditions), effectively make the licences perpetual and they can only be revoked on grounds such as failure to meet licence conditions or for exceptional reasons. This approach is recommended by this paper in Australia.

³⁴ <https://www.mobileeurope.co.uk/norway-s-lyse-to-buy-ice-and-create-convergent-fixed-mobile-operator/>

³⁵ <https://www.teliacompany.com/en/news/press-releases/2014/7/teliasonera-acquires-tele2s-norwegian-operations-and-accelerates-nationwide-4g-roll-out/>

³⁶ Auction best practice, GSMA Public Policy Position, September 2021, p.5, <https://www.gsma.com/spectrum/wp-content/uploads/2021/09/Auction-Best-Practce.pdf>

Exhibit 7: Markets with a strong expectation of licence renewal to existing holders

Country	Renewal expectation	Regulatory objectives and context
United States	Near Automatic	Timely network investment, continuous spectrum use, compliance with licence conditions. Continuous spectrum use is defined as, over any 180 day period, at least one site in the licence area used the spectrum.
Finland	Near Automatic	To promote the supply of digital services, the quality and capacity of broadband networks and efficient spectrum use – renewal if spectrum is in productive use. For example, applications to renew 900, 1800 and 2100 MHz licences in 2019 were assessed by beauty contest, focusing on network coverage. Fees were set separately based on the policy of minimising spectrum fees.
Canada	Strong	Investment, the provision of service to customers, long term stable use of spectrum where appropriate, compliance with licence conditions. The government has even stated that re-auctioning of spectrum would only happen in exceptional circumstances such as an overriding policy need ³⁷ .
New Zealand	Moderate	Service continuity, accommodating future growth in mobile demand, efficient spectrum use. The Ministry states that there is an expectation of renewal if spectrum is being actively used and there are no countervailing public policy grounds. Accordingly, most rights for 1800 MHz, and all for 2100 MHz were reissued to the incumbents in 2019 ³⁸ .

Source: Coleago

The central themes from the approaches to renewal summarised above is the importance of continued network investment, continuity, and service quality. They underscore the point that the spectrum management authorities in these countries consider that the public benefit is best served by giving mobile operators a strong or near automatic expectation of renewal.

Even in some countries where expiring mobile spectrum licences have been re-auctioned in the past, approaches are changing. In France³⁹ and Portugal, licences have been reissued to the holders in an administrative process linked to providing commitments to extending coverage. In Spain, legislation was amended to allow 40 year spectrum licences and recently auctioned spectrum has already been awarded for 40 years. The Ministry's rationale was *"to promote the deployment of modern and innovative electronic communications networks, encourage investment and consolidate Spain's leadership in connectivity"*. The Ministry also found that a 40 year licence term *"confers greater stability in the use of these frequencies of the radioelectric spectrum for the operators and allows operators can amortise required investments over a longer time"*⁴⁰.

³⁷ "Framework for Spectrum Auctions in Canada", Government of Canada, <https://ISED-ISED.CANADA.CA/site/spectrum-management-telecommunications/en/spectrum-allocation/framework-spectrum-auctions-canada#section36>

³⁸ "Cabinet Minute of Decision: Renewal of Radio Spectrum Management Rights in the 1800 and 2100 Megahertz Frequency Bands", New Zealand Cabinet, Feb 2019, <https://www.mbie.govt.nz/dmsdocument/4641-cabinet-minute-of-decision>

³⁹ In 2010, the French government reached a legally binding agreement with MNOs to improve LTE coverage, especially in rural areas and across the road and rail network, in return for reissuing the 900, 1800 and 2100 MHz licences to the incumbents for ten years at unchanged licence fees.

⁴⁰ https://portal.mineco.gob.es/es-es/comunicacion/Paginas/120523_consulta_publica_ampliacion_concesiones_uso_domicilio_publico_radioelectrico.aspx, (1 June 2023)

It is noted that a strong expectation of renewal could be given through the use of renewal statements that were brought in by the Modernisation Act 2020. Moreover, in the last major ESL process in Australia, the minister made the Radiocommunications (Class of Services) Determination 2012⁴¹ (COS Determination), which listed services for particular frequency bands, where, if the licence was used in the provision of that service, it was considered in the public interest for that licence to be re-issued.

5.6 Conclusions

The case for re-auctioning ESLs is weak given the evidence that the current allocation is likely to remain the most efficient use of spectrum and the further disadvantages of auctions compared to reissuing ESLs. The main reasons for this conclusion are as follows:

- Auctioning ESLs is unnecessary since the licences have already been auctioned;
 - The secondary market and profit maximisation also help to maintain efficient spectrum use over time as markets and technology change;
- Mobile markets are now more mature and have undergone significant consolidation which limits the scope for auctions to facilitate sustainable new entry and is leading some regulators to alter their approach to new releases of mobile spectrum. Further, the prospect of sustainable new entry is low as evidenced by the following:
 - The lack of participation of new entrants in recent auctions e.g. 3.4/3.7GHz
 - Very limited engagement by new entrants in the ESL process and responding to the ESL Consultation;
 - Hence, there is no compelling evidence of demand for re-auctioning from potential new entrants, and while the ACCC proposed re-auctioning ESL, it stated it was unaware of any such demand;
- Re-auctioning of spectrum can have unintended consequences and is not risk-free. In particular there is a risk of auction failure/stranded spectrum if reserve prices are set too high, as international experience has shown. “Testing demand” via an auction will have significant business impacts for incumbents and on competition that cannot be easily unwound if an auction fails. For example, it risks:
 - undermining of competition, particularly in a market structurally at risk of distortions of competition such as Australia and further concentration of spectrum in the hands of Telstra could spark pressure for further industry consolidation;
 - uncertainty, which can have a chilling effect on investment and the deployment of new technology;
 - disruption to service continuity, quality and coverage if incumbents lose access to spectrum that is in use since it may take time to bring new equipment or resources on stream to replace lost spectrum;
- Some leading countries which use auctions for initial awards of spectrum recognise this and have instituted a strong presumption of renewal to incumbents for ESLs;
- Moreover, if the spectrum is re-auctioned and the result is that the MNOs reacquire the spectrum this would be a failure of the auction process and public policy with no new use being identified but considerable disruption to the industry (and networks) should not be underestimated. If the auction resulted in further consolidation this would be a failure in competition policy

⁴¹ <https://www.legislation.gov.au/Details/F2012L00235/Explanatory%20Statement/Text>

Appendices: Benchmarking spectrum prices

Appendix A: Summary

Background

Telstra voiced support for benchmarking as the best determinant of market price and stated that benchmark prices show a declining trend. In the following it is shown that prices paid for spectrum licences at auction other countries say nothing about the value of spectrum to operators in Australia. Secondly, it has not been possible to replicate Telstra's finding from Telstra that "spectrum prices are falling".

Prices paid in spectrum auctions are in a large part driven by spectrum policy

Using benchmarks from prices paid for spectrum at auction in other countries in the past to assess the value of spectrum in Australia is misguided. Essentially benchmarking relies on calculating an average price paid in different countries at different times. However, prices paid at auction are in a large part driven by spectrum policy.

For example, in Italy operators paid three to seventeen times more for the same spectrum than operators in Finland. Adopting the Finnish approach to making spectrum available for a near nominal price would in effect mimic spectrum policy in Finland whereas adopting the Italian approach to maximise auction revenues would align Australia with spectrum licence fee policy in Italy. Calculating an average of the two is pointless. Australian policy makers need to be clear as to how they want to deliver the value of spectrum to Australian society.

The value of spectrum accrues to society and not to investors in mobile operators

A fundamental fallacy is to equate the prices operators paid for spectrum with the value of spectrum without stating to whom the value ultimately accrues. In a competitive market, prices decline to the point where operators just earn their cost of capital. There is no evidence that low spectrum prices increase enterprise value. However, data from the ACCC Communications Market Reports shows that between 2014 and 2022 mobile services retail prices in Australia declined by 79% in real terms. During the same period operators' Return on Invested Capital did not increase. In fact, Optus' ROIC at 2% is well below its cost of capital. This demonstrates that the value of additional spectrum accrues to consumers and not to investors.

A situation where the returns are consistently below the cost of capital is not sustainable. Investment will decline and the Australia market will become less competitive. This is a very real danger for Australia.

Using benchmarks to assess the value of spectrum is an unsound methodology

Benchmarking spectrum prices is widely used but it is an unsound methodology to estimate the value of spectrum to operators in Australia. In particular, benchmarking has a number of problems:

- Benchmarking is backward looking and hence not appropriate to use for pricing spectrum licences with licence terms from 2028 to 2042/44.
- The core assumption for benchmarking is that what a mobile operator paid for comparable spectrum in country A in year X is an indication of how much the same spectrum is worth to a mobile operator in country B in year Y. The wide range of prices paid for the same spectrum does not support this hypothesis.
- Benchmarking requires large datasets to be statistically significant. Usually, data from spectrum auctions covering more than a decade is collected and includes a wide variety of countries, local policies, and competitive situation.
- Adjustments need to be made for GDP, exchange rates, licence duration, annual fees, renewal, coverage obligations and other factors; this introduces subjectivity.

- Outputs from benchmarking exercises require interpretation: Should we benchmark against the arithmetic mean or the median? Should outliers be eliminated? Such adjustments create a degree of arbitrariness.
- Benchmarking lacks objectivity as is apparent from the debate on how benchmarks should be adjusted and used. Benchmarking is fundamentally flawed because the value of spectrum in a particular set of circumstances says nothing about the value of spectrum in another set of circumstances.

Prices paid for similar spectrum show a wide variation. There is an over 100 fold difference between the lowest and highest prices paid for similar spectrum. Even within a relatively homogenous set of countries spectrum prices for the same band in the same timeframe vary by a factor of 73. To calculate and average is meaningless.

Benchmarking is not appropriate set renewal prices in Australia

The Australian Government has a policy of developing digital Australia and recognises connectivity as a key tool to achieve this societal goal. The Minister wants the ACMA to “take a proactive regulatory approach, with particular expectations that the regulator promote investment, innovation and the adoption of new and emerging technologies, while continuing to safeguard the interests of consumers and small businesses.”⁴² Using benchmark prices from past spectrum auctions in countries which mostly did not have, or still do not share, Australia’s policy objectives is not appropriate.

If a benchmark is to be used, it is that of Finland, where very low spectrum prices in combination with indefinite licence terms delivered four times higher data usage per capita compared to its peers which charged considerably higher fees for spectrum licences.

Appendix B: Introduction

Spectrum pricing in the context of spectrum policy in Australia

The long-term public interest is the key for the ESL renewal and this policy should inform ESL renewal pricing.

The regulatory framework for spectrum licence renewal is set out in the Radiocommunications Act 1992 (the Act)⁴³ and the Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020 (the Modernisation Act 2020) which revised the Act.

Broadly speaking the ACMA has the power to decide whether to offer ESL holders the opportunity to renew licences on payment of a charge determined by the ACMA, or to not renew the licences and re-assign them, most likely by auction⁴⁴. However, the Minister for Communications, Urban Infrastructure, Cities, and the Arts can provide guidance on relevant policy objectives through Ministerial Policy Statements (MPS).

The critical assessment that the ACMA must make under the Act is whether renewal is in the long-term public interest. The public interest is broadly defined in the Act as “providing for the management of the spectrum in a manner that:

- facilitates the efficient planning, allocation and use of the spectrum;
- facilitates the use of the spectrum for:
 - commercial purposes;
 - defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes); and
- supports the communications policy objectives of the government.”⁴⁵

⁴² Minister Michelle Rowland, 12 December 2022

⁴³ Section 77C on the ACMA’s power to renew a spectrum licence

⁴⁴ The ACMA could also decide to partially renew licences to the existing holders

⁴⁵ Section 3 of the Act as revised by the Modernisation Act 2020

The ACMA set out its initial views on how it would do this in its ESL Consultation. Noting that the term public interest was not well defined in the Act, it proposed five criteria to guide its considerations:

- facilitates efficiency (often divided into allocative, productive and dynamic efficiency);
- promotes investment and innovation (also encouraging productive and dynamic efficiency);
- enhances competition;
- balances public benefits and impacts; and
- supports relevant policy objectives.

Section 294 of the Act gives the ACMA the power to set charges for spectrum licences and provides the ACMA with considerable discretion on how to set charges. Furthermore, the Minister has the power to give directions to the ACMA on setting charges and examples of what this may cover include setting charges that “reflect the amount that the Minister considers to be the value of the spectrum”.

The Minister may be minded to proposing spectrum price benchmarking to determine the value of spectrum in Australia. In this paper we provide evidence that looking at what prices were paid for spectrum in the past in Australia and in other countries is inappropriate.

Structure of the analysis

In the following sections we:

- explain that prices paid in different countries are a function the policy objectives of the particular country;
- show that the value of spectrum accrues to society and not to investors and hence placing a high price on spectrum is a form of taxation and provide a specific example showing the how pricing for 700 MHz spectrum in New Zealand harmed competition;
- highlight that using benchmarks is a backward-looking methodology whereas the renewed spectrum licences would cover the period 2028 to 2043 / 2048; and
- outline the rationale for benchmarking spectrum prices and explain the imitations of using benchmarking.

Appendix C: The impact of policy objectives on prices paid for spectrum

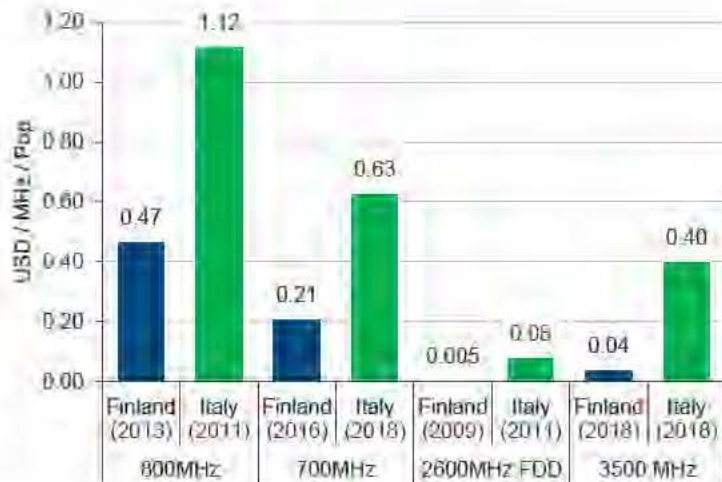
Some countries have an objective to maximise Government revenue from the assignment and continued use of spectrum rights, whereas others aim to make as much spectrum available as possible, as early as possible and at the lowest possible price.

Prices paid for 700 MHz spectrum in Italy vs. Finland serves as an illustration. Policy makers in Italy consistently had revenue maximisation objectives whereas policy makers in Finland did not. As a result, Italian operators consistently paid far more for spectrum than operators in Finland:

- 2.4 times more for 800 MHz spectrum
- 3.0 times more for 700 MHz spectrum
- 17.5 times more for 2600 MHz (FDD) spectrum
- 9.7 times more for 3500 MHz spectrum

Furthermore, spectrum licences in Finland are effectively perpetual, whereas licences in Italy expire after the initial period.

Exhibit 8: Spectrum prices paid Finland vs. Italy



Source: Coleago spectrum auction database

Adopting the Finnish approach to spectrum pricing would in effect mimic spectrum policy in Finland, whereas adopting the Italian approach to spectrum pricing would align Australia with spectrum licence fee policy in Italy. Calculating an average of the two is pointless.

Australian policy makers have clearly stated how they want to deliver the value of spectrum to Australian society. The Australian Government has a policy of developing digital Australia and recognises connectivity as a key tool to achieve this societal goal. The Minister wants the ACMA to “take a proactive regulatory approach, with particular expectations that the regulator promote investment, innovation and the adoption of new and emerging technologies, while continuing to safeguard the interests of consumers and small businesses.”⁴⁶

Therefore, if a benchmark for pricing spectrum is to be used, it is prices paid in Finland (see Exhibit 9 below), where very low spectrum prices in combination with indefinite licence terms delivered four times higher data usage per capita compared to its peers which charged considerably higher fees for spectrum licences (see Appendix A).

Exhibit 9: Benchmark spectrum prices paid in Finland

Band	Year	€/MHz/Pop	AUD/MHz/pop
2600 MHz FDD	2009	0.003	0.005
2600 MHz TDD	2009	0.006	0.009
800 MHz	2013	0.342	0.551
700 MHz	2016	0.199	0.321
3500 MHz	2018	0.036	0.058

Source: FICORA/Traficom

Appendix D: The socio-economic value of spectrum

It is a fundamental fallacy to equate the prices operators paid for spectrum with the value of spectrum without stating to whom the value ultimately accrues. In a competitive market, prices decline to the point where operators just earn their cost of

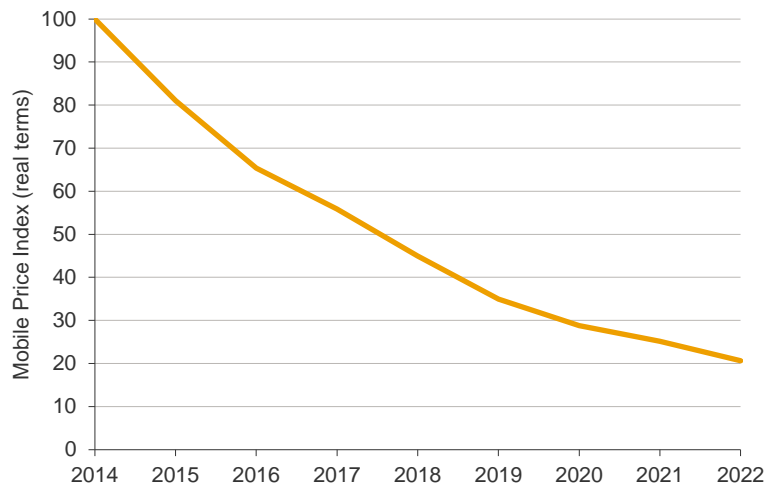
⁴⁶ Minister Michelle Rowland, 12 December 2022

capital. There is no evidence that low spectrum prices increase enterprise value. However, there is ample evidence that the investment to deploy additional spectrum generates consumer benefits. Exhibit 10 shows the decline in mobile retail prices in Australia between 2014 and 2022. The analysis is based on the price declines⁴⁷ reported in the ACCC Communications Market reports covering this period. The price declines are reported in nominal terms. The observation covers eight years and hence we have adjusted prices for inflation⁴⁸ and calculated an index with 2014 = 100.

The data shows that between 2014 and 2022 retail prices declined by 79% in real terms. During the same period operator's Return on Invested Capital did not increase. In fact, Optus' ROIC at 2% is well below its cost of capital. This demonstrates that the value of additional spectrum accrues to consumers and not to investors.

A situation where the returns are consistently below the cost of capital is not sustainable. Investment will decline and the Australia market will become less competitive. This is a very real danger for Australia.

Exhibit 10: Mobile retail price decline in Australia



Source: ACCC Communications Market reports and Coleago calculations

The finding that social gains far outweigh the benefit of any immediate gains from collecting spectrum licence fees has been understood for many years and is well documented in a 2010 paper by Hazlett and Munoz:

*"[T]he ratio of social gains [is of] the order of 240-to-1 in favour of services over licence revenues...Delicate adjustments that seek to juice auction receipts, but which also alter competitive forces in wireless operating markets are inherently risky. A policy that has an enormous impact in increasing licence revenues need impose only tiny proportional costs in output markets to undermine its social utility. In short, to maximise consumer welfare, spectrum auctions should avoid being distracted by side issues like government licence revenues."*⁴⁹

In the past there was still a rationale in spectrum auctions to ensure that new spectrum is allocated efficiently and hence the negative societal impact of high spectrum prices may have been a price worth paying. In Australia's ESL renewal process this rationale does not exist and hence the focus of spectrum pricing should be the value to society.

⁴⁷ Feature-adjusted price changes (%) for the hedonic approach

⁴⁸ All groups CPI and Trimmed mean, Australia, annual movement (%), Australian Bureau of Statistics

⁴⁹ Hazlett and Munoz, What Really Matters in Spectrum Auction Design, 2010

Appendix E: The impact of spectrum licence fees on competition

Spectrum auctions were initially introduced to deliver "efficient" use of spectrum and to ensure that the assignment process was transparent and objective. What do policy makers mean when they talk about "efficiency" in spectrum assignments? An efficient assignment of spectrum means assigning spectrum to those who generate the greatest economic value to society from the use of the spectrum.

"The key goal of any auction is to guide goods to those who value them the most. Spectrum auctions help identify the highest value use and users".⁵⁰

In a spectrum auction which is unconstrained by allocation limits, the value of spectrum from gaining competitive advantage or even driving a competing operator out of business is significant. However, if as a result of such an unconstrained auction a competitor ends up significantly weakened or driven out of the market this does deliver value to consumers.

"The private value for incumbents includes benefits gained by preventing rivals from improving their services. The value of keeping spectrum out of competitors' hands could be very high. However, this 'foreclosure value' does not reflect consumer value."⁵¹

The 700MHz auction in Australia in May 2013 provides an example of how private value differs between operators.

- There was an allocation limit of 2x25MHz. Vodafone and TPG did not bid, which indicates that the value of the spectrum to these operators was less than the reserve price. Optus could have acquired 2x20MHz at the reserve, but only acquired 2x10MHz. The business case of a particular operator and the ability to finance the spectrum acquisition lead to an uneven outcome. Clearly there was no "market price".
- Telstra had a materially higher market share and hence could achieve a sufficiently high value for 2x20 MHz and had the ability to finance the acquisition. The cost of deploying 700MHz radios does not depend on the amount of spectrum deployed in a radio. Therefore the deployment cost per MHz of spectrum to Telstra is 50% lower than for Optus. As a result of the auction Telstra deepened its cost advantage over Optus. These dynamics mean that competition in mobile network operation may not be sustainable in the long term if the cost of spectrum continues to add significantly to the fixed cost base of an operator.

The 700 MHz auction in New Zealand in 2013 provides an illustration of the negative impact on competition of high spectrum licence fees because it handed competitive advantage to the dominant operator in form of lower deployment costs

Exhibit 11: The 700 MHz auction in New Zealand

New Zealand is geographically a large country with a relatively small population of 4.5 million and hence low population density. In 2013, the mobile market was dominated by Vodafone and Telecom New Zealand, now Spark. The recent new entrant 2degrees Mobile has a small market share and significant coverage and spectrum disadvantage.

In 2013, band 28, consisting of 2 x 45 MHz of spectrum, was put up for auction in two stage auction.

- Stage 1, a spectrum cap of 2 x 15 MHz for each operator; and
- Stage 2, if there is unsold spectrum after stage 1, then end cap is removed.

⁵⁰ New Zealand Ministry of Business, Innovation and Enterprise, May 2013

⁵¹ US Department of Justice, Ex Parte Submission before the FCC, April 2013

The reserve price was set at NZ\$ 22 million per 2 x 5 MHz block were significant (0.40 US\$ / MHz / pop)

In stage 1 of the auction all three operators acquired spectrum at the reserve price:

- Vodafone: Three blocks @ NZ \$68 million
- Spark: Three blocks @ NZ \$68 million
- 2degrees: Two blocks @ NZ \$44 million.

Due to its small size and resulting lack of economies scale, 2degrees' valuation for three blocks was below NZ\$ 66 million and hence it only bid for 2 blocks.

In stage 2 Vodafone and Spark bid for the last remaining block.

- Spark paid NZ\$ 90 million for the last block.

There are two insights from this auction – firstly, with regard to the misleading nature of benchmarks and secondly, with regard to the weakening of competition.

Calculating a benchmark price and using this to assess the value of 700 MHz spectrum does not make sense. The benchmark price is neither representative of the value of spectrum to 2 degrees nor to Spark.

- Total auction receipts for 2 x 45 MHz amounted to NZ\$ 270 million. The average price per 2 x 5 MHz block was NZ\$ 30 million.
- 2degrees did not buy the third 2 x 5 MHz block for NZ\$ 22 million because it was worth less than NZ\$ 22 million to them.
- Spark bought a fourth 2 x 5 MHz block for NZ\$90 million because it was worth at least NZ\$90 million to them.

Source: Coleago research based on data published by Radio Spectrum Management of New Zealand

Given their significantly larger market share Spark and Vodafone, even before the auction, had a significant cost advantage over 2degrees. As a result of the spectrum auction, Spark and Vodafone further extended their cost advantage over 2degrees. The cost of deploying 700 MHz radios does not vary with the amount of spectrum. Spark acquired 40 MHz (four blocks of 2 x 5 MHz) and 2degrees only 20 MHz (two blocks of 2 x 5 MHz). Spark can deploy 40 MHz in one 700 MHz radio whereas 2degrees has only 20 MHz available to deploy in a 700 MHz radio. Therefore, the cost per MHz deployed for Spark is 50% of the cost to 2degrees.

Exhibit 12: Prices paid for 700MHz spectrum in New Zealand



Source: RSM New Zealand

The cost of spectrum licence renewal fees will have a far greater impact on TPG and Optus compared to Telstra. Given its market dominance and ability to extract economies of scale, spectrum licence renewal fees would put the three-player market structure in Australia at risk. The reduction in competition is not in the public interest.

The lower the spectrum licence renewal fees, the lower the risk of Australia losing another facilities based mobile operator.

Appendix F: Benchmarking spectrum prices, uses and limitations

The rationale for benchmarking

The logic behind benchmarking is that if appropriate adjustments are made for population and GDP and assuming some similarities between the cost of setting up and running a mobile operation, in principle the value of comparable spectrum should be similar across different markets.

Benchmarks can be analysed in several ways:

- The arithmetic mean (commonly referred to as an average) is the simplest measure but the measure is distorted by outliers i.e., extremely high or extremely low prices in the data set. However, it could be argued that very low and very high values should be included in when calculating a benchmark average because these values are a reality.
- The median, i.e., the halfway point between the highest and the lowest value, is used primarily for skewed distributions. The median is a better indication of central tendency (less susceptible to the exceptionally large value in data) than the arithmetic mean. In most cases the mean is higher than the median.
- The range is defined as the difference between the highest and lowest number in each data set. The range provides an indication of what prices may be considered realistic, depending on the factors which impact on operator's spectrum valuations in a particular country. There may be reasons for a wide range. For example, as a matter of policy a government might have decided to offer spectrum at a very low price. A high price may be the result of spectrum scarcity in a particular market.

Looking at how much mobile operators paid for spectrum at auctions is widely used to assess how much a spectrum asset may be worth. Prices paid in the past are used as benchmarks. Benchmark prices are calculated on a US\$ per MHz per head of population (\$/MHz/pop). Given that the benchmark dataset includes countries with very different levels of GDP per capita, \$/MHz/pop prices are normalised using per capita GDP or per capita Purchasing Power Parity⁵² (PPP) per capita GDP.

In the past, prices paid for spectrum differed substantially depending on the frequency range. Benchmark prices are calculated separately for low-band spectrum (<1 GHz), lower mid-band spectrum (between 1 and 3 GHz) and upper mid-band spectrum (above 3 GHz).

Further adjustments might be made to account for differences in licence duration, licence obligations such as coverage obligations, demand vs. supply, operator profitability, the auction format and rules, presence of spectrum caps, set-aside from new entrants, or some other material factor.

Benchmarks are backward looking

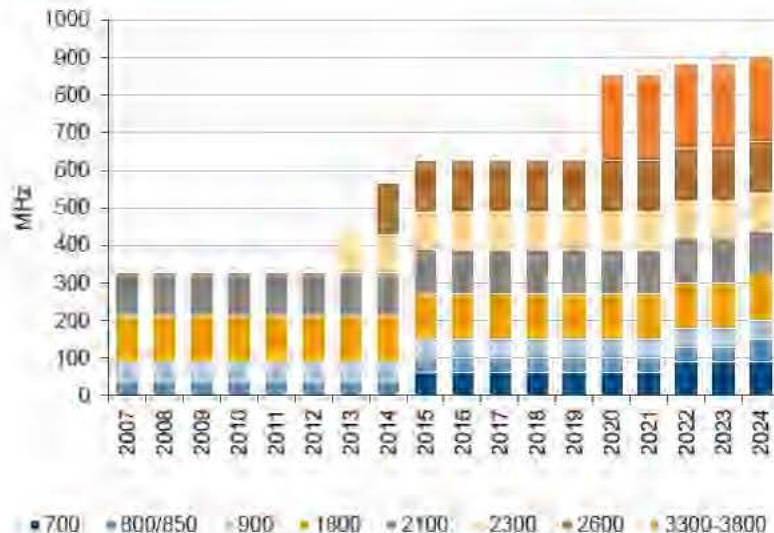
Many regulators use benchmarking to determine the reserve price or the price for an administered assignment or renewal. They look at prices paid in other countries in terms of \$ / MHz / per head of population and adjust, for example for differences in per capita GDP.

Using benchmarking to set spectrum licence fees is not appropriate because it is backward looking rather than forward looking. During the last ten years, the amount of spectrum allocated to mobile has increased and will continue to increase. Exhibit 13

⁵² Purchasing power parity (PPP) The rate at which the currency of one country would have to be converted into that of another country to buy the same amount of goods and services in of the two each country.

shows all low and mid band spectrum allocated to mobile operators in Australia by band in the period 2007 to 2024. In addition, in 2021, 2400 MHz of mmWave spectrum (26 GHz) was acquired by mobile operators.

Exhibit 13: Spectrum licenced to mobile operators



Source: ACMA, excludes mmWave.

Note: The dates are from when spectrum was available to mobile operators nationally or regionally.

The graphs below show how revenue per MHz declined in Australia from 2007 to 2022. They illustrate the challenge for mobile operators to generate an appropriate return⁵³ on capital by expanding the revenue side of the equation.

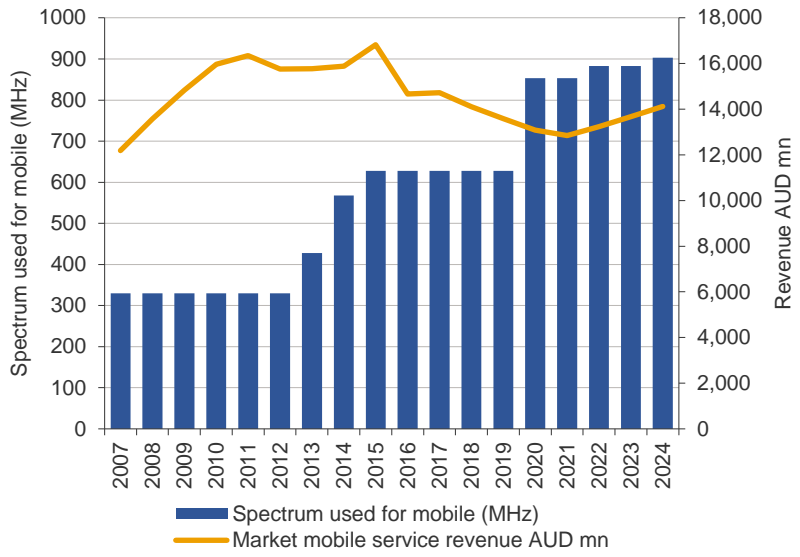
Exhibit 14 shows operator mobile service revenue and the amount of spectrum (excluding mmWave) used to produce that revenue for all mobile operators. Exhibit 15 shows that revenue per MHz used to produce that revenue is declining rapidly. Exhibit 16 and Exhibit 17 show the same data but include mmWave spectrum. The charts show that revenue is increasing marginally but the amount of spectrum used to produce that revenue is increasing rapidly.

This is evidence that additional spectrum does not increase revenue and that operators are passing the benefit of additional spectrum on to consumers and businesses who use mobile services. The need for spectrum is driven by the sharp increase in mobile data traffic. The spectrum is used to increase capacity and reduce the cost per bit. A lower cost per bit allows operators to pass on the benefit of additional spectrum to mobile users in the form of lower prices and higher data speeds. Lower prices may also reflect the fact that dramatic increases in average usage have allowed more efficient spectrum utilisation.

As a result, additional spectrum delivers socio-economic value far more than private value to operators. Furthermore, given that the mobile service revenue per MHz of spectrum used has declined sharply, spectrum renewal fees should in fact be substantially lower, on a per MHz basis, compared to what was paid in the past.

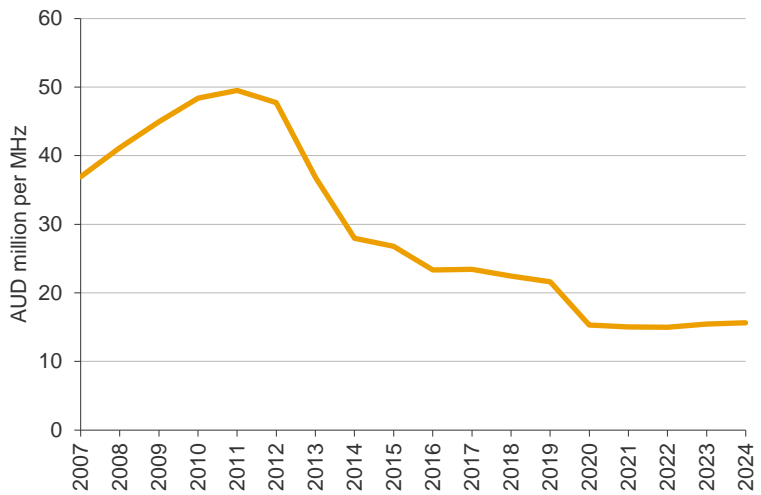
⁵³ We do not seek to quantify what an appropriate return on capital should be here. Rather, the issue is that operators need to generate cash to cover network and spectrum costs plus the cost of capital or they would not be able to compensate investors and finance their investment.

Exhibit 14: Spectrum (excl. mmWave) used and mobile service revenue



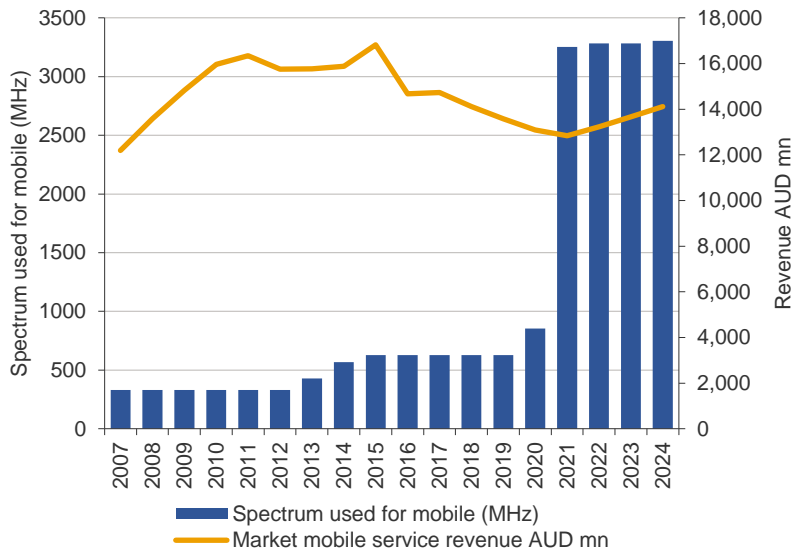
Source: Coleago, based on data from ACMA, Optus, and Bank of America Global Wireless Matrix. 2007 to 2022 are actuals. 2023 and 2024 are forecasts

Exhibit 15: Mobile service revenue per MHz of spectrum (excl. mmWave)



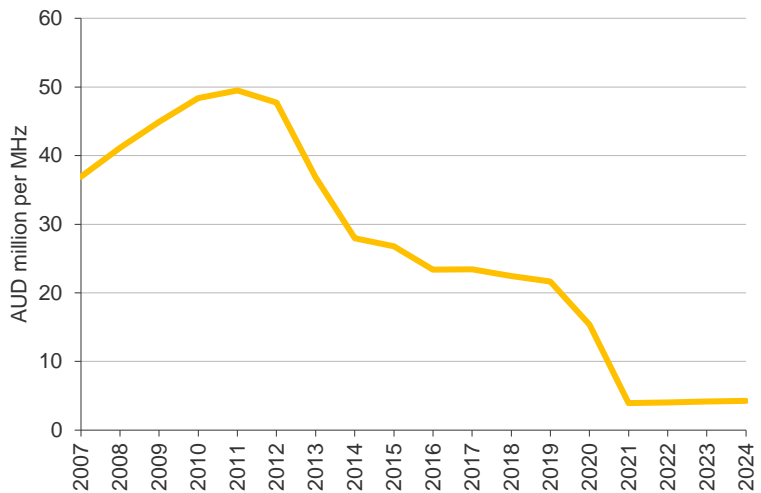
Source: Coleago

Exhibit 16: Spectrum (incl. mmWave) and mobile service revenue



Source: Coleago, based on data from ACMA, Optus, and Bank of America Global Wireless Matrix. 2007 to 2022 are actuals. 2023 and 2024 are forecasts.

Exhibit 17: Mobile service revenue per MHz of spectrum (incl. mmWave)



Source: Coleago

Limitations of benchmarking

The spectrum price benchmark data shown in this report should not be confused with a spectrum valuation exercise. The value of a particular spectrum asset is specific to a particular operator in a particular market and can only be ascertained through business modelling, i.e., what is the impact on cash flow of buying or not buying a particular spectrum asset.

Benchmarking is not a substitute for spectrum valuation. Benchmarks merely show what was paid by an operator in a particular market and set of circumstances but not the value of spectrum to another operator under a different set of circumstances.

There are factors which result in very different outcomes in terms of prices paid and even unsold spectrum. Auction format and rules, allocation limits (often referred to as spectrum caps), supply of spectrum at an auction vs. demand, reserve prices and other conditions, result in differences between prices paid. Set asides for new entrants have created artificial scarcity and auction rules can lead to very different prices being paid in the same auction for blocks within the same band e.g., Denmark's 2600 MHz auction.

Some benchmarking exercises attempt to adjust auction prices for other factors, for example the duration of a licence which can vary from ten years to perpetuity. However, duration is only one of many licence terms and there are many other variables for which an adjustment would be required.

In spectrum auction price benchmarks there is a wide range of auction results for any spectrum band across the world. From our research the outcome is dependent on several variables:

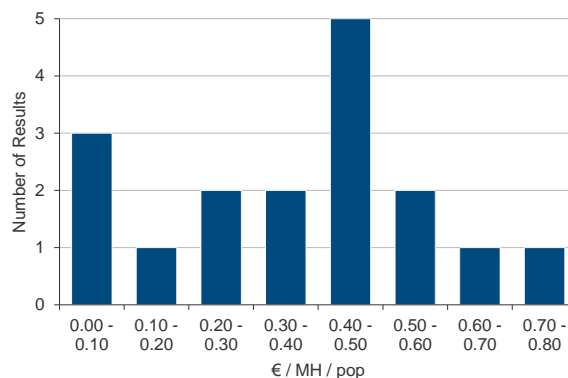
- The relative wealth of the country matters; there is correlation between mobile service revenue and GDP.
- Policy with regard to spectrum reserve prices is a key factor in explaining differences in spectrum auction prices paid between countries.
- Some regulators have deliberately created spectrum scarcity to drive up the gap between supply of spectrum and demand for spectrum, thus driving up prices paid.
- The competitive dynamic in an auction is a key factor in determining prices paid. Where there are more bidders for spectrum this tends to drive prices higher. There tends to be more competition in an initial licence award compared to a renewal award.
- Prices paid for spectrum are impacted by auction design and rules, the approach to spectrum lot packaging by the regulator and the amount of spectrum offered in the auction, whether there are allocation limits as to how much spectrum an operator can acquire, and the presence of set-aside for new entrants.
- The value of a block of spectrum depends on what other spectrum can be acquired with it. This fact is the motivation for using a combinatorial spectrum auction format such as a Combinatorial Clock Auction (CCA) where operators bid for packages of spectrum rather than individual lots.
- The duration of the spectrum licence impacts the results of auctions. Operators will be willing to pay a higher amount for spectrum which is available for a longer period.
- The current spectrum holding of the operator impacts their need for further spectrum and determines the network capital and operating cost avoidance opportunity of acquiring further spectrum.
- The level of fixed annual licence fees in addition to the up-front auction-determined price varies between countries. For example, in Mexico the annual (non-auction dependent) licence fees represent two thirds of the NPV price of a typical ten-year licence. Hence if the up-front auction price paid is a relatively low number, this says nothing about the true cost of the licence to an operator. Due to high annual fees, the cost of spectrum to operators as a percentage of revenue is one of highest in the world.
- In some countries there is an initial licence duration but with a presumption of perpetuity. In other countries there is presumption of perpetuity.
- Some licences have onerous coverage obligations; others do not.

- Most countries allow amortisation of the licence fees, but some do not.
- Some spectrum licences have mandated MVNO access; others do not.
- The timing of an auction is relevant in the context of technology diffusion, e.g., the adoption of 5G and band availability in smartphones.
- The financial situation of operators and their ability to raise funds to finance the spectrum acquisition.
- The weighted average cost of capital (WACC) which is used as the discount rate to value spectrum varies over time and hence operator's spectrum valuations differ over time.
- The need for spectrum by operators varies over time. Demand for spectrum has increased significantly in the last decade as data usage has accelerated. Prior to 2000, spectrum prices were lower than the current levels as less spectrum was required to meet demand for voice usage. However, prices paid during the 2001 dotcom boom for 3G licences have not been replicated in later years.
- Many countries have poorly developed fixed networks and hence Wi-Fi is not available as a substitute to mobile access.

These aspects vary hugely from country to country and year to year. Attempts have been made to adjust for these factors, but this introduces considerable subjectivity. However, there are so many of these factors and regression analysis on a small dataset is inconclusive. and adjustments.

It might just about be plausible to conclude that benchmarking is an appropriate measure if prices paid for the same spectrum were clustered around the mean in the form of a normal distribution. However, clearly this is not the case as can be seen from the result of seventeen European countries for prices paid at auction for 800 MHz presented in Exhibit 2 below: The lowest price paid was €0.01 / MHz / pop and the highest €0.73 / MHz / pop. There is a very wide range, i.e., a factor difference of 73 between the lowest and the highest price paid. Therefore, calculating an average is not at all representative of the data set. In fact, calculating an average is highly misleading because it suggests some meaningful central value.

Exhibit 18: Range of prices paid for 800 MHz spectrum in Europe



Source: Coleago

The same conclusion can be drawn from the larger dataset used from our world-wide spectrum price benchmarking study for low-bands (sub-1 GHz), lower-mid bands (1GHz to <3GHz), and upper mid-bands (3.3GHz to 4GHz). xxx below shows the mean median, maximum, and minimum prices paid at auction in GDP adjusted AUD per MHz

per head of population (AUD/MHz/pop) for the three data sets. The data includes 366 auctions results during the past 15 years.

Exhibit 19, Prices paid for spectrum AUD/MHz/pop

AUD/MHz/pop	Low band	Lower-mid band	Upper-mid band
Mean	1.259	0.481	0.302
Median	1.094	0.217	0.141
Minimum	0.064	>0.000	0.009
Maximum	7.335	4.328	3.271

Source: Coleago spectrum auction database

Despite the relative inconclusiveness of calculating an average in a dataset with a wide range, averages are often calculated. However, if an average is calculated to make inferences, then the median is better than the mean because it is a better representation of the central value of a dataset. This is particularly relevant when there is a very wide range in the dataset (as is the case with spectrum price benchmarks) because outliers have a disproportionate effect on the mean. Therefore, if benchmarking against average spectrum prices, then the median rather than the mean is appropriate.

The most appropriate use of benchmarks is to assess where a valuation sits within the range of benchmarks. If a value is at the upper or lower end of the range or even outside the range, this may warrant investigation as to why this is the case.

Erroneous notion of market value of spectrum

Benchmarking is an attempt to ascertain a market value of spectrum. Given the wide range of prices paid, clearly there is no market value, not even within a country. The example of the 700MHz auctions in Australia and New Zealand demonstrate that a particular amount of spectrum has considerably different value, depending on the business case of an operator.

No trend in prices paid at auction

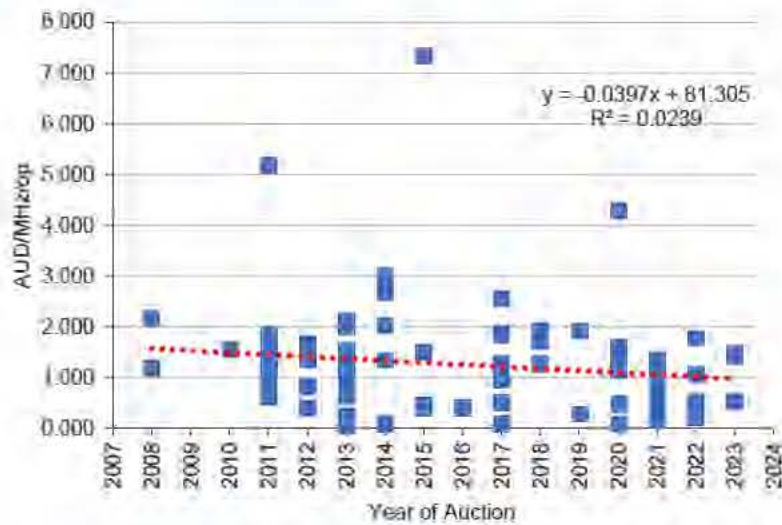
Prices paid for spectrum at auctions during the past 15 years are analysed in this section. The dataset only includes IMT (mobile spectrum) for auctions where data was publicly available for prices paid for particular bands. For Simultaneous Multi-Round Ascending (SMRA) auctions the data is usually available but for Combinatorial Clock Auctions (CCA) the data how much was paid for a particular band is rarely available. Hence most CCAs are not included in our analysis.

We did not discover a clear upward or downward trend. However, there appears to be a constant. Jurisdictions with low spectrum prices consistently have low spectrum prices and those with a high prices consistently have high prices. The comparison of prices paid in Finland vs Italy as shown in Exhibit 8 is a good example of this finding.

Our analysis confirms that policy with regards to pricing spectrum is a key determinant of prices paid at auction. It validates the conclusion that benchmarking spectrum prices is akin to importing the policy decisions of other jurisdictions.

Exhibit 20 below shows prices paid for low-band spectrum (sub-1GHz) in AUD/MHz/ per head of population (AUD/MHz/pop) adjusted for GDP per capita to normalise data to the Australian economy. The dataset includes 64 auctions. A linear trend line shows an R^2 value of 0.02, i.e. time does not explain variations in prices paid. I.e. there is no discernible trend in prices paid for spectrum. The chart also shows that there is a very substantial difference between the lowest and highest price paid in any particular year. These variations are due to Government policy with regards to spectrum pricing as well as the factors listed under 0 above.

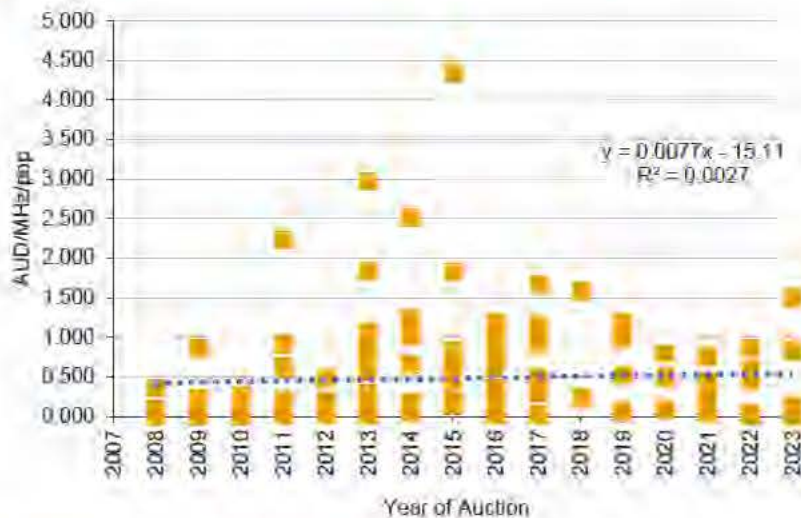
Exhibit 20: Low-band spectrum prices paid at auction



Source: Coleago spectrum auction price database

Exhibit 21 below shows prices paid for lower-mid band spectrum (above 1GHz but below 3.3 GHz) in AUD/MHz/pop. The dataset includes 134 auctions. A linear trend line shows an R^2 value of less than 0.01, i.e. time does not explain variations in prices paid. Even if high price “outliers” are removed, it is not possible to conclude that prices either increase or decrease over time. As with low-band spectrum, the chart also shows that there is a very wide range of prices paid in any particular year.

Exhibit 21: Lower-mid band spectrum prices paid at auction

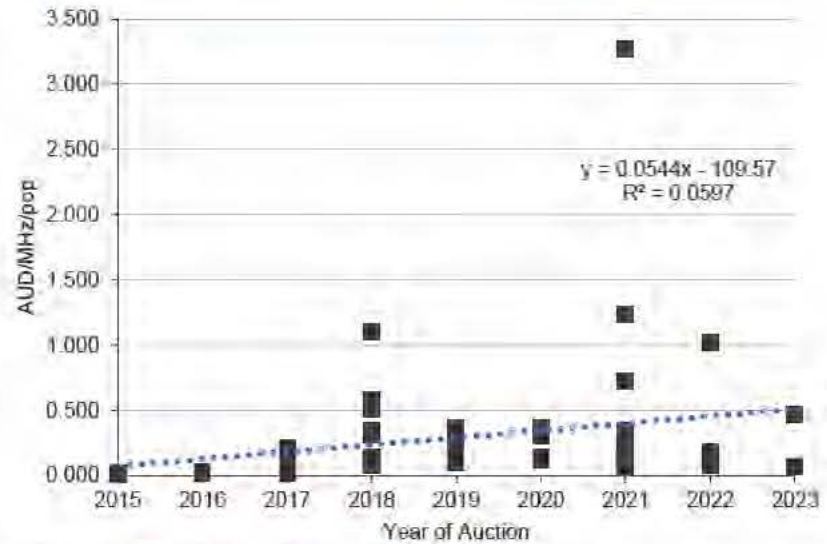


Source: Coleago spectrum auction price database

Exhibit 22 below shows prices paid for upper-band spectrum (above 3.3 GHz, essentially the C-Band) in AUD/MHz/pop. This smaller dataset includes 48 auctions since 2015. A linear trend line shows an R^2 value of less than 0.06, which means time is not a good variable to explain variations in prices paid, i.e. there is no discernible trend over time. Even if high the very price “outliers” is removed, it is not possible to

conclude that prices either increase or decrease over time. As with low-band and lower-mid band spectrum, the chart also shows that there is a very wide range of prices paid in any one particular year.

Exhibit 22: Upper-mid band spectrum prices paid at auction



Source: Coleago spectrum auction price database

The logo for Optus, featuring the word "OPTUS" in a bold, teal, sans-serif font. The letters are slightly shadowed, giving it a 3D appearance. The background is a soft, out-of-focus gradient of light colors.

Submission in response to
ACMA Consultation Paper

**Expiring Spectrum
Licences – Stage 3**

Public Version

June 2025

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Section 1. EXECUTIVE SUMMARY

- 1.1 Optus welcomes the opportunity to respond to the ACMA's consultation on expiring spectrum licences (ESLs). We support the ACMA's preliminary view that renewing all expiring licences for mobile services delivers the highest public benefit, particularly when used for wide-area wireless broadband (WA WBB) services.
- 1.2 Optus maintains our position on the use of public interest pricing but also recommends improvements to the benchmarking methodology and an increased focus on industry affordability and essential service delivery.
- 1.3 The pricing of ESLs will shape mobile network competition in Australia for the next two decades. If set too high, it risks market consolidation, reduced investment, and delayed infrastructure deployment – particularly in regional areas. Conversely, pricing within a sustainable range will enable all three mobile network operators (MNOs) – Telstra, Optus, and TPG – to continue investing in innovation and coverage and to meet social and government expectations.
- 1.4 To achieve this, Optus proposes a **two-stage pricing model** to establish the range of possible ESL pricing that best promote the public interest:
- (a) Establish a conservative benchmark through refined analysis – to set the upper bound of the range.
 - (b) Apply a 50% public interest discount, as permitted under s.294(2) of the Radiocommunications Act – to set the lower bound of the ESL price range.
- 1.5 This approach results in a **total industry renewal cost of \$2–2.4 billion**, a range that balances affordability, competition, and public benefit. Pricing above this range would jeopardise essential services, government policy outcomes, and the productivity gains enabled through a competitive mobile sector.
- 1.6 Optus further recommends:
- (a) **Instalment-based payments** aligned with licence durations, rather than upfront payments.
 - (b) **Upfront disclosure of final costs** to support corporate governance and financial planning.
 - (c) **Licence durations aligned to 2044**, harmonising expiry dates across low- and mid-band spectrum.
- 1.7 We support the renewal of licences without additional conditions, preserving national spectrum integrity and avoiding fragmentation. There is no evidence of failure in the secondary market, and we see no need to introduce a secondary licensing framework.
- 1.8 Optus' proposed pricing model promotes:
- (a) **Sustainable competition** by accommodating the financial capacity of all MNOs.
 - (b) **Regional investment** aligned with digital inclusion goals.

- (c) **Continued provision of essential services** dependent on mobile connectivity, supporting the implementation of key government policy objectives.
- (d) **Innovation readiness** for 5G Advanced, 5G-SA, 6G, and emerging LEOsat technologies.
- (e) **Support for emergency services** through broader, more reliable coverage.
- (f) **Financial viability**, reducing the ongoing fixed cost burden and supporting long-term investment.

1.9 In summary, a renewal price range of **\$2–2.4 billion** is essential to maintain a competitive, innovative, and inclusive mobile sector that supports national policy objectives and delivers long-term public benefit.

Section 2. INCUMBENT USE CASES AND THE PUBLIC INTEREST

- 2.1 Optus supports the ACMA’s preliminary view for each of the four identified incumbent use cases, and in particular the initial public interest derived from the use of the spectrum analysis that has been undertaken to date – and which finds that: ¹
- (a) WA WBB and FWA use cases “promotes, and are likely to promote, the long-term public interest derived from the use of the spectrum.”
 - (b) Rail communications use cases “promote, and are likely to promote, the public interest derived from the 1800MHz band in the short-to-medium term.”
 - (c) TOB use cases “promote, and are likely to promote, the public interest derived from the 2.5GHz mid-band gap in the short-to-medium term.”
- 2.2 Optus agrees with the ACMA that the proposed renewal process, together with support for lower spectrum pricing, will play a significant role in the ability for licensees to continue to invest in infrastructure and new innovations.
- 2.3 This section provides feedback on the evaluation of the ESL use-cases, specifically:
- (a) Mobile services (WA WBB);
 - (b) Fixed Wireless Access;
 - (c) Rail Communications; and
 - (d) Television Outside Broadcasting.

Mobile services (WA WBB)

- 2.4 The ACMA acknowledges WA WBB use-case includes “WA WBB networks, primarily to support national mobile voice and data services, but also including complementary use-cases like internet-of-things (IoT) and low Earth orbit satellite (LEOsat) direct to device (D2M) technologies.”² These are primarily used by MNOs – Telstra, Optus and TPG.
- 2.5 Optus broadly supports the ACMA’s preliminary views set out in Table 2 of the Consultation Paper that WA WBB use cases “promotes, and are likely to promote, the long-term public interest derived from the use of the spectrum” but considers greater caution be applied to the speculative benefits purported from satisfying complementary demand.
- 2.6 Incumbent use of spectrum for WA WBB is not disputed, with Optus in agreement that most public interest objectives can be demonstrated through:

¹ ACMA, 2025, Expiring spectrum licences – stage 3, Consultation Paper, April, p.12

² ACMA, 2025, Expiring spectrum licences – stage 3, Preliminary views paper 1: Incumbent licensee use-cases and the public interest, April, p.1

- (a) Continuous use of ESL spectrum to operate WA WBB networks since initial allocation of the spectrum in the 1990s and 2000s.
 - (b) Continued investment in, and deployment of, successive generations of mobile technologies and increased outputs generated from the spectrum.
 - (c) Use of secondary markets to facilitate more efficient use of the spectrum through defragmentation and consolidation.
- 2.7 Optus agrees that the ability of the MNOs to deliver competition, continue investment, and support key government policy objectives, is largely determined by the spectrum holdings of each MNO. Optus also agrees with the ACMA’s observation that industry sustainability, and financial appetite for increased investment under current economic conditions, is challenging – more so in the hard to serve locations which have historically been difficult to monetise for telecommunication services.³
- 2.8 Access to sufficient spectrum, at financially sustainable price levels, is a key determinant of an MNO’s ability to offer strong competition in regional areas, both in terms of providing a network that extends to regional areas and a network that has the capacity to service end-users in these areas.⁴
- 2.9 Optus agrees with the ACMA that the introduction of a national new entrant is highly unlikely, due to the barriers to entry in form of cost and time of deployment, the cost and availability of spectrum and the maturity of the Australian market. With existing competitive players struggling with low returns, it is unlikely that a new entrant will find this market an attractive proposition.
- 2.10 As such, the ACMA notes two recent and emerging developments within the mobile sector – the Optus/TPG MOCN agreements and LEOsat deployments – as significant potential drivers in enhancing the ability for MNOs to compete, particularly in regional Australia. The ACMA also acknowledges the potential of these arrangements, noting its preliminary support for these options in their consideration of licence duration.
- 2.11 Firstly, the ACMA notes that arrangements such as the Optus/TPG MOCN agreement will enhance investment and innovation in the use of spectrum. Cost-effective agreements will support efficient use of spectrum by allowing the parties to share network deployment and operational costs. Reduced costs on infrastructure and network operations inevitably lead to improved sustainability for competition in the mobile market.
- 2.12 Optus welcomes the ACMA’s recognition that “... the full benefits of the MOCN agreement rely significantly on access to ESL spectrum currently licensed to Optus and TPG.”⁵ It follows that ESL pricing should support the MOCN agreement and other innovative commercial uses of spectrum.
- 2.13 Second, the ACMA notes that LEOsat deployments represent an emerging use-case which has the potential to support competition by providing services to enhance

³ Ibid, p.8

⁴ Ibid, p.18

⁵ Ibid, p.10

connectivity in hard-to-serve locations. Renewal of ESL spectrum for WA MBB use will support further development of the LEOsat ecosystem in Australia.

- 2.14 While LEOsat D2M is unlikely to enable direct competition to terrestrial services on the basis of speed, capacity or capability, the ability of MNOs to support LEOsat D2M solutions open up a variety of new services that can target key government policies like regional digital inclusion, closing the gap objectives, and increased safety in remote areas.

Fixed Wireless Access

- 2.15 The ACMA acknowledges that FWA use-cases include “WA WBB networks to primarily support wholesale internet connectivity.”⁶ These are used by NBN Co.
- 2.16 Optus broadly supports the ACMA’s preliminary views set out in Table 3 of the Consultation Paper that FWA use cases “promotes, and are likely to promote, the long-term public interest derived from the use of the spectrum” but considers that the renewal of licences for FWA should not preclude NBN Co from participating in any future review to address the current fragmented design of the 3.4GHz band should that opportunity arise.

Rail Communications

- 2.17 The ACMA acknowledges that Rail use-cases include rail safety “voice, signalling and other control communications used to operate rail networks.”⁷ These are primarily used by a number of state-based rail authorities.
- 2.18 Optus broadly supports the ACMA’s preliminary views set out in Table 4 of the Consultation Paper that rail communications use cases “promote, and are likely to promote, the public interest derived from the 1800MHz band in the short-to-medium term.”⁸
- 2.19 We similarly recognise that continued reliance on ESL spectrum for rail communications in the short-term is likely to promote the public interest until a transition to arrangements in the 1900MHz band can be facilitated, and Rail’s existing holdings in the 1800 MHz can be returned for WBB use.

Television Outside Broadcast

- 2.20 The ACMA acknowledges that TOB use-cases include “communications to facilitate producing television, including coverage of live events outside of a production studio.”⁹ These are primarily used by free-to-air broadcasters.
- 2.21 Optus broadly supports the ACMA’s preliminary views set out in Table 5 of the Consultation Paper that TOB use cases “promote, and are likely to promote, the public interest derived from the 2.5GHz mid-band gap in the short-to-medium term.”

⁶ Ibid, p.1

⁷ Ibid, p.1

⁸ Ibid, p.1

⁹ Ibid, p.1

2.22 We similarly acknowledge the ACMA's preliminary view that given the requirements for TOB are less clear in the longer term, a holistic review of the 2.5GHz mid-band gap and TOB spectrum requirements should be encouraged.

Section 3. OPTIONS FOR ESL FREQUENCY BANDS AND THE PUBLIC INTEREST

- 3.1 Optus supports the ACMA's preliminary views set out in Table 6 of the Consultation Paper. This sets out a clear approach to seek renewal for low and mid band frequencies for mobile services. In summary,
- (a) Optus supports the renewal of licences for mobile services across all ESL frequency bands. The use of these frequency bands for WA WBB is well supported by international harmonisation and standardisation with extensive available equipment ecosystems.¹⁰
 - (b) Importantly, we support the ACMA's recognition that partial renewal may undermine the long-term public interest, and which, for example, can risk fragmentation of nation-wide low-band licences limiting their use to support the provision of services on a national-basis.¹¹
 - (c) Optus does not object to the preparation of ESL paperwork to reflect the mandated downshift in the 850 MHz band from June 2028 on the proviso that there are no changes to the requirement for industry agreement prior to the licence expiry.
 - (d) Optus also supports ACMA's preliminary view for the renewal option for the 3.4 GHz band. We consider targeted options for a partial renewal incorporating regulator-led defragmentation in cases where there are opportunities to align the licence holdings and improve spectrum utility without impacting existing deployed infrastructure.
- 3.2 We also recognise, similar to Rail and TOB bands, that any consideration of variations to the licencing framework will warrant future and separate investigation as it involves potential changes to licence types and accessibility.
- 3.3 Optus maintains that as there is no evidence of failure in the secondary spectrum trading market, there is no need to introduce a secondary licensing framework.
- 3.4 This section provides Optus' views on the following issues:
- (a) Renewal of licences across the 700 MHz, 850 MHz, 2 GHz, 2.3 GHz, 2.5 GHz and 3.4 GHz bands;
 - (b) Rail's use of 1800 MHz spectrum and the 2.5 GHz midband gap;
 - (c) Regulator-led implementation of the 850 MHz downshift;
 - (d) Defragmentation of the 3.4 GHz band; and
 - (e) Secondary licensing.

¹⁰ ACMA, 2025, Expiring spectrum licences – stage 3, Consultation Paper, April, pp.21-22

¹¹ Ibid, p.21

700 MHz, 850 MHz, 2 GHz, 2.3 GHz, 2.5 GHz and 3.4 GHz bands

- 3.5 Optus supports the ACMA's view that it is in the public interest to renew the spectrum licences for all these bands where the licensee can demonstrate that the licences have been proven to provide WA WBB, or WA WBB and FWA services.
- 3.6 The ACMA's consideration of partial renewals for the bands is noted and the rationale for disregarding partial renewal in each of the bands is fully supported by Optus.

1800-Rail and 2.5-mid band gap

- 3.7 Optus supports, in principle, the ACMA's preliminary view that rail communications and TOB services will continue to support public interest criteria in the short-to-medium term.
- 3.8 While the ACMA also acknowledged a move for these licenses to transition to apparatus licensing, we strongly recommend that the ACMA engage in a further (separate) consultation on a future licensing construct.
- 3.9 This matter warrants further investigation as it involves potential changes to licence types and accessibility.

Regulator-led implementation of the 850 MHz downshift

- 3.10 Optus does not object to the preparation of ESL paperwork to reflect the mandated downshift from June 2028 on the proviso that there are no changes to the requirement for industry agreement up until this date.
- 3.11 The downshift can only be realised prior to June 2028 via industry agreement and if this is not achieved then it will be implemented as part of the renewed 850 MHz licences in June 2028.
- 3.12 Optus cautions that any moves by the ACMA to vary spectrum licences without adherence to procedural fairness and agreement between affected licensees would set a dangerous precedent as it risks undermining the rights of existing spectrum licensees.
- 3.13 **[CiC Begins]**
- 3.14 .
- 3.15 .

3.16 .

3.17 .

3.18 .

3.19 .

Figure 1 **[CiC]**

Source: Optus

3.20 .

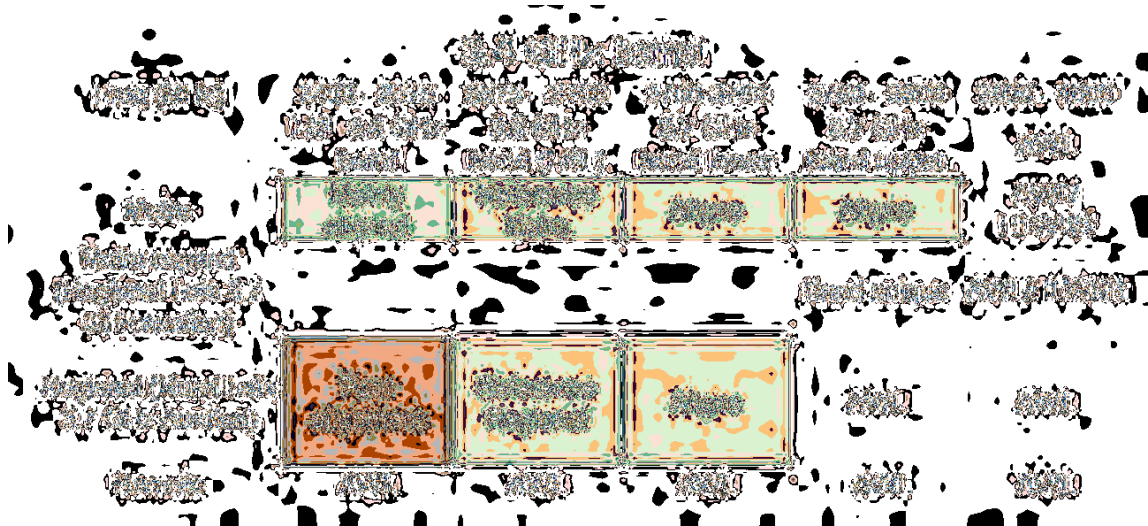
3.21 .

- 3.22 .
- 3.23 .
- 3.24 .
- 3.25 .
- 3.26 **[CiC Ends]**

3.4 GHz defrag

- 3.27 Optus agrees that facilitating defragmentation of the 3.4 GHz band is in the long-term public interest. However there has been significant investment in delivering 5G services to consumers under the current framework which cannot be easily adapted to support a new band structure.
- 3.28 Optus supports the ACMA's preliminary view for the renewal option for the 3.4 GHz band; and additionally, the partial renewal option incorporating regulator-led defragmentation in cases where there are opportunities to align the licence holdings and improve spectrum utility without impacting existing deployed infrastructure.
- 3.29 For simplicity the following comments are based on the following terminology noting that the reference configuration is based on the 3.6 GHz band.

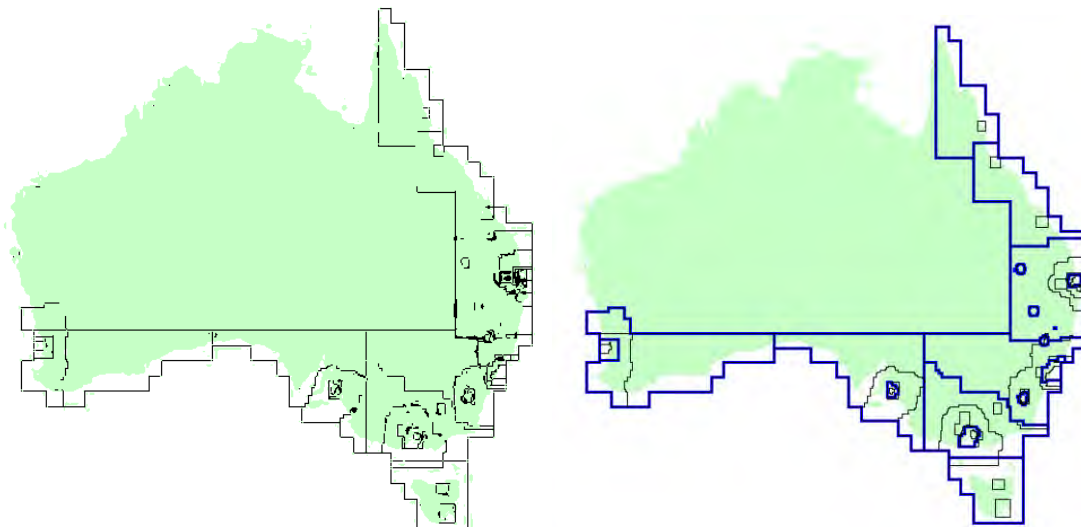
Figure 2 Overview of licence configuration in the 3.4 GHz band



Source: Optus

- 3.30 As shown in Figure 3 below, different licence boundaries during the multiple C-band auctions, as well as AWL allocations, have culminated in a patchwork of boundaries which make industry defragmentation difficult. In the long term, an ideal outcome could be to align the 3.4 GHz with 3.6 GHz boundaries as the reference configuration for the Band (as shown below in bold).

Figure 3 Spectrum Licence boundaries across the 3.4 GHz band (with the *reference* 3.6 GHz licence boundaries highlighted in bold)



Source: Optus

- 3.31 Given the complexity of the 3.4 GHz band, Optus submits that any 3.4 GHz defragmentation activity, while welcome, will be complex and unlikely to reach a single harmonised outcome across the entirety of the band in both a frequency and geographic sense. Despite this, industry should seek to proceed with defragmentation to unlock the long-term efficiency benefits of the 3.4 GHz band – which may be achieved through operator-led and/or regulatory-led defragmentation.

- 3.32 Operator-led de-fragmentation which includes a change in owned assets can be complicated to enact as there are commercial considerations which are in play. This is especially the case where there are competitive advantages to be gained or lost.
- 3.33 In contrast, Optus considers the ESL process offers a unique opportunity for the ACMA to implement a targeted regulator-led defragmentation of the ESL 3.4 GHz band which includes modifying licences to support potential subsequent operator led defragmentation.
- 3.34 Optus further submits that implementation of a regulator led defragmentation of the ESL 3.4 GHz band licences under ESL should adhere to the following overarching principles:
- (a) Licence bandwidths should be converted to multiples of 10 MHz;
 - (b) Geographic boundaries should align with the structure of the 3.6 GHz licences;
 - (c) Changes to licences should not impact any existing services and the decision to remove licence frequencies or areas should be based on minimising the impact on the licensees;
 - (d) All spectrum which is removed from one licensee should be offered to the logical recipient licensee under the ESL process so that there is no unlicensed spectrum; and
 - (e) Optus supports the proposal to align the expiry date of the expiring spectrum licences to January 2044 as this will facilitate and encourage defragmentation of the ESL 3.4 GHz band.
- 3.35 It follows that a prudent approach to defragmentation should be to address different segments of the 3.4 GHz band in turn. To begin, Optus considers that only licences within the ESL 3.4 GHz band will be suitable for defragmentation during the current ESL process.
- 3.36 In contrast, Optus maintains the 3.6 GHz band licences should remain unchanged.

[CiC Begins]

[CiC Ends]

- 3.37 While Optus is not commenting on any defragmentation options in the ESL 3.4 GHz which do not relate to Optus holdings, Optus believes there are further opportunities available for NBN Co and Telstra to further improve the alignment of the ESL 3.4 GHz band to the 3.6 GHz band boundaries.
- 3.38 Appendix B details the specific changes impacting Optus ESL 3.4 GHz licences when the above principles are applied.
- 3.39 During an internal review of the Optus ESL 3.4 GHz holdings, a number of issues were identified where there is no obvious solution. These include:
- (a) NBN Co holds 75 MHz in metro markets, and this does not satisfy the condition of holdings with a multiple of 10 MHz. This consequently means that not all MNOs are able to hold spectrum in multiples of 10 MHz, resulting in 5 MHz of spectrum not fully utilised.
 - (b) NBN Co occupies the lower part of the 3.4 GHz band and holds large range of bandwidths across different geographics. This in turn affects the holdings and lower frequencies for MNOs. Optus considers that configuration alignment across our markets is desirable because the introduction of new features and equipment functionality is more efficient and less complicated as there is less complexity in the product test cases.
 - (c) Whilst defragmentation by itself delivers greater spectrum efficiency across an area, it is also important to consider adjacent area spectrum holdings. Holding misaligned spectrum across spectrum boundaries reduces or denies operators the opportunity to deploy in the boundary areas. The analysis of this component must be applied across specific configurations on a case-by-case basis. In some instances, defragmentation may deliver poorer outcomes than maintaining existing holdings.
- 3.40 **[CiC Begins]**

3.41 .

Source: Optus based on RRL data

[CiC Ends]

Initial comments on secondary licensing framework

- 3.42 Optus also notes the ACMA's tentative position on the introduction of a demand-driven secondary licensing framework and the part it may have to play in delivering place-based access to spectrum licenced spectrum.
- 3.43 Optus reiterates that as there is no evidence of failure in the secondary spectrum trading market, there is no need to introduce a secondary licensing framework.
- 3.44 As recognised by the ACMA, "Australia's spectrum licensing frameworks provide operators with a high-degree of exclusivity and the ACMA's ability to issue licences to secondary users in spectrum-licensed bands is limited ... [and that] legislative change would likely be required to give effect to a framework that permits the licensing of apparatus licences in spectrum-licensed areas."¹²

¹² ACMA, 2025, Expiring spectrum licences – stage 3, Supporting paper 3: Trends and developments in spectrum management, policy and technology, and markets, April, p.6

- 3.45 Optus submits that any consideration of reducing the exclusivity of the spectrum licenses must be preceded by a detailed assessment of the perceived shortcomings or failures in the existing secondary market, and whether the foreseen demand merits any revision of existing framework.
- 3.46 Optus considers that, for any prospective licensee to access the framework, certain conditions should be met. These may include:
- (a) Demonstration that the request for a licence is reasonable and will not, or is unlikely to, cause harm or impediment to the incumbent licensees current or planned network.
 - (b) Evidence that good faith discussions between a prospective licensee and incumbent licensee(s) have taken place under the existing secondary market trading mechanisms.
 - (c) That the results of these discussions are considered unreasonable by the prospective licensee.
 - (d) A mechanism is included for the spectrum licence holder to reclaim access to the spectrum under certain conditions such as the delivery of public services including Triple Zero calls.
- 3.47 Optus notes that, if such a framework had existed and secondary licences had been in place in areas where TPG's access to Optus' network had been provided under the MOCN, the MOCN would not have been possible.
- 3.48 Consideration of potential future network sharing or novel network expansions (LEO, UOMO, etc.) should feature heavily in any proposals relating to the introduction of a secondary licencing framework and will warrant future and separate investigation as it involves potential changes to licence types and accessibility.

Section 4. LICENCE DURATION AND LICENCE STATEMENTS

- 4.1 Optus supports the ACMA's preliminary views to adopt Option 2 licence duration and considers there is room for incremental improvements to add clarity to the renewal process. In particular, Optus submits that the public benefit from renewals would be improved where ESL pricing by band includes the option for instalment payments.
- 4.2 This section provides feedback in relation to:
- (a) Licence duration;
 - (b) Licence renewal statements;
 - (c) The timing and information required for applications; and
 - (d) The need for instalment payments to be offered.

Licence duration

- 4.3 Optus strongly supports the alignment of expiry dates for substitutable bands in 2044 as presented in Option 2. This provides licensees with investment confidence and reduces barriers to licence trading for this ESL period.
- 4.4 Option 2 provides licence lengths that are sufficiently long – at 11.25 to 16 years – to support investment and provide certainty to MNOs for this ESL period. Option 2 also ensures that the next ESL process is efficient and does not extend over a 10-year period. Optus supports the ACMA's view that aligning the expiry dates of substitutable bands will make the next ESL process far more efficient.
- 4.5 Optus commends the ACMA for the introduction of a common licence alignment period. This will provide ACMA and licensees an opportunity to review the structure of substitutable bands and technical frameworks on a holistic basis. Such a review should also account for the procedural aspects of licensing, such as payment terms and renewal statement agreements, upon which Optus would welcome further consultation.

Licence renewal statements

- 4.6 While we welcome the clarity of having each of the specific periods in licence renewal statements to be defined, it is also important that all relevant information (including price) for a renewal application be provided upfront and prior to commencement of the renewal application period.

Instalment payments for future renewals

- 4.7 Optus considers that instalment payments should be made available for this and any future spectrum licence renewal processes. The adoption of Option 2 would result in the renewal of up to 10 separate frequency bands within the same calendar year the next ESL process. The impact of this on the industry would be significant. If all renewed licences require up-front payment, this will have a material cash impact on MNOs and could raise industry sustainability risks.

Application information timing and information required

- 4.8 Due to the staggered nature of the ESL application process there will be overlapping application processes for multiple bands starting from June 2026. This may complicate incumbent licensee's internal corporate governance and funding processes for ESLs.
- 4.9 ESL renewal applications should not be considered in a piecemeal fashion, particularly as the renewal decisions on substitutable spectrum are interlinked.
- 4.10 Optus considers that the total envelope of absolute spectrum payments should be provided for all the ESL bands at the same time. Absent an absolute price for all bands, renewal decision-making and corporate governance processes can only be made against imperfect information.
- 4.11 Pricing certainty will be a key factor for ESL renewal. Optus requests that:
- (a) In line with the previous spectrum renewal process,¹³ the PMPs by band for *all* ESL bands should be made available prior to the start of the first renewal application period for the first set of ESLs. Ideally the PMP information for all ESL bands should be released in October 2025.
 - (b) The relevant price and calculation parameters (e.g. population estimate) for each ESL band should be confirmed upfront and made available prior to the start of the renewal application for the first ESL band. Ideally, this information should be released in October 2025.
 - (c) Having upfront information on price and payment terms for *all* bands subject to renewal is important and should be provided prior to the commencement of the renewal application period in 2026 for the first set of ESLs subject to renewal. The certainty provided by such information would support the delivery of essential mobile services, including the delivery of key government policy objectives and the productivity benefits that flow from the use of mobile services.
- 4.12 It is important for applicants to be aware of the absolute pricing of each renewal. This requires the population and MHz per geographical area to be provided. For example, the difference between the low and high ABS population forecasts can be significant and the impact on absolute pricing can be substantial.
- 4.13 We also note that the absolute price for one band could impact the decision to renew another. If the absolute pricing is not released simultaneously, there is the risk that a licensee may wish to withdraw from one application because of the cost of a future application.
- 4.14 Further, to support corporate governance processes, the ACMA should also include information on the process of withdrawing a renewal application in the information pack. If the application to renew constitutes a legal commitment that it is unable to be withdrawn, this further reinforces the requirement case for the up-front provision of

¹³ See for example, the Radiocommunications (Spectrum Access Charges) Direction 2012 which was made under subsection 294(2) of the Radiocommunications Act 1992 (the Act).

prices for all ESLs at least 9 months prior to the opening of the first application window (850/1800 MHz).

The option of instalment payments should be made available

- 4.15 The ACMA's preliminary price ranges for ESL bands assumes upfront payment. Optus submits that the option for instalment payments for ESLs should be made available and that the payment schedule should be in line with the annualised cost of the assets. Cashflow management is crucial for the ongoing sustainability of the industry and healthy competition between the MNOs. Allowing for cashflow management enables MNOs to continue to invest in greater coverage, innovative services and improved social outcomes.
- 4.16 Optus notes that the ACMA observes that spectrum access charges determined by auction generally require upfront lump-sum payments. When considering the use of instalment payments, the ACMA assesses the risks of default and the potential impact on competition.¹⁴ Generally, the ACMA observes that upfront payments reduce the risk of default, reduced the complexity of auction outcomes and may reduce speculative bidding at auctions.¹⁵
- 4.17 In addition, the ACMA has also referred to the Spectrum Pricing Review 2018 Recommendation 6 as justification for upfront payments for renewals. However, the Spectrum Pricing Review paper *does not make any mention of renewal payments* and only refers to auction payments and the potential impact of instalment payments on auctions e.g. competition and speculative bidding. Optus notes that these reasons are not relevant to this decision. The main risk cited in the Review is providing remedies for speculative bidding. However, this risk does not exist in the ESL process as there is no bidding.
- 4.18 The above concerns are therefore not applicable to renewals. Optus submits that serious consideration should be given to the offer of instalment payments for all MNOs due to the large sums in line with the annualised cost of spectrum.
- 4.19 The ACMA has presented no clear rationale for the preference for upfront ESL renewal payments, other than that the ACMA has historically required upfront payments for renewals and most auctions.
- 4.20 Optus submits that the assessment of whether instalment payment terms should be offered in these ESL renewals, should be made against the key legislative criteria; the same efficiency, competition and public interest arguments that apply to the renewal of ESLs applies to the offering of instalment payment terms.
- 4.21 Irrespective of the payment option offered (either upfront or instalment payments), there will be no impact on the core price, as it is a predetermined value set by the ACMA or the Government. Similarly, any instalment payment premium applied should have no impact on core pricing of the spectrum because this is a renewal *not* an auction process.

¹⁴ Department of Communications and the Arts, 2018, Spectrum pricing – review, February, p.4

¹⁵ Ibid, p.9

- 4.22 The ACMA has the power to offer instalment payments for spectrum auction and renewal payment. Optus therefore recommends that the ACMA exercise its power to offer the option of upfront payments or instalment payments to all the licensees for the ESL renewal payments. There is precedent in the Australian market that the option for instalment payment is available for spectrum licensing, as was provided in the unsold 700 MHz auction in 2017 and the 26 GHz auction in 2021.
- 4.23 Optus further notes that licensees do not receive the full benefit of acquiring the spectrum upfront. The benefit of possession of the spectrum licence (primarily derived from cost avoidance) accrues over the life of the licence. It seems logical that the licence payment schedule should reflect this time period.
- 4.24 Optus considers that instalment payments should be made available for this and the next round of ESLs in 2044. The adoption of Option 2 would result in the renewal of up to 10 separate frequency bands within the same calendar year the next ESL process. The impact of this on the industry would be significant. If all renewed licences require up-front payment, this will have a material cash impact on MNOs and will increase risks to industry sustainability.

Section 5. PRICING FOR ESLs

- 5.1 Optus appreciates the ACMA's transparency on the ESL pricing papers and supporting information. We acknowledge the ACMA's use of a detailed and rigorous global benchmarking review, which has informed the preliminary view on price ranges in a projected nominal sum of \$5-6.2 billion for the renewal of ESL spectrum.
- 5.2 The ACMA has also noted "there is broad consensus that the financial, regulatory and administrative costs versus potential returns associated with regional, rural and remote deployment disincentivise investment, competition and connectivity in regional Australia."¹⁶ Optus agrees with the ACMA that the industry sustainability, and financial appetite for increased investment under current economic conditions is challenging.
- 5.3 Optus maintains our position on the use of public interest pricing.
- 5.4 The pricing of ESLs will significantly influence mobile network competition in Australia for the next 20 years. If priced too high, spectrum renewals risk consolidation, reduced investment, and delayed deployment. It puts at risk many government policies that rely on ubiquitous mobile coverage. Conversely, appropriate pricing can also enable all three MNOs to sustainably invest in infrastructure and innovation, particularly in rural and regional areas.
- 5.5 This section recommends improvements to the benchmarking methodology, highlights the need for spectrum pricing to support competition, and presents a strong case for applying a public interest discount to ensure sustainable market outcomes.
- 5.6 In summary, the below objectives should be central to the ACMA's approach to ESL pricing:
- (a) **Affordability must be central:** ESL pricing should reflect the ability of the smallest MNO in market to recover their costs and remain competitive.
 - (b) **Risk of spectrum concentration:** Without affordability safeguards, spectrum may be re-acquired by the dominant player, further reducing market competition.
 - (c) **Benchmarking alone is insufficient:** Market value benchmarks do not account for the essential nature of spectrum and public interest considerations.
 - (d) **Public interest discounts are justified:** Socio-economic benefits warrant a departure from pure market-based pricing.
- 5.7 Optus recommends that the adoption of a two-stage pricing approach will deliver on these objectives:
- (a) **Stage 1:** Apply improved benchmarking to set a conservative baseline price. This would represent the upper bound of the efficient price range.

¹⁶ ACMA, 2025, Expiring spectrum licences – stage 3, Consultation Paper, April, p.15

(b) **Stage 2:** Apply a public interest discount (50%) as permitted under s294(2) of the Act. This would set the lower bound of the efficient price range.

5.8 Optus has engaged Coleago Consulting to conduct an external review of the benchmarking study to set a conservative baseline price under stage 1 above. The output of this analysis shows that the stage 1 improvements results in an ESL price range of \$4.1-4.7 billion. The Coleago Consulting final report is provided as Attachment 1 to this Submission.

5.9 The stage 2 applies an appropriate public interest discount, which in part, addresses the material differences between the mobile service revenue (MSR) of the dominant incumbent and the smallest MNO in the market. Adopting this discount will reduce the annual ESL to MSR percentage to around 3% for Optus and TPG – which is more in line with the ACMA’s preliminary view. As a result, the public interest discount moves the ESL price range to around \$2-2.4 billion.

5.10 Optus recommends that the ACMA adopt a revised ESL price range using the upper bound (\$2.4 billion) and lower bound (\$2 billion) outlined below.

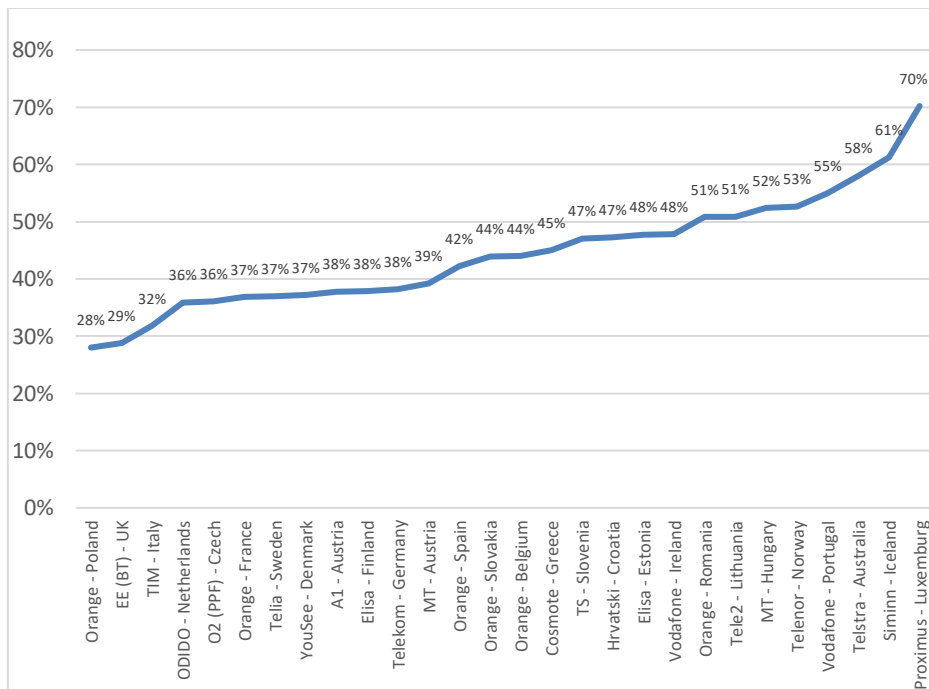
5.11 The remainder of this section further discusses the above views.

ESL pricing must be based on the affordability to the smallest MNO

5.12 The current Australian MNO market structure is highly asymmetric and lies outside international norms.

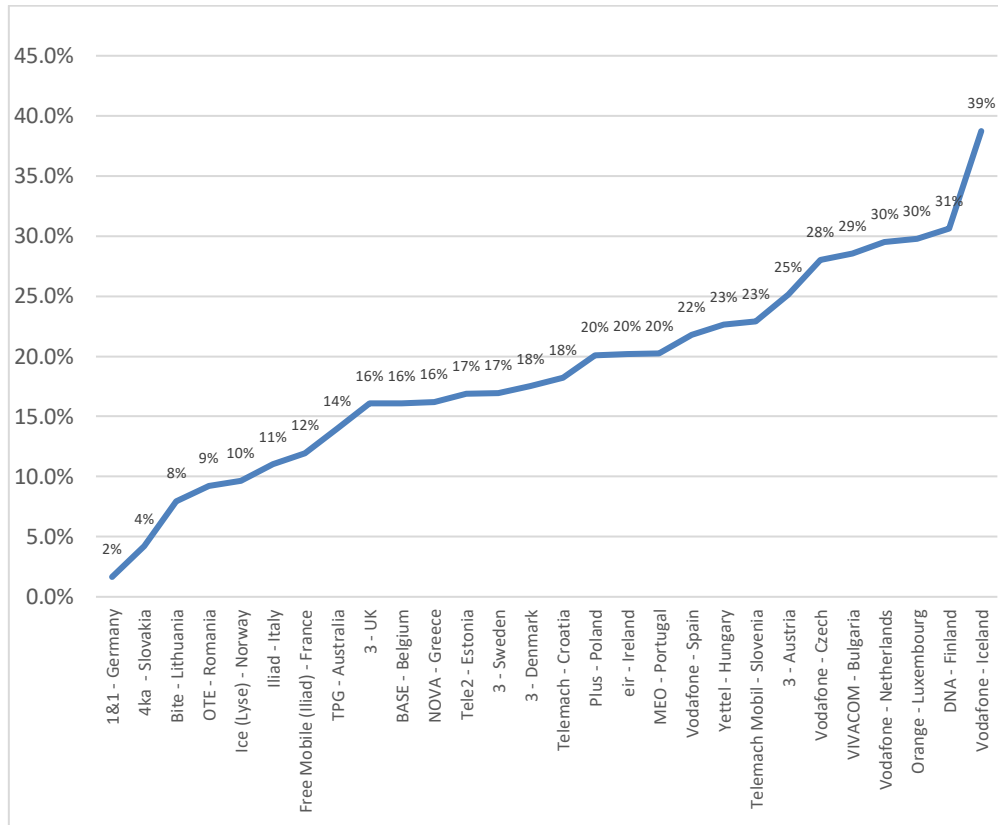
5.13 As shown in Figure 5 and Figure 6 below, Australia has one of the highest MSR share for an incumbent, and one of the lowest MSR share for the smallest MNO in the market, when compared with other countries.

Figure 5 Incumbent MSR share by country



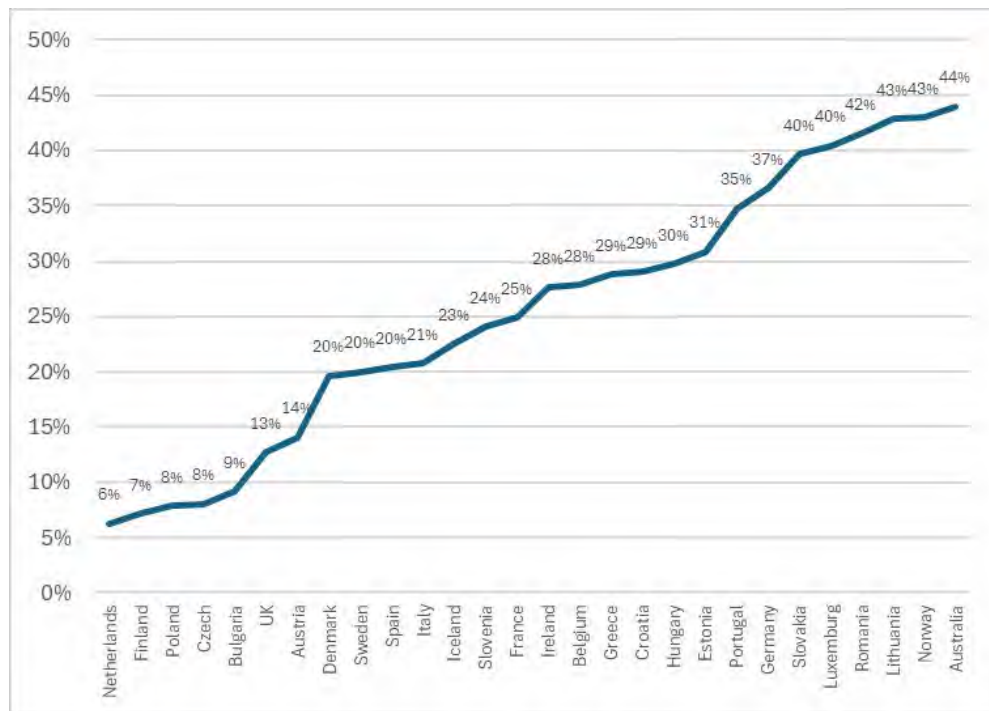
Source: GSMA, Telstra, Optus and Vodafone TPG Annual Reports

Figure 6 MNO with lowest MSR share by country



Source: GSMA, Telstra, Optus and Vodafone TPG Annual Reports

Figure 7 Country MSR share gap (incumbent vs MNO with lowest share)



Source: GSMA, Telstra, Optus and Vodafone TPG Annual Reports

- 5.14 The above charts show the MSR share for both incumbent MNOs and MNOs with the lowest MSR share across the 28 countries in the benchmark set. Notably, that:
- (a) Telstra holds 58% MSR share, amongst the highest of countries benchmarked.
 - (b) TPG holds only 14% MSR share, at the lower end of countries benchmarked.
 - (c) The resulting 44% MSR share gap between Telstra and TPG is representative of a highly asymmetric market. It is the largest gap among the 28 global markets and highlights the inequity between Telstra and TPG.
- 5.15 A market with such disparities is at greater risk of further market consolidation as the smallest player struggles to compete. To mitigate this risk and reduce the likelihood of the MSR gap increasing, it is important to ensure the smallest MNO can afford the ESL pricing.
- 5.16 Optus proposes that the following factors are applied to ESL pricing to maintain competition and support effective delivery of essential mobile services:
- (a) ESL pricing should be set at a level based on an affordability test applied to the MNO with the lowest MSR share, i.e., TPG. Only the incumbent, Telstra, is generating a ROIC above the cost of capital. This severely limits Optus' and TPG's ability to sustainably compete with Telstra.
 - (b) Parity ESL pricing applied to all MNOs.
 - (c) Ensure that ESL pricing considers the significant and increasing regulatory costs imposed on the industry so that this is not a barrier to competition.

Review of benchmarking study and recommended adjustments

- 5.17 Optus has engaged Coleago Consulting to conduct an external review of the benchmarking study. They identified several concerns which can be summarised as:
- (a) Omissions from the sub-1GHz sample: 700MHz Finland in 2016 and Germany in 2015. This change alone would drive a 10% reduction in the ACMA's sub-1GHz ESL price.
 - (b) Licence length of auctions in the USA, Canada and Finland, stated as 15 years, but referring only to the initial term; the actual tenure the licensees enjoy is in effect "perpetual"
- 5.18 In addition to the adjustments that Optus and Coleago Consulting recommend for the ESL benchmarking study, further enhancements should be considered, including:
- (a) Number of MNOs
 - (i) The definition of an "MNO" appears unclear; Optus proposes that an MNO should be defined as a company with a mobile network.
 - (ii) The number of MNOs in an auction is not always the same as the number of bidders, e.g., bidders may include non-MNOs.

- (iii) Auctions where a non-MNO has acquired spectrum, potentially involving speculative bidding, could be considered for removal from the sample.
 - (iv) The number of MNOs can vary with time and should not be assumed to be static. There are instances where Coleago Consulting has found the number of MNOs was incorrectly stated e.g., The Canadian 600MHz auction with 4 MNOs not 3 MNOs, German 3.4GHz with 4 MNOs not 3, and various US auctions with 4 MNOs not 3.
- (b) Future MSR/MHz/pop
- (i) The assumption that the MSR/MHz/pop downward trend will not continue beyond 2022-2023 does not appear sound.
 - (ii) Coleago Consulting has found that using ACMA's likely future spectrum assignment for mobile in Australia, there could be new allocations up to 2032 and each will place a downward trend on MSR/MHz/pop.

5.19 After applying these adjustments and enhancements, Coleago Consulting has recalculated the ESL price range. This has resulted in a reduction of 20–25% to the revised estimated ESL spectrum price for the total industry (from \$5.1-6.3bn to \$4.1-4.7bn), as shown below:

Figure 8 ESL Prices after adjustments and enhancements to the benchmarking

Band	Adjusted preliminary price ranges (AUD/MHz/pop)		Change vs. ACMA proposals	
	Lower	Upper	Lower	Upper
700 MHz	0.4608	0.5091	-24%	-31%
850 MHz	0.5592	0.6179	-12%	-21%
1800 MHz	0.1827	0.2246	-4%	-5%
2 GHz	0.1084	0.1333	-32%	-32%
2.3 GHz	0.0355	0.0524	-35%	-22%
2.5 GHz	0.0396	0.0586	-30%	-15%
3.4 GHz	0.1212	0.1349	-23%	-32%

Source: Coleago Consulting

- 5.20 Optus further recommends improvements to the sample design, and suggests that the ACMA:
- (a) Include renewal prices, as global regulatory price setting reflects global public policy, as opposed to global auction market prices. As the ACMA is undertaking a renewal pricing consultation, it follows that this should include the global views on renewals.
 - (b) Include only those auctions where *all* of the spectrum was sold at reserve price (as price is set by the regulator). Where auctions result in unsold spectrum, these should be excluded as this indicates that the reserve price was set too high.

Public interest pricing discounts should be applied to MNO ESL renewals

- 5.21 MNOs provide essential services for Australians.
- 5.22 Optus maintains there are strong justifications for the application of public interest discount on MNO ESL renewal benchmark price range. These reasons not only include the technical corrections noted above by Coleago Consulting but also the important public benefits that flow from the use of ESL spectrum to deliver critical infrastructure and essential services for Australians. Lower ESL pricing promotes:
- (a) Key national and social policy objectives, such as:
 - (i) Innovation (D2M) and 5G Advanced/5G-SA/6G readiness
 - (ii) Regional connectivity and digital inclusion
 - (iii) Effective and sustainable competition that supports continued investment in essential services
 - (iv) Supporting emergency services and improved
 - (b) MOCN sustainability and continuation:
 - (i) As the ACMA acknowledges, “At this time, we are inclined to agree with TPG’s and Optus’s claims that the full benefits of the MOCN agreements rely significantly on access to ESL spectrum currently licensed to both Optus and TPG.”¹⁷
 - (ii) Lower spectrum pricing increases likelihood of MOCN spectrum renewal and supports the market competition.
 - (c) Financial viability for the industry
 - (i) Each of the three MNOs should be able to generate a ROIC above the cost of capital.
 - (ii) As ACMA has noted in Supporting Paper 3, despite the projected revenue growth in the mobile industry, its overall financial health remains uncertain with declining ARPU, heavy capital expenditure on 5G expansion and growing expectations with corresponding social/policy pressure to maintain prices.
- 5.23 After applying the above calculations to the ACMA pricing, the following proposed ESL pricing becomes (as per Coleago Consulting paper):

¹⁷ ACMA, 2025, Expiring spectrum licences – stage 3, Preliminary views paper 1: Incumbent licensee use-cases and the public interest, April, p.10

Figure 9 Revised ESL Price Proposals (incl. 50% public interest discount)

Band	Adjusted preliminary price ranges (AUD/MHz/pop)		Change vs. ACMA proposals	
	Lower	Upper	Lower	Upper
700 MHz	0.2304	0.2546	-62%	-66%
850 MHz	0.2796	0.3089	-56%	-60%
1800 MHz	0.0914	0.1123	-52%	-52%
2 GHz	0.0542	0.0666	-66%	-66%
2.3 GHz	0.0177	0.0262	-68%	-61%
2.5 GHz	0.0198	0.0293	-65%	-58%

Source: Optus

Conservative approach to ESL pricing supports industry affordability

- 5.24 Applying these revised prices results in the following annualised ESL cost for each MNO as compared to their respective MSR, with the estimated ESL payments and the existing annualised cost for non-ESL spectrum licence payments of 850e, 900, 3700 and 26GHz.

Figure 10 Annualised cost of (ESL and non-ESL) as percentage of MSR

	Preliminary pricing	Optus/Coleago Consulting proposed pricing
<i>Telstra</i>	2.7%	1.6%
<i>Optus</i>	4.6%	3.1%
<i>TPG</i>	6.7%	3.0%
<i>Total MNOs</i>	3.8%	2.2%

Source: Optus, Coleago Consulting

- 5.25 Optus' proposed ESL pricing (using the two-stage pricing approach outlined above) delivers a 2.2% industry annualised spectrum cost (ESL and non-ESL) as a percentage of MSR. This cost is more balanced and sustainable than the 3.8% of MSR based on ACMA's preliminary pricing. However, it is important to note that the Australian annualised cost of spectrum is still more than 50% higher than best practice of 1.4%.¹⁸
- 5.26 Of more importance than the industry total annualised cost of spectrum, are the rates relevant to the two competitive networks – Optus and TPG. For example, under the preliminary pricing approach. TPG's annualised cost of spectrum is more than double than that of Telstra. Under the suggested Optus/Coleago Consulting approach above, the annualised cost of spectrum differential between Telstra and TPG reduces to less than double.
- 5.27 In addition, when Optus/Coleago Consulting pricing method is applied, the annualised cost of spectrum rate for Optus and TPG is very similar at 3.1% and 3% respectively,

¹⁸ Coleago Consulting, 2025, The ACMA ESL Stage 3 Consultation paper response, June, pp.24, 27

providing a more level playing field for TPG compared to the ACMA pricing, where there is a gap of 2.1% (Optus 4.7% and TPG 6.7%).

- 5.28 Finally, while the Optus/Coleago Consulting pricing method greatly improves the annualised cost of spectrum for Optus and TPG, the rate still remains materially above the best practice rate of 1.4% seen globally. Optus notes that even with the suggested improvements, there remains investment risk for these two competitive networks.

Appendix A. ACMA BENCHMARKING METHODOLOGY

This appendix provides an evaluation of the ACMA benchmarking methodology, including a review of the assumptions made in the ESL preliminary views – paper 4, Appendix B. This is also supported by Coleago Consulting’s report, as set out in their detailed feedback, and provided as Attachment 1 to this submission.

In summary, Optus does not support global auction price benchmarking to be used to set renewal pricing. A key weakness in adopting price benchmarking can be the difficulty in replicating input assumptions and model sensitivities, as changes to the sample set and adjustments applied, can yield different outcomes and thereby make the benchmarking conclusions inconsistent and unreliable.

The remainder of this section sets out Optus’ views on a Step-by-Step basis, as presented in the ACMA’s benchmarking study.

Step 1: Compiling the benchmarking data.

Sample design Type of allocations

- (a) Sample selection for benchmarking relies on subjective judgement regarding the type of allocations to be included, for example, auctions or renewals, reserve price auctions or competitive auctions. This poses an inevitable inherent risk for significant outcome variations in the benchmarking methodology
- (b) Only auction results were included in the benchmarking sample, with no renewals included, even though the process at hand is setting prices for renewals. Optus believes the omission of renewal data points represents a fundamental flaw in the methodology.
- (c) Optus suggests that the use of renewal prices would be far more appropriate for global benchmark pricing when considering local renewal prices.
- (d) A benchmarking comparison of renewal prices could be expected to result in significantly lower pricing than the ACMA study of auction prices. As a number of countries, e.g., USA, Canada and Finland, have licences operating in perpetuity with a nominal renewal fee.
- (e) The rationale for not including renewals in the benchmarks was that this pricing was set by the regulator. However, Optus supports a comparison of regulator prices and does not support market price benchmarking, as previously stated.
- (f) A number of Australian auctions included in the sample were based on regulator set pricing as the spectrum was sold at reserve price. To be consistent with the ACMA methodology they should have been excluded.
- (g) The sample set includes auctions where spectrum was left unsold due to the reserve price being too high, notably the Australian 700MHz auction in 2013, where 2 x 15MHz of the spectrum was unsold and unused for a number of years. To be consistent with the ACMA approach, Optus believes this auction should not have been included in the sample set, as the price was not set by the market.

- (h) Optus is of the view that it is more appropriate for the ACMA to benchmark their ESL pricing against other regulator-set pricing to ensure it is in line with global public policy.
- (i) Optus proposes that renewal prices should be included in the sample set and all auction prices should be removed. Restricting the sample set to auction data means only prices from competitive bidding are included in the benchmarking, which results in inflated market prices.
- (j) Optus does not support the use of market value pricing for setting renewal prices.

Auction design:

- (a) Auction designs vary significantly across jurisdictions, and over time within the same country. Every auction has its own context, and its outcomes are directly influenced by factors in the auction design, such as reserve price, allocation limits, set asides and financial health of the industry at that point in time.
- (b) Public policy settings exert a significant influence on auction outcomes, for example, auction revenue maximisation or public interest pricing. The relevance that global auction outcomes on regulatory-set renewal pricing in Australia is questionable.

Band categories:

- (a) Optus supports the four pricing categories used by the ACMA for their benchmarking study – i.e., Sub-1 GHz, Lower 1-3GHz, Upper 1-3GHz and 3.4GHz.
- (b) While price benchmarks within the four band categories can be compared, Optus does not agree that the substitution should be applied for future auction allocation limits as the grouped bands are not necessarily exact substitutes for one another, depending on the licence conditions, contiguous available bandwidths and national or sub-national licence extents.
- (c) Optus agrees with the practice of grouping substitutable bands for consistent pricing and licence expiry dates as it may reduce barriers to defragmentation, band harmonisation and simplification of licence conditions as technology develops.
- (d) Optus supports two categories for expiry dates, that is separate expiry dates for sub-1 GHz and mid band.
- (e) Optus supports the use of price in local currency for price benchmarking and then discounting to the present value using the WACC. Optus considers that the WACC proposed by the ACMA is appropriate.
- (f) Optus considers that the analysis undertaken for the full amount of spectrum (MHz) for each of the licence areas should have been completed. If this had been completed, the analysis of each band would have been significantly more complex due to differential holdings in different licence areas. The ACMA has stated "We have only used spectrum in metro areas for this index, which is why auctions like the 1800 MHz Regional auction in

2016 caused no change to lower 1–3 GHz bandwidth."¹⁹ Even within metro spectrum areas there are different allocations, and it is not clear which specific cities are chosen/omitted in the ACMA's study.

- (g) Optus supports the use of actual or forecast population within each licence area under consideration in the data set, but it is unclear whether this has been implemented in the ACMA's preliminary prices. It is also acknowledged that this is highly complex for each band, considering the number of separate geographical areas across the licences.
- (h) Optus understands that the population per licence area is based on ABS forecasts and can therefore be provided for all the bands, licences and geographical areas to be renewed. To reduce the risk of over-forecasting of the population, Optus proposes that the ACMA uses the ABS low series forecast (ABS population projections 2022) for the calculation of the absolute price for all spectrum bands.

Sample size

- (a) Optus considers the sample size selected for the benchmarking study to be too small.
- (b) Only 32 countries were used in the sample, with many countries which prefer regulator-set administrative allocations excluded.
- (c) The sample size needs to be sufficiently large to ensure that outlier prices do not inflate the median or the overall price range in benchmarking results.
- (d) The sample bias of the excluded auctions with such a small sample is a reason for concern. It results in an unclear data selection exercise for allocations and countries, thereby making the benchmarking study near impossible to replicate.
- (e) No specific identification or explanation has been provided for the allocations that are excluded from the study, beyond general comments relating to comparisons with Australia.

Sample size by band category

- (a) Sub-1 GHz: A sample of only 29 data points were used, of which only three were from Australia, and which included questionable auction results:
 - (i) 700 MHz in 2013, where the 700 MHz was sold at the reserve price and 2x15 MHz was unsold indicating the reserve price was too high.
 - (ii) Unsold 700MHz in 2017, where two thirds of the spectrum was acquired by a non-MNO by paying around 80% of the final price
 - (iii) 850/900MHz in 2023, where metro was sold at the reserve price

¹⁹ ACMA, 2025, Expiring spectrum licences – stage 3, Preliminary views paper 4: Pricing for ESLs, April, p.57

- (b) Lower 1-3 GHz: A sample of only 37 auctions with only one from Australia for 1800MHz in 2016
- (c) Upper 1-3 GHz sample: A sample of only 28 auctions with only one from Australia for 2600 MHz, where the spectrum went at reserve price in 2013 and 2x10 MHz was acquired by a non-MNO
- (d) 3.4 GHz band: A sample of only 29 auctions with only three from Australia, including:
 - (i) 3600 MHz in 2017 where all of metro went at reserve
 - (ii) The recent 3400/3700 MHz in 2023.

Information required for benchmark prices

- (a) Local currency: Optus supports the use of prices in local currency for benchmarking and then discounting to the present value using the WACC. Optus considers that the WACC proposed by the ACMA is appropriate.
- (b) Population: Optus supports the use of the population within each licence being referenced but it is not immediately clear whether this has been implemented in the ACMA's preliminary prices. It is acknowledged that this is highly complex for each band, considering the number of separate geographical areas across different bands.
- (c) Population per licence area: Optus understands that the population per licence area is based on ABS forecasts and therefore it can be provided for all the bands, licences and geographical areas to be renewed. To reduce the risk of over forecasting of the population, Optus proposes that the ACMA uses the ABS low series forecast (ABS population projections 2022) for the calculation of the absolute price for all spectrum bands. The impact on absolute prices as well as the PMP metric needs to be considered and be consistent.
- (d) PMP: Optus supports the PMP metric being used and that it is a weighted average based on MHz.
- (e) Licence dates/duration: Optus agrees with the practice of grouping substitutable bands for consistent pricing and licence expiry dates as it will assist with defragmentation, band harmonisation and simplification of licence conditions as technology develops. While Optus agrees with the ACMA's chosen grouping of substitutable bands in this instance, it cannot be assumed that this will be the case for future allocations where this substitutability may not be applicable.

Step 2: Convert valuations to consistent licence durations

- (a) Optus supports using licence duration in the price benchmarking.
- (b) The determination of licence lengths can require a thorough understanding of the context to ensure it is accurate. An initial term may only require a minimal fee to provide a perpetual licence and therefore it is in fact a perpetual licence. Inaccurate licence lengths have a significant impact on benchmark pricing

Step 3: Convert to Australian dollars (spot or PPP)

- (a) Optus supports using spot exchange rate but does not support PPP (parity purchasing power) being used as an input.
- (b) PPP is based on a basket of goods in a similar way to how CPI is calculated in Australia. Optus considers the use of this metric inappropriate and not relevant to the price of spectrum.
- (c) Optus proposes that a more appropriate metric beyond spot exchange rate would be a spectrum related PPP based on the components of cost avoidance, which is used by MNOs to value their spectrum.
- (d) A spectrum related PPP would include items such as network equipment costs, network opex, labour costs, site rent and other site-related inputs, and not consumer inputs. Optus acknowledges that carrying out this comprehensive study for each country at each point in time would be highly complex.

Step 4: Carry forward valuations to 2024-2025.

- (a) The ACMA acknowledges that there is a consistent view regarding mobile profit as the best indicator of cashflows generated from spectrum use. However, for practical ease and better accessibility, ACMA considers MSR as a “reasonable proxy for profit”.
- (b) While usage of MSR by the ACMA is agreeable for its practical ease, it cannot truly and fully represent profit and does not factor in the (increasing) cost of doing business, regulatory/compliance costs, increasing burden of overall spectrum costs and ROIC declines. As such, MSR can over-represent spectrum value, resulting in higher benchmarking prices.
- (c) The profit margin of each MNO in Australia varies considerably, with Telstra receiving more than 58% of the industry profit. This represents a higher proportion of profit share than revenue share, creating further imbalance and consolidation in the industry.
- (d) Optus contends that it is unlikely that the downward trend of MSR/MHz/pop will not continue beyond 2022 and is sceptical of the ACMA’s assumption of a flattened MSR/MHz/pop from 2022 to 2033. No rationale has been provided for this assumption.
- (e) The Draft 2025 FYSO work plan identifies several new allocations under consideration in the next 5 years to 2029 i.e., 600 MHz, 1.5 GHz, 6 GHz, future mmWave and WRC-27 agenda item 1.7 candidate bands.
- (f) Taking this consideration into account places downward pressure on spectrum prices, which should in turn lower the renewal prices.

Step 5. Compile supplementary data and calculate weights

- (a) Population density: The ACMA has considered national population density to ascertain relevance of a country with Australia by applying weights. However, several nuances arising from other closely related features such as overall population, urban-rural split or population density in urban centres are not accounted for in the benchmarking study, creating risks of false equivalency. These factors can have a varying impact on the spectrum value for different bands. For example, Canada’s major cities

have a much lower population density than Australia's major cities. Similarly, Australia and Iceland have very similar average population density, the two countries are not comparable in terms of their overall national population.

- (b) Another important consideration is Australia's land mass, which is nearly 8 million km² with a population of 27 million. This is a very low population density compared to most countries. However, there is high population density where most people live and where the spectrum is used the most. It is also noteworthy that deployed mobile networks cover only around a third of the land mass.
- (c) Number of national MNOs: Optus supports the use of number of MNOs in the weighting but seeks the ACMA's definition of an MNO. Optus recommends that the definition of an MNO is a company with a national mobile network. The number of MNOs is not the number of bidders in an auction, and auctions where a non-MNO has acquired spectrum, potentially speculatively, should be considered for removal from the sample set.
- (d) The number of MNOs can vary at times and should not be presumed as static. Furthermore, the relative market share of the MNOs can impact auction outcomes. However, there appears to be no allowance for these considerations in the benchmarking study.
- (e) MHz x Pops: It seems that the allocations have not been weighted in relation to the amount of spectrum allocated and the population covered by the MHz (i.e., MHz x pop) so that all allocations, all things being equal, are treated the same. There is a need to ensure a minor allocation does not have the same weighting as a major allocation, i.e., avoiding circumstances where small amounts of spectrum in minor population areas appear to have equal weight to large allocations in major populations.
- (f) In summary, Optus acknowledges the ACMA's consideration of GDP, population density, number of MNOs and MHz x Pops for establishing equivalency of other global markets with Australia. However, as we have pointed out above, this remains a rather simplistic rounding up of a much more complex comparison, necessitating appropriate allowances and margins to prevent the benchmarking results from erring towards the higher side.

Step 6: Determine spectrum band group valuation with various multiple weighting techniques

- (a) Optus does not consider the sample set to be sufficiently large for any of the band groupings when compared to global allocations including auctions and/or renewals.

Step 6a Cohort analysis:

- (a) Optus supports use of the cohorts of real GDP per capita, MNOs and population density. However, there remain concerns regarding the definitions of MNOs and the number of MNOs and population density applied.

Step 6b Numeric weighting analysis:

- (a) Optus supports applying weightings to reduce the effect of benchmarks from countries that are dissimilar to Australia. However, Optus has

concerns regarding the application of weightings to establish relevance of a market for Australia.

- (b) Optus notes that applying weightings requires decisions and assumptions that tend to introduce error.
- (c) Optus notes that the value of a band in different countries can vary, influenced by population density, land mass and urban/rural split. This is not taken into consideration in the weightings.
- (d) For example, Belgium is average-weighted as 0.5 for both 700 as well as 3500 for its equivalency with Australia, however the more rural/remote the population spread, more valuable lower bands will be for that country for achieving near-100% coverage. Similarly, the population density in urban centres significantly impacts the value of mid-band spectrum.

Step 6c calculate intersection range:

- (a) Optus has outlined concerns about cohorts and weightings.
- (b) This gives rise to further concerns related the use of intersections as it will only replicate and likely increase all the concerns stated above, as assumptions are applied on top of other assumptions.

Step 7: Carry forward values for future dates

- (a) Optus supports the carry forward projections to the end of the ESL spectrum period in 2044, to account for the declining spectrum prices over the licence duration of the renewed ESL spectrum.
- (b) The downward trend of spectrum prices is expected to continue beyond 2024-25, and throughout the renewed licence duration of the ESLs till 2044 (and beyond).
- (c) As such, Optus proposes that to take into consideration the declining value of the spectrum over its licence length, forward-looking pricing needs to carry forward the valuation projections, not to the start of the ESL spectrum renewal period, but to its end in 2044.
- (d) Optus also contends that there will be downward pressure on spectrum prices, which in turn should lower the renewal prices. Furthermore, the next set of ESL pricing in 2044 can be expected to be lower than this round of renewals.

Step 8: Expand valuation to desired licence duration

- (a) Optus agrees with the methodology of expanding the pricing from 365 days to the various licence lengths.

Step 9: Calculate the intersection range for spot and PPP exchange rate valuations

- (a) Optus supports using an intersection range for spot and PPP exchange rates, however proposes that the PPP be calculated based on the components of cost avoidance and not the standard “basket of goods” PPP.

Appendix B. 3.4 GHz DEFRAGMENTATION

This appendix sets out further details on how a regulator-led defragmentation could assist in facilitating greater alignment in the 3.4GHz band to the 3.6GHz band configuration impacting Optus licences.

Using the principles described in Section 3, Optus has considered the non-aligned frequencies and areas and proposes the following under a regulator-led defragmentation.

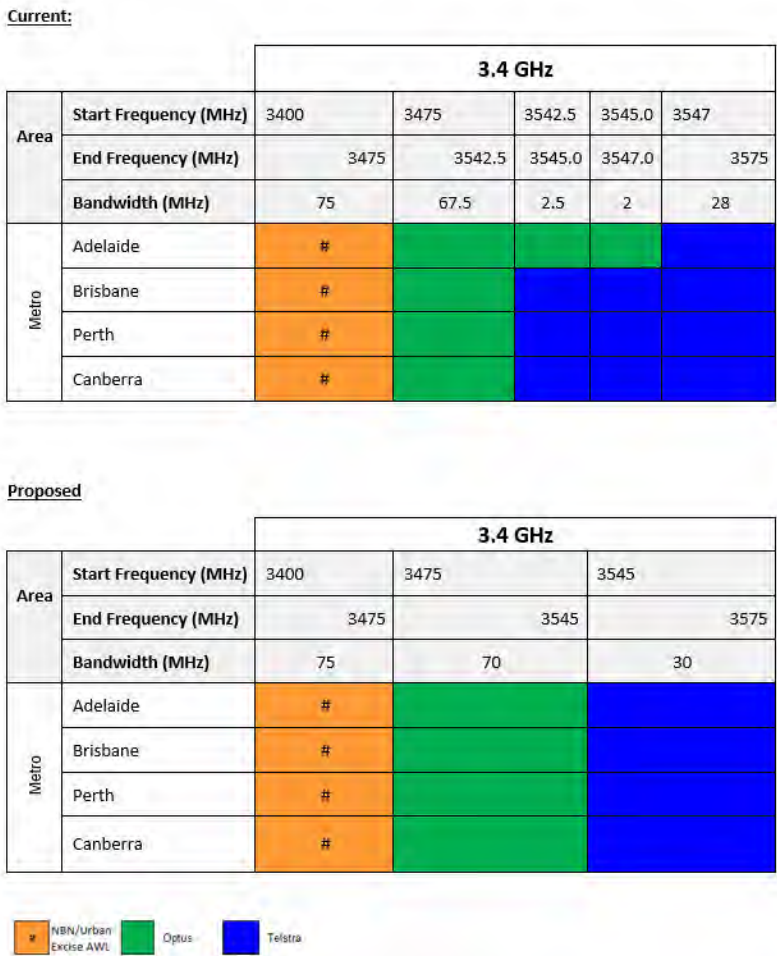
Proposed regulator-led defragmentation to facilitate alignment to 10MHz lots

Desired outcome: Frequency alignment of Optus Metro Holdings to a multiple of 10 MHz

As discussed, and shown in Figure 11,

- (a) Adelaide: Optus currently holds 72 MHz of ESL 3.4 GHz spectrum. Optus renewal offer reduced to 70 MHz (3475 – 3545 MHz) and the remaining 2 MHz offered to Telstra
- (b) Brisbane, Perth, Canberra: Optus currently holds 67.5 MHz of ESL 3.4 GHz Spectrum. Telstra renewal offer reduced by 2.5 MHz and Optus renewal offer increased by 2.5 MHz to 70 MHz (3475 – 3545 MHz)

Figure 11 Optus Metro Holdings to be aligned to a multiple of 10 MHz



Source: Optus

Desired outcome: Geographic boundary alignment of Optus Metro Holdings MHz

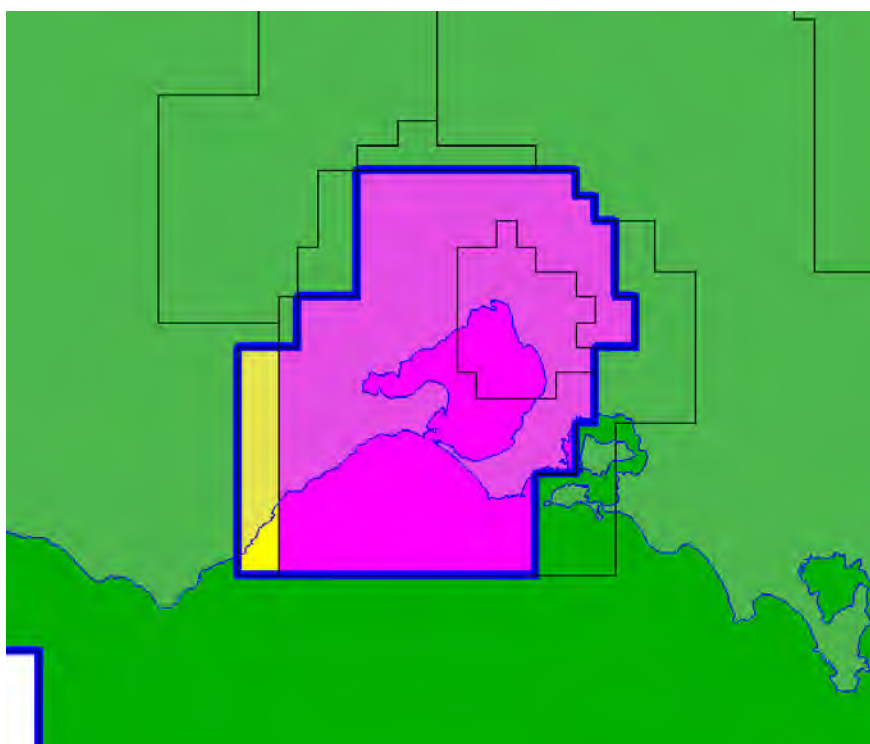
The following cases describe areas where the Geographic ESL 3.4 GHz area are currently not aligned to the 3.6 GHz boundaries for Optus licences. In each example, Optus sets out the current and proposed changes to address defragmentation of licences in those spectrum areas.

Case Study 1: Melbourne

Figure 12 shows the Melbourne region spectrum boundaries. The standard 3.6 GHz boundaries are identified by the thick blue lines. The different Optus BW holdings are coloured. In Melbourne, Optus holds 100 MHz across 5,007,982 pops (pink area) and 70 MHz across 5,268 pops (yellow area - Melbourne Outer SW).

In order to align the ESL 3.4 GHz boundary to the standard 3.6 GHz configuration, the small area of Melbourne Outer SW needs to be combined with Optus existing Melbourne holdings.

Figure 12 Melbourne Metro Licence Boundaries



Source: Optus

To achieve alignment, Optus suggests that the ACMA modify the renewal offers for Melbourne Outer SW to:

- (a) Telstra's renewal offer removed for 10 MHz (3500 – 3510 MHz)
- (b) NBN renewal offer removed for 20 MHz (3475 – 3485 & 3490 – 3500 MHz)
- (c) Unsold 5 MHz to be allocated to Optus as part of the renewal offer
- (d) Optus renewal offer to be increased by 35 MHz (3475 – 3510 MHz) to align with Optus Melbourne 100 MHz holdings (3475 – 3575 MHz).

Figure 13 Current and proposed licence changes for Melbourne

Current:

		3.4 GHz					
Area	Start Frequency (MHz)	3400	3475	3485	3490	3500	3510
	End Frequency (MHz)		3475	3485	3490	3500	3510
	Bandwidth (MHz)	75	10	5	10	10	65
Metro	Melbourne	#					
Outer Metro	Lorne						

Proposed:

		3.4 GHz	
Area	Start Frequency (MHz)	3400	3475
	End Frequency (MHz)	3475	3575
	Bandwidth (MHz)	75	100
Metro	Melbourne	#	
Outer Metro	Lorne		



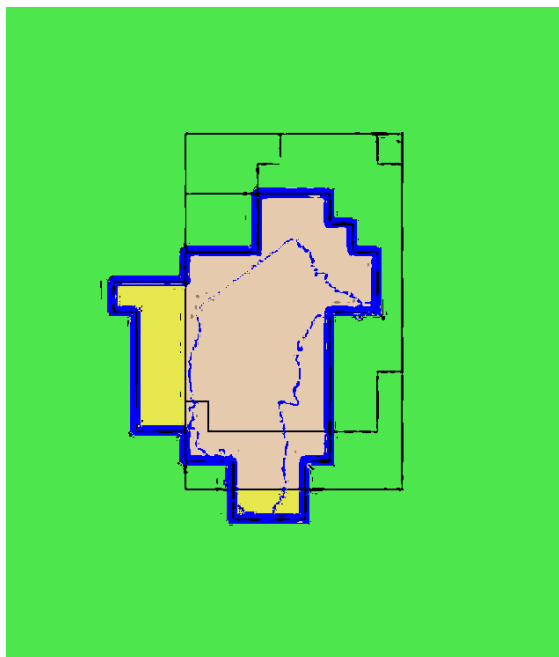
Source: Optus based on RRL data

Case Study 3: Canberra

Figure 14 shows the Canberra region spectrum boundaries. The standard 3.6 GHz boundaries are identified by the thick blue lines. The different Optus BW holdings are coloured. In Canberra, Optus holds 67.5 MHz across 506,579 pops (beige area) and 65 MHz across 167 pops (yellow area – ACT South (71 pops) and ACT West (96 pops) This area is also not aligned in frequency.

In order to align the ESL 3.4 GHz boundary to the standard 3.6 GHz configuration, the small area of ACT South and ACT West needs to be combined with Optus existing Canberra holdings.

Figure 14 Canberra Metro Licence Boundaries



Source: Optus

In order to achieve alignment and assuming that the Optus Metro holdings are changed to 70 MHz (3475 – 3545 MHz), Optus suggests that the ACMA modify the renewal offers for ACT South and ACT West to:

- (a) NBN renewal offer removed for 20 MHz which changes holdings from 3400 – 3495 MHz to 3400 – 3475 MHz. Note that a recent check of the ACMA RRL indicates that NBN hold no registrations in this and surrounding area in the frequency range 3475 – 3495 MHz.
- (b) Optus renewal offer increased by 5 MHz and repositioned in the band from 3510 – 3575 MHz to 3475 – 3545 MHz to align with Optus Canberra 70 MHz holdings (3475 – 3545 MHz).
- (c) Telstra renewal offer increased by 30 MHz to 3545 - 3575 MHz to align with Telstra's Canberra holdings.
- (d) Note that the 15 MHz of unsold spectrum is now allocated.

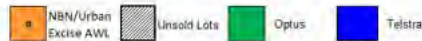
Figure 15 Current and proposed licence changes required for Canberra

Current:

		3.4 GHz						
Area	Start Frequency (MHz)	3400	3475	3495	3510	3540	3542.5	3545
	End Frequency (MHz)	3475	3495	3510	3540	3542.5	3545	3575
	Bandwidth (MHz)	75	20	15	30	2.5	2.5	30
Metro	Canberra	#						
Outer Metro	ACT West & ACT South							

Proposed:

		3.4 GHz		
Area	Start Frequency (MHz)	3400	3475	3545
	End Frequency (MHz)	3475		3575
	Bandwidth (MHz)	75	70	30
Metro	Canberra	#		
Outer Metro	ACT West & ACT South			

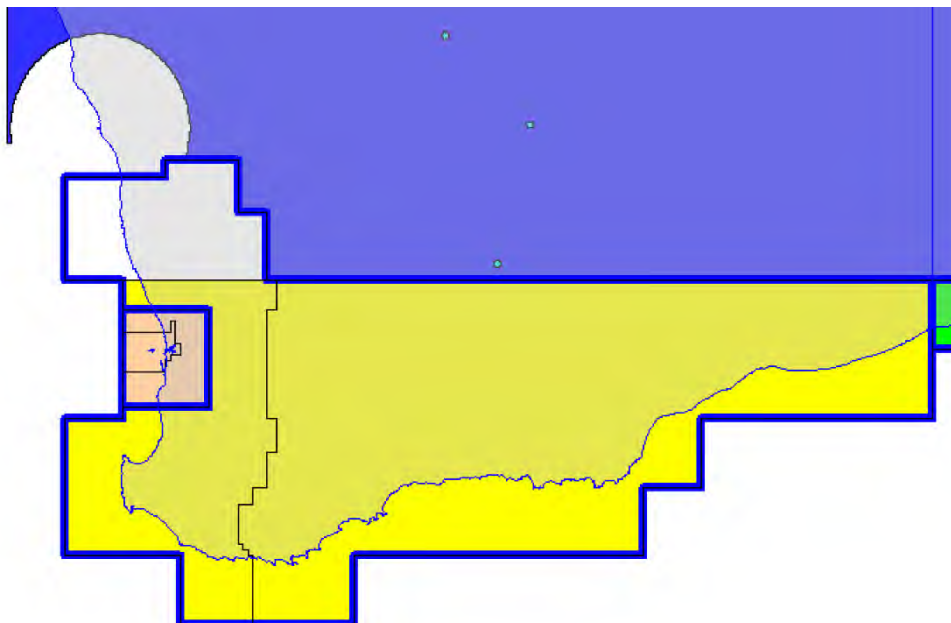


Source: Optus based on RRL data

Case Study 3: WA Region

Figure 16 shows the WA region spectrum boundaries. The standard 3.6 GHz boundaries are identified by the thick blue lines. Note that whilst Optus holds 65 MHz across WA Regional SW and WA Regional SE (yellow areas), the frequencies do not align.

Figure 16 WA Region licence boundaries



Source: Optus

In order to achieve greater frequency alignment, Optus suggests that the ACMA modify the renewal offers for WA Regional SE (pop 90,436):

- (a) Telstra renewal offer removed for 2.5 MHz and the frequency band moved from 3505 – 3542.5 MHz to 3540 – 3575 MHz.
- (b) Optus renewal offer change frequency band from 2 blocks (3442.5 – 3475 MHz and 3524.5 – 3575 MHz) to a single block (3475 – 3540 MHz)
- (c) NBN renewal offer increased by 2.5 MHz and moved to occupy a single block, 3400 – 3475 MHz

Figure 17 Current and proposed licence changes required for WA Regional South East

Current:

		3.4 GHz							
Area	Start Frequency (MHz)	3400	3442.5	3475	3505	3510	3540	3542.5	3545
	End Frequency (MHz)	3442.5	3475	3505	3510	3540	3542.5	3545	3575
	Bandwidth (MHz)	42.5	32.5	30	5	30	2.5	2.5	30
Metro	Perth	#	#						
Regional	WA Regional South West								
	WA Regional South East								

Proposed:

		3.4 GHz					
Area	Start Frequency (MHz)	3400	3475	3510	3540	3545	3575
	End Frequency (MHz)	3475		3510	3540	3545	
	Bandwidth (MHz)	75		35	30	5	
Metro	Perth	#					
Regional	WA Regional South West						
	WA Regional South East						



Source: Optus based on RRL data

ATTACHMENT 1

Coleago Consulting, 2025, The ACMA ESL Stage 3 Consultation paper response, June

The ACMA ESL Stage 3 Consultation paper response

prepared for

Optus

23 June 2025



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1. Executive Summary

ESL prices for MNO spectrum licences should reflect the long-term public interest

Public interest pricing approach takes into account the overall benefits to the community: both spectrum fees and the long-term socio-economic impact of mobile

Mobile communications should be regarded as an essential service and the ACMA has recognised the significant public benefits it can generate

This paper responds to the ACMA's Expiring Spectrum Licences, Stage 3: Consultation Paper published in April 2025¹ and, in particular, Preliminary views paper 4: Pricing for ESLs, published alongside the consultation Paper.

We believe that ESL prices for WA WBB should be based on public interest pricing to reflect the long-term public benefits delivered as we advocated in our 2024 "ESL Pricing Paper"² submitted as input to the Stage 2 information gathering process. For the avoidance of any doubt, we do not equate this approach with cost recovery pricing. Rather, the public interest pricing approach takes into account the overall benefit to the community from both spectrum fees as well as the long-term socio-economic impact of mobile. In our view, setting ESL prices based on market value will undermine the long-term public interest.

The critical determination the ACMA must make in deciding whether renewing ESL (full or partial renewal) is the long-term public interest according to Section 77C (5) of the Radiocommunications Act 1992 (the Act). Coleago believes that the same principle should apply to the pricing of ESLs that are renewed, as we also argued in our Stage 2 submission. The ACMA calls this approach *public interest pricing*³ and we would characterise this as setting ESL prices below the market value of the spectrum where there is evidence that they provide public benefits and/or help meet relevant government policy objectives.

In Preliminary views paper 4, the ACMA states that spectrum pricing is one of the ways they can ensure that the public interest is promoted. However, while the ACMA do not provide firm views on whether public interest pricing (or discounts) should be applied to ESL spectrum, they do note that the Minister has powers to give "*written directions to the ACMA about matters dealt with in spectrum access charge determinations*" under section 294 (2) of the Act⁴. As a result, the preliminary price ranges for ESLs estimated by the ACMA are only intended to reflect the market value of the spectrum.

The ACMA's preliminary views recognise that ESLs for wide-area wireless broadband (WA WBB) can generate significant benefits according to the public interest criteria and relevant policy objectives from Ministerial Policy Statements that comprise the ACMA's ESL evaluation framework. In fact, mobile communications should be regarded as an essential service given its contribution to the economy and society. Furthermore, we argue that the level of spectrum prices will affect the extent to which public benefits and relevant policy objectives are met. Hence, there is a strong case for setting ESL prices below market value, whatever the mechanism for doing so, to maximise the long-term benefits to the economy and the community.

As we said in our ESL Pricing Paper⁵, these include investment, digital transformation through 5G and 6G, including providing access to online government services, innovation (e.g. increasing coverage through complementary satellite services), and competition and supporting emergency services. Public benefits will also arise from mobile communications and new satellite D2D services through promoting inclusion and social cohesion, particularly in peri-urban and rural areas.

Moreover, the ACMA has imposed a range of additional regulations on MNOs since the last ESL process to benefit consumers through requirements to improve customer

1 <https://www.acma.gov.au/consultations/2025-04/expiring-spectrum-licences-stage-3-preliminary-views>

2 Attached to Optus Submission in Response to ACMA Consultation Paper, ESL Stage 2, <https://www.acma.gov.au/consultations/2024-03/expiring-spectrum-licences-stage-2-information-gathering-and-views-uses-frequency-bands-and-alternative-licence-conditions>

3 Preliminary views paper 4, pages 5 and 6

4 Preliminary views paper 4, page 6

5 Attached to Optus ESL Stage 2 Submission, <https://www.acma.gov.au/consultations/2024-03/expiring-spectrum-licences-stage-2-information-gathering-and-views-uses-frequency-bands-and-alternative-licence-conditions>

communications and complaints handling for significant local outages⁶ and for handling Triple Zero calls⁷.

The rules will benefit the public by ensuring customers are better informed during local outages and that additional efforts are made to keep vulnerable consumers connected. They will also provide greater certainty that calls to the Triple Zero emergency service will be carried where a telco network suffers an outage and an alternative telco network is available to carry the call.

The public interest framework requires that the ACMA should set its ESL price estimates conservatively ... and ...

it is appropriate and necessary for public interest discounts to be applied

Given the public interest framework that the ACMA has set out for ESL, we argue in the rest of this paper that the following implications arise:

- The ACMA's ESL prices should be set conservatively
 - We have also identified a number of potential enhancements to the benchmarking that the ACMA could readily address by adjustments to the benchmark dataset and which would reduce ESL price estimates
- Ministerial public interest discounts should be applied to the ACMA benchmarking estimate. Appropriate Ministerial discounts should be set to reflect the long-term public interest thereby optimising the positive impacts on investment, competition, innovation, inclusion remote/rural connectivity.
- A public interest discount of 50% would be consistent with other discounts given for spectrum pricing⁸ and would generate significant public benefits.

A public interest discount of 50%, similar to past discounts for rail communications and NBN, would lead to significant public benefits

The table below presents our ESL price estimates after adjusting for amendments to the benchmarking and applying a 50% public interest discount.

Exhibit 1: ESL Prices after adjustments to benchmarking and 50% public interest discount

Band	Adjusted preliminary price ranges (AU\$/MHz/pop)		Change vs. ACMA proposals	
	Lower	Upper	Lower	Upper
700 MHz	0.2304	0.2546	-62%	-66%
850 MHz	0.2796	0.3089	-56%	-60%
1800 MHz	0.0914	0.1123	-52%	-52%
2 GHz	0.0542	0.0666	-66%	-66%
2.3 GHz	0.0177	0.0262	-68%	-61%
2.5 GHz	0.0198	0.0293	-65%	-58%
3.4 GHz	0.0606	0.0687	-61%	-65%

Source: Coleago

The total market impact of these prices, taking the lower and upper limits would range from AU\$ 2-2.4 billion.

⁶ <https://www.acma.gov.au/articles/2025-04/stronger-consumer-protections-during-telco-outages>

⁷ Changes to the Emergency Call Service Determination 2019 commence on 1 November 2025

⁸ In the 2013 renewal process, The Minister directed the ACMA to give a 50% discount rail communications use of 1800 MHz and, in 2020, the Minister directed the ACMA to discount fees for NBN Co by 50% in the conversion of apparatus to spectrum licences for 3.4 GHz.

2. The ACMA should set ESL prices conservatively, based on the long-term public interest

ESL prices do not have to be set at market value to promote efficiency. Moreover, ESL prices should reflect the long-term public interest

The ACMA notes that its decision to set a preliminary price range for ESL prices that reflect market value will encourage efficient spectrum use – one of the components of the long-term public interest. The fact that the ACMA gives a range acknowledges the challenges in using benchmarking to set spectrum prices.

However, we do not agree that ESL prices should ultimately be set at market value. They should reflect the long-term public interest and be set below the market value of the spectrum, where there are material public benefits, even if the ACMA benchmarking is estimated conservatively.

We believe that, where the ACMA decides that existing licensees have a continuing need for ESL spectrum and that demand from alternative uses (if it exists) is unlikely to better promote the public interest, the secondary market is sufficient to ensure that spectrum continues to be efficiently used over time. Therefore, ESL prices do not have to be set at market value to promote efficiency.

While assessing what level of ESL prices optimises the public interest is a policy question, as long as prices are above the opportunity cost of the spectrum in alternative uses, the allocation of spectrum will be efficient. In the rest of section 2, we discuss the challenges of the ACMA's proposed benchmarking approach and the need to set prices conservatively given the asymmetric risks of setting prices too high vs. too low. The public interest benefits of lower spectrum prices are set out in more detail in section 4 and approaches for setting an ESL price floor based on the opportunity cost of ESL spectrum in alternative uses is discussed in section 5.2.

2.1 The challenges of the ACMA's benchmarking approach

Enterprise value, cost avoidance and auction avoidance have significant drawbacks for ESL pricing

We note the challenges that the ACMA describes in estimating market values and that the ACMA has ruled out the approaches of enterprise value, cost avoidance and auction avoidance, the drawbacks of which are summarised in Appendix A:

Instead, the ACMA has proposed a benchmarking approach to estimating market value. While the ACMA has produced a detailed and transparent analysis, benchmarking is still challenging. This is because benchmarking necessarily involves determining a large number of influencing variables and assumptions to deal with the heterogeneity of the input data. This makes benchmarking an art more than a science, requiring subjective assumptions which can be hard to replicate without access to datasets, such as:

However, benchmarking is challenging due to the subjective assumptions that must be made

- Selecting which countries are appropriate comparators
- Dealing with changing trends in spectrum values over time
- The treatment of outliers or level of dispersion within the results, i.e. the choice of the range
- The treatment of spectrum that has sold at the reserve price is difficult. If spectrum is sold at the reserve price, it usually indicates that regulators unintentionally set the reserve price too high and even above the marginal value of the spectrum (though not high enough to fail to sell all the spectrum)
 - If spectrum is set aside for new entrants, a lack of competition can make it difficult to draw conclusions on the true value of the set aside lots (if they sell at the reserve price)

Moreover, each spectrum auction comes with its own set of unique features such as spectrum allocation limits, coverage or capacity use cases, specific licence conditions, speculative bidding by non MNOs, ties to other commercial activities such as a merger or roaming agreement, set asides for continuity of use at predetermined prices and

spectrum reserved encourage new entrants (which can create artificial scarcity). The level of competitive intensity can differ, even where the number of MNOs is the same – e.g. market shares could be roughly equal, or one MNO may dominate much smaller rivals – which complicates comparisons between countries. In other words, the regulatory and market environments vary between countries and over time, which adds further complexity to benchmarking.

They are also relatively infrequent within the same country, as the ACMA states, though taking data from a range of relevant countries can compensate for this. However, once data is filtered for relevance to the Australia context, there is a risk that data sets become limited in size.

Finally, the ACMA has explicitly excluded renewal price information, domestic and international. Renewal prices are often lower than auction prices - for example, they are less influenced by the market conditions which can lead to mis-estimations of spectrum value and over-bidding as in many of the European 3G auctions in the early 2000s. As a result, we believe there is a good argument for including renewal prices in the benchmarking of spectrum values.

We set out some potential adjustments that the ACMA could make to improve the proposed benchmarking in section 3.

2.2 ESL prices should be set conservatively and with necessary adjustments to reflect the challenges of benchmarking and asymmetric risks

Given the challenges and the asymmetric effects of (low/high) prices on public benefits, the ACMA should set ESL prices conservatively

Given the challenges of using benchmarking as set out in the previous section, it is essential that ESL prices are set conservatively. With all the assumptions needed, benchmarking is not precise, and it is prudent that the ACMA has tried to control outlier prices, taken into consideration the declining trend of spectrum prices, and proposed a preliminary price range.

However, there are even more compelling reasons to set ESL prices conservatively once all the elements of the long-term public interest are considered.

There is, broadly, an inverse relationship between ESL fees and the overall economic/societal benefit from operating ESL spectrum. This means that the risk to the long-term public interest is asymmetrically much higher in setting ESL prices too high rather than too low. If ESLs are offered for renewal, then the ACMA will have determined the MNO has an ongoing need for the spectrum, hence, if prices are too low, the risks to efficiency, investment, competition and the wider public benefits from mobile communications are limited.

However, if prices are too high, the risk of disincentives to investment, distortions to competition and other public interest objectives are much higher (as we explain in the following sections). Telstra and TPG also highlighted this in their ESL Stage 2 submissions and the ACMA appear to accept this point in Preliminary views paper 3, stating that their “*approach leads to relatively conservative renewal prices, as the valuation methodology controls for outlier prices and assumes declining spectrum values over time.*”⁹

2.3 Risks of setting spectrum prices too high

High ESL prices will negatively affect a range of key benefits including investment, digital transformation, competition and affordability

High spectrum prices carry significant risks because they:

- Compete for funds and hence risk crowding out network investment which could, in particular, slow down both the extension of 5G coverage and the upgrade to 5G Standalone technology in Australia

⁹ Preliminary views paper 3, page 5

- Exacerbate competitive distortions in the market – fixed costs in the Australian mobile market are significantly higher than average and this already undermines competition
 - Telstra has the highest economies of scale since it has the most extensive network (particularly in regional and remote areas) and enjoys a competitive advantage as a result. Spectrum fees are also fixed costs. The higher prices are, the greater the risk of exacerbating existing competitive imbalances, particularly benefiting Telstra
 - Asymmetric prices would not be a good solution to the risk that high ESLs prices benefit Telstra, because they would be discriminatory and difficult to justify in terms of the public interest. Rather, the solution is to set prices conservatively to minimise the risk of distortions to competition that favour larger operators
- Risk raising retail prices either if operators pass on higher costs or there is a significant lessening of competition
- Risk that spectrum charges exceed the value to the existing holder. It might become economically unviable for the existing holders to renew their licences even though they were the most efficient possible user of the spectrum and could deliver the greatest public benefit. It would not be viable for anyone else to acquire the spectrum at that price, so:
 - The spectrum could lie wastefully fallow for a period until reassigned, e.g. at auction, which would inevitably lead to a lower price given underlying spectrum valuations
 - Alternatively, consolidation could occur reducing competition and/or Telstra could ultimately acquire spectrum left fallow thus increasing its competitive advantage
 - Bidders in the German 3G auction where spectrum prices are generally agreed to be excessive (Group 3 and MobilCom) handed spectrum back (without refund) under pressure from the regulator once it was clear they could not meet rollout requirements

These themes are similar to the more general public interest issues, and we expand upon them in our discussion of the broader public interest issues in section 4.

2.4 The risks to efficiency of setting spectrum prices too low are limited

Renewing ESL implies an identified ongoing need for the spectrum and as long as prices are above opportunity costs for alternative uses, the economic risk is low

On the other hand, low ESL prices are unlikely to result in a misallocation of spectrum, provided that they are above the opportunity cost for alternative uses of the spectrum. This should be the case, given that the decision to renew would be predicated on the ACMA finding continuing and ongoing demand for ESL spectrum from existing licensees and a lack of credible competing demand from alternative users.

In conclusion, the arguments set out above mean that ACMA must set ESL prices conservatively, even if its focus is only on the public interest criterion of efficiency. In relation to its preliminary price ranges, this could mean setting ESL prices below the lower end of the ranges if the factual issues we have identified in the benchmarking, and set out in the next section, are addressed.

3. Enhancements to the benchmarking analysis

While considering the benchmarking approach developed by the ACMA appropriate to estimate the future value of ESLs, there are some areas where, despite the ACMA's thorough analysis, the benchmarking can be improved. These changes reduce the benchmarking estimates by as much as 35%, depending on band, according to our estimates. We recommend that the ACMA amends its analysis accordingly.

3.1 Additional data points in the benchmarking dataset

The benchmark data set includes auctions from 2013 onwards with most from 2017 onwards. However, the following relevant auctions with low \$/MHz/pop prices for sub-1 GHz spectrum were not included in the dataset:

- Finland, November 2016, 700 MHz band, € 0.199 (AU\$ 0.296)/ MHz / pop, with fees payable in five-year instalments for a licence which is effectively in perpetuity, three MNOs/bidders
- Germany, June 2015, 700 MHz band, € 0.202 (AU\$ 0.298) / MHz / pop, 15-year licence duration, three MNOs/bidders

Including these two auctions within the benchmark would lead to a reduction in the sub-1 GHz preliminary prices range of about 10%¹⁰.

3.2 Amendments to information within the benchmarking dataset

3.2.1 Revisions to spectrum licence duration data

In table 13, some licence durations should be revised to reflect the actual tenure licensees enjoy rather than the initial term:

- In Canada, the USA, and Finland licences are for an initial period of a defined number of years and upon expiry of the initial period become effectively perpetual thereafter. The value bidders attach when bidding for the initial licences is based on perpetuity. After the initial term has expired, a small administrative fee is paid annually to cover the spectrum management authority's costs, but this is not a licence fee.
- For example, in the US while the licenses are not "perpetual" in the strict legal sense, the FCC's framework allows for continuous renewals, effectively enabling licensees to operate indefinitely, assuming compliance with regulatory obligations. This approach is designed to provide long-term certainty for licensees, encouraging substantial investment and deployment in the spectrum. Canada and Finland have similar arrangements.

Two European auctions appear to have been missed from the data set – including them reduces sub-1 GHz preliminary price ranges by c. 10%

In a number of countries such as Canada, Finland and the US, spectrum licences are effectively perpetual – taking a 50-year duration as an approximation leads to reductions in benchmark prices of up to 16%

¹⁰ Germany and Finland would be the 2nd and 3rd lowest data points in the sub 1GHz sample if included and hence lie outside the 35% and 65% range for the cohorts. However, adding them to the sample shifts the 35th & 65th percentiles downwards (in all 3 cohorts, i.e. GDP, number of MNOs and population density) which reduces the lower and upper values for the benchmark price range.

Exhibit 2: Spectrum licence durations to be revised

Country and allocation	Licence duration in table 13	Effective licence duration
Canada - 600 MHz	20	Perpetual
United States – 600 MHz	12	Perpetual
Canada – 2 GHz	20	Perpetual
United States – 1.995 GHz	10	Perpetual
United States – 1.7–2.2 GHz	10	Perpetual
Canada - 2.6 GHz	20	Perpetual
Canada – 2.6 GHz	12	Perpetual
Finland – 2.6 GHz	20	Perpetual
United States – 2.5 GHz	10	Perpetual
Canada – 3.5 GHz	20	Perpetual
Canada – 3.6 GHz	17	Perpetual
Canada – 3.8 GHz	20	Perpetual
Finland – 3.5 GHz	15	Perpetual
United States – 3.7 GHz	15	Perpetual
United States – 3.45 GHz	15	Perpetual

Source: Coleago

According to our estimates, adjusting for these effectively perpetual durations¹¹ would reduce the preliminary price ranges by 0-16% over the four band categories.¹²

3.2.2 Number of MNOs

In table 14, we believe that some data with regards to the number of MNOs should be revised to better reflect market conditions¹³:

- The Canadian 600 MHz auction was a regional auction there were at least four MNOs bidding in each region and not only three. Some were outbid, so that eventually in most regions, spectrum was assigned to only three MNOs. However, in nearly all regions there are four MNOs competing;
- The German 3.4 GHz auction had four MNOs bidding and not only three. All four MNOs obtained spectrum;
- In the US, in most auctions, there were more than three MNOs in the majority of markets and typically 4 national MNOs.

It is also unclear how the ACMA defines MNOs for the cohort analysis in the benchmarking. We would argue that those who bid, but did not have or subsequently deployed a wide area mobile network should not be included as MNOs and should be excluded from the benchmark¹⁴. The ACMA seems only to consider national MNOs and this will understate competition where there are regional operators as in the US. We also note that the number of MNOs in some markets has changed over time, and it is not clear whether this has been taken into account in the benchmarking analysis.

11 We approximated the impact of perpetual licence durations by assuming a duration of 50 years. Beyond this point, future revenues and costs becomes very uncertain.

12 In sub 1 GHz, the upper limit falls by 9%, the lower limit is not affected; the lower 1-3 GHz bands are unaffected; in upper 1-3 GHz, the upper limit is unaffected, the lower limit falls by 16%; in 3.4 GHz, the upper limit falls by 9%, the lower limit is not affected.

The reason why the price ranges are only partially affected is that it is only when the adjusted data points affect the lower or upper percentile (either before or after the change) that the price ranges are affected.

13 Revisions to the number of MNOs leads to additional reductions of up to 2% in the sub-1 GHz and 3.4 GHz price ranges

14 The 2017 Australian auction of unsold 700 MHz lots is an example of the difficulties that can arise in making this distinction. TPG acquired 700 MHz but did not then deploy a national network and become an MNO. It only became an MNO when it subsequently merged with Vodafone.

The MSR/MHz/pop index used to account for the changing value of spectrum over time does not assess the impact of future spectrum releases

The ACMA plans significant spectrum releases between now and 2032

Taking a conservative position that 500 MHz becomes available by 2032 would lead to a reduction in preliminary prices by 4-32% depending on the band

The ACMA should also assess how future spectrum releases could affect the value of spectrum post 2032

Although the auction benchmarks include regional data, the MSR/MHz/pop index excludes them. The ACMA should review and explain the rationale for this discrepancy

3.3 Assumptions in the future MSR/MHz/pop index

The ACMA rightly recognises that mobile service revenue per MHz used to generate that revenue has declined. In step 7 of its valuation methodology the ACMA uses the MSR/MHz/pop index projections. Appendix C of the Preliminary views paper 4: Pricing for ESLs contains the detailed information. Figure 17: MSR/MHz/pop values – single-year and 3-year moving average and Figure 18: MSR/MHz/pop index values (base year FY25 = 1) show that in its calculations the ACMA assumes that beyond 2025 values are almost constant.

The assumption that between now and 2032 MSR/MHz/pop remains flat implies that there will be no new spectrum assignments for mobile operators in Australia. This is not plausible as apparent from several ACMA documents:

- “That the frequency range for 6585–7100 MHz will be reserved for WA WBB in yet to be defined metro areas/regional centres.”¹⁵
- “To progress considerations on WRC-27 agenda item 1.7, we will also undertake relevant studies towards possible IMT identifications in the 4400–4800 MHz frequency band, parts of the 7125–8400 MHz and the 14.8–15.35 GHz frequency bands”.¹⁶
- The 1.5 GHz band (1427-1535) is at the preliminary replanning stage and a release outcomes paper is scheduled for Q3 2025 according the Draft FYSO 25-30¹⁷.
- The 600MHz band is being monitored for potential IMT use. While the amount of spectrum in this band is 80 MHz at the most, it would account for a substantial proportion of sub-1GHz spectrum.

Assuming the ACMA follows through on these statements, in the period to 2032 at least 500 MHz in the range below 7.1 GHz could be assigned to mobile operators. With those allocations, MSR/MHz/pop will decline substantially. These future spectrum allocations should be included in the calculation and inform the ACMA’s licence renewal pricing calculations. Assuming that spectrum does increase by the minimum 500 MHz evenly spread over the years 2028-2032, the resulting change in the MSR/MHz/pop index would reduce the ACMA’s metrics by 4%-32% depending on the start date of the new licences (the impact is biggest for licences that expire latest i.e. 2 GHz licences in FY 2033).

Taking a forward-looking approach for such foreseeable developments would be good practice and would reduce the risk of overestimating ESL prices.

Taking a forward-looking approach also means that the ACMA’s price estimates should incorporate how the value of spectrum is expected to fall post 2032 as more spectrum is likely to become available. In addition, future ESL prices should be lower than in this round assuming current trends continue.

3.4 Inconsistencies in the use of metro and regional data

We note that while the benchmark auction data includes information from regional auctions – for example, at 1800 MHz in 2016 and 3.4/3.7 GHz in 2023 in Australia – the MSR/MHz/pop index only includes data from metro areas. The ACMA has not explained its rationale for taking a different approach in the two cases making it difficult to comment on this part of the methodology.

¹⁵ Future use of the upper 6 GHz band, Outcomes paper, December 2024

¹⁶ Five-year spectrum outlook 2025–30 and 2025–26 work program, Draft for consultation, March 2025

¹⁷ https://www.acma.gov.au/sites/default/files/2025-03/Draft_FYSO_2025-30_0.pdf

3.5 Summary of our estimated ESL price after correcting for benchmarking issues

The table below presents our estimates of the preliminary price ranges for each band after correcting for each of the enhancements we recommended above, i.e. omissions to the data set, effectively perpetual licence durations, revisions to number of MNOs and projected future falls in the MSR/MHz/pop index. We also show the percentage change compared to the ACMA's proposed preliminary price ranges.

Public interest discounts have not been applied to these figures.

Exhibit 3: Estimated ESL price ranges after amending for recommended benchmarking enhancements (Option 2 licence duration)

Band	Adjusted preliminary price ranges (AU\$/MHz/pop)		Change vs. ACMA proposals	
	Lower	Upper	Lower	Upper
700 MHz	0.4608	0.5091	-24%	-31%
850 MHz	0.5592	0.6179	-12%	-21%
1800 MHz	0.1827	0.2246	-4%	-5%
2 GHz	0.1084	0.1333	-32%	-32%
2.3 GHz	0.0355	0.0524	-35%	-22%
2.5 GHz	0.0396	0.0586	-30%	-15%
3.4 GHz	0.1212	0.1349	-23%	-32%

Source: Coleago

Exhibit 4: Estimated total industry bill before and after benchmarking enhancements (Option 2 licence duration)

Band	Total Bill with ACMA proposed prices		Est. Total Bill after benchmarking enhancements	
	Lower	Upper	Lower	Upper
	<i>AU\$ mn</i>	<i>AU\$ mn</i>	<i>AU\$ mn</i>	<i>AU\$ mn</i>
700 MHz	1,591	1,946	1,211	1,338
850 MHz	724	885	636	702
1800 MHz	810	1,007	781	960
2 GHz	460	572	315	388
2.3 GHz	111	136	72	106
2.5 GHz	231	282	162	239
3.4 GHz	1,148	1,457	887	1,006
Total	5,076	6,286	4,063	4,739

Source: Coleago

Applying the changes to the benchmarking discussed in this section would result in total ESL fees of AU\$ 4-4.7 billion (under Option 2) as opposed to AU\$ 5.1-6.3 billion under the preliminary view pricing, a reduction of 20-25%.

3.6 Pricing and the choice of licence duration

The ACMA sets out two options for the duration of renewed ESLs: Option 1 – a 20-year duration; Option 2 – varying the duration by band so as to synchronise expiry per band category for 2044.

Coleago believes that Option 2 is the better approach. Faster and more streamlined renewals process will benefit the MNOs and the ACMA and the secondary market will be more effective.

However, if Option 1 were chosen, we would recommend the ESL fees were set on a linear basis. I.e. the value of the licence over the 20-year duration should be set

according on a flat annuity basis as proposed by the ACMA for Option 2. The ACMA is right to say that, given the current outlook for the market, it is no longer appropriate to assume that cash flows will increase at a constant rate and better to assume that they are flat. Therefore, a flat annuity is the best approach.

We present estimates for ESL pricing and the total industry bill under Option 1, using a flat annuity approach, in Appendix B:.

4. Public interest discounts for ESLs

4.1 Mobile networks provide an essential service to the public

The Government and other stakeholders acknowledge that mobile networks are essential to modern life and hence it is in the public interest to ensure that all three operators can continue to invest to deliver 5G Advanced, 5G-Stand Alone, and later 6G to Australians.

In the words of the Minister for Communications, the Hon Michelle Rowland MP: *“Telecommunications services are essential for participation in modern life, and ensuring that systems and processes are working to support people during stressful outages is fundamental.”*

“Telecommunication services are essential services, as important to our health and way of life as the electricity and water in our homes”.
Ombudsman Cynthia Gebert

The Telecommunications Ombudsman Cynthia Gebert stated: *“Telecommunication services are essential services, as important to our health and way of life as the electricity and water in our homes. We rely on phone and internet services in emergencies, for work, banking, telehealth services, social cohesion – everything. We need a policy agenda that reflects the indispensable nature of telecommunications.”*

The increasing number of regulatory requirements imposed on mobile operators that are linked to the societal benefits mobile delivers are clear evidence of the public interest function of mobile services.

The preliminary price ranges set out in ACMA’s Preliminary views paper 4 explain that proposed ESL prices do not reflect public interest criteria: *Pricing for ESLs, are intended to reflect the market value of the spectrum. They therefore do not account for any public interest discounts.*

Although efficient spectrum use and the market value of spectrum are useful reference points, if spectrum use delivers significant benefits in other areas of the public interest, this should also, ultimately, be reflected in pricing.

Use of the spectrum for WA WBB will generate a range of wider economic and societal benefits that will be greater the lower ESL prices are. Deciding on appropriate ESL prices, or discounts to the ACMA’s benchmarking estimates for ESL spectrum, is then a matter of balancing the returns to the community from direct spectrum fees against the wider economic and social impact of lower fees.

The key economic and social benefits that are enhanced by lower spectrum fees are:

- Investment
- Maximising the benefits from Australia’s digital infrastructure to support the digital transformation in the economy and public services
- Innovation in new technologies and services and promoting efficiency over time
- Competition
- Inclusion and social cohesion
- Supporting emergency services

It is appropriate for ACMA to recommend that the Minister applies a public interest discount, similar to the 50% discount granted to rail and NBN Co.

It is crucial that ESL fees do not undermine the business case for all three MNOs to continue to invest in the networks with the view to fully realise the above public benefits. This point is particularly relevant, given the challenges MNOs face (particularly TPG and Optus) in recouping their cost of capital given the industry’s current financial environment.

Considering these factors, it is appropriate for ACMA to recommend that the Minister applies a public interest discount, similar to the 50% discount granted to rail and NBN Co.

4.2 Lower spectrum fees will promote greater investment

Spectrum fees are substantial upfront costs that compete with investment for funds

Given that only Telstra is earning its cost of capital, MNO finances are challenging. In this environment, low spectrum will have a major impact on Optus' and TPG's to maintain the pace in 5G Standalone investment and 6G from 2030 onwards

MNOs must be able to generate cash returns for their investors in order to raise funds for investment in the network over its lifetime. Similarly, spectrum charges represent substantial, typically upfront costs that have to be recovered over the lifetime of the licence together with the associated cost of capital.

As MNO finances are under pressure, and we argued in our last submission that the financial outlook for the industry in Australia was challenging, then spectrum charges may end up competing with network investment requirements for a limited pot of resources. The options open to MNOs would be to reduce network investment or increase retail prices. In either case, there would be a negative impact on consumers and the economy. MNOs in the UK, Vodafone¹⁸ and O2¹⁹ recently made public statements supporting this point – that higher spectrum fees have a negative impact on investment – in the context of annual licence fees for certain spectrum bands in the UK and all UK MNOs supported setting such licence fees conservatively because of the asymmetry risks.

Lower spectrum fees, on the other hand, increase the viability of the business case for future investment. This direct impact is even more important because of the investment outlook for MNOs in Australia. Substantial investment is needed to deploy 5G – Advanced and 5G-Standalone (already underway) and from 2030 in 6G) to support digital transformation in the private and public sectors and allow Australia to keep level with other leading economies. Other initiatives, such as LEOsat D2D services and extending coverage in regional, rural and remote areas, also require considerable investment to benefit consumers in these areas and society through greater inclusion.

Further, although advanced 5G and 6G may bring considerable benefits to consumers, new application providers and society, it is uncertain whether MNOs will be able to monetise investments in the network and generate new revenue streams to capture a substantial part of these benefits given experience to-date with 5G. Other factors that make it difficult to monetise future network investments are:

- Returns on invested capital (ROIC) well below the cost of capital for some operators: Optus' ROIC was 2% in 2022 and still reported as being below its cost of capital in 2023²⁰, TPG's ROIC – 6.1% in 2024 – was also below its cost of capital, and Telstra's ROIC was higher at 8.3% in 2024²¹
- Challenging business cases in regional, rural and remote areas
- The financial burden of replacing equipment as a result of the Australian Government's decision to ban Huawei from 5G network deployment which affected Optus (and is ongoing) and TPG but not Telstra whose supplier was Ericsson

Within this context, the lower spectrum fees are, the more affordable it will be, particularly for TPG and Optus, to make the necessary investments in the network in the short and longer term.

The opportunity cost for alternative uses is a useful lower bound in considering how to optimise the public benefits from lower ESL fees

The case we have outlined above is also supported by empirical evidence of the impact of spectrum prices on network capacity and performance (which is related to investment). Our ESL Pricing Paper²² found a correlation between lower spectrum fees (as a percentage of service revenues) and mobile data traffic in a simple statistical analysis of thirteen EU spectrum markets. Our conclusion is still that lower spectrum

18 Vodafone response to Ofcom's 2024 Review of Annual Licence Fees, <https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-1-10-weeks/consultation-review-of-annual-licence-fees/responses-december/vodafone.pdf?v=393653>

19 O2 response to Ofcom's 2024 Review of Annual Licence Fees, <https://www.ofcom.org.uk/siteassets/resources/documents/consultations/category-1-10-weeks/consultation-review-of-annual-licence-fees/responses-december/vmo2.pdf?v=393659>

20 <https://www.optus.com.au/content/dam/optus/documents/about-us/media-centre/financial-reports/2023/2HFY23-Slides.pdf>

21 <https://www.telstra.com.au/aboutus/investors/reports>

22 Attached to Optus ESL Stage 2 Submission, <https://www.acma.gov.au/consultations/2024-03/expiring-spectrum-licences-stage-2-information-gathering-and-views-uses-frequency-bands-and-alternative-licence-conditions>

We expect opportunity costs to be relatively low, particularly in metro areas, based on the ACMA's analysis of competing alternative uses in the Stage 3 Consultation

fees will promote greater investment, but we recognise that it is difficult to identify precisely where the trade-off that maximises the long-term public interest should lie. The opportunity cost of the spectrum to alternative uses, however, would represent a sensible lower bound for ESL prices.

Following on from the ACMA's analysis in Stage 3 Supporting paper 2, demand from alternative uses is most likely to arise in regional and remote areas for place-based services (private networks, local WBB use, satellite services and remotely piloted aircraft systems). By implication, opportunity costs in metro areas should be very low compared to WA-WBB auction prices. We would also expect opportunity costs in rural and remote areas to be low. The fact that demand may be highly localised also means that care should be taken in extrapolating value estimates for individual uses to wider areas.

Direct information on the value of alternative uses, e.g. auction bids for wide-area licences, is limited. Where alternative operators such as Dense Air acquired spectrum, e.g. in Australia, New Zealand, Ireland etc., a critical test of its relevance is whether networks have been rolled out instead of selling the spectrum on to MNOs. For example, in Australia, Dense Air did not roll out a network after winning spectrum. Moreover, it subsequently traded 3600 MHz (won at the reserve) and 26 GHz spectrum to TPG and 2600 MHz spectrum (acquired in the secondary market) to Telstra.

As an alternative to a bottom-up estimate of opportunity, we have outlined a top-down approach to estimating opportunity costs in section 5.2.

Finally, we note that the ACMA itself recognises that the continued use of WA WBB spectrum will generate public benefit through ongoing investment in mobile network infrastructure – for example, in Preliminary views paper 2²³, the available options for each ESL frequency band are assessed against the public interest criteria and ESL Ministerial Policy Statement. We view this as consistent with our argument to set ESL prices below market value and the ACMA's benchmarking estimates to reflect contributions to the long-term public interest.

4.3 Maximising the potential of Australia's digital infrastructure to drive forward social and economic development

Lower spectrum fees will also lay the foundations for digital transformation through promoting the deployment of 5G-SA and 6G infrastructure

The impact of lower spectrum fees in promoting network investment goes beyond the direct benefits of higher capacity and network performance because of the role 5G-SA and 6G infrastructure are expected to play in driving digital transformation. Digital transformation is set to be a major influencer of increased productivity, economic growth, national security and social cohesion.

In the commercial sector, digital transformation is bringing significant productivity benefits, improved functionality and lower costs as well as creating the opportunity for innovative new services. In the public sector, digitalisation will be transformative in the delivery of public services as well as driving productivity and lower costs. New smart city services such as environmental monitoring and management, intelligent transport systems and medical applications could substantially improve the quality of life in cities and communities across Australia.

These public benefits must be reflected in ESL prices. The trade-off between licence fees and other public interest benefits is difficult to estimate precisely given that the uncertainties involved will influence the speed and extent to which the MNOs can realise the investments that generate these wider economic and societal benefits.

23 <https://www.acma.gov.au/consultations/2025-04/expiring-spectrum-licences-stage-3-preliminary-views>

Lower ESL prices will stimulate innovation through their impact on investment, and two important innovations in spectrum use identified by the ACMA are the Optus-TPG MOCN and LEOsat D2D services

4.4 New technologies and services

There is a significant public benefit from the continued use of ESL spectrum to innovate in technologies and services which we believe should be recognised in the ultimate ESL prices that MNOs have to pay.

The ACMA highlighted two innovations in WA WBB use of spectrum, both of which bring public benefits and support relevant policy objectives from enhancing the availability and quality of services in regional and remote Australia:

- Active infrastructure sharing through the Optus-TPG MOCN deal is an innovation in business models. It brings down the cost of coverage for less densely populated areas, making some areas economically viable to cover that previously were not viable. It should also increase investment and strengthen competition in regional and remote areas.
- Low Earth Orbit satellite (LEOsat) D2D services are an innovation that could deliver connectivity across Australia. LEOsat operators in combination with MNOs would provide voice, SMS and data services over MNO spectrum, primarily targeting areas unserved by terrestrial mobile networks (i.e. a complementary service to existing networks). They could also help provide service resilience during natural disasters and power failures. As such, LEOsats could deliver significant public benefits in terms of increasing coverage, promoting First Nations inclusion and social cohesion.

Additionally, the ongoing investments in 5G Stand Alone (5G-SA) and future investment in 6G represent significant technology innovations that will generate sizeable public benefits. As such, this adds to the case for setting ESL prices below the ACMA benchmarking estimates of market value for the long-term public interest.

Furthermore, Coleago believes that spectrum trading provides incentives for the ongoing efficient use of spectrum within WA WBB usage. I.e., if one operator developed an innovation which would allow it to increase profits if it could acquire more spectrum, the marginal value of spectrum for that operator would increase. With a well-functioning secondary market, this operator would be able to acquire spectrum from operators with a lower marginal value of spectrum and fully exploit the innovation. In practice, other operators might be encouraged to bring forward similar innovations rather than trade spectrum if they believed it could generate added value.

Therefore, setting ESL prices at market value is not essential for spectrum use to remain efficient over time and, if ESL prices are set below market value to reflect public benefits, this should not undermine the incentives on licensees to deploy the most efficient technologies and adopt service innovation over time.

4.5 Competition

High ESL prices increase the risk of damage to competition because they exacerbate the already high level of fixed costs in Australia which gives Telstra, the largest operator, a significant cost advantage (through higher economies of scale than its competitors)

Competition is another key element in the ACMA's public benefit criteria, and we would add it to the list of risks from setting ESL prices too high summarised by the ACMA's in its Preliminary views paper 4 on ESL pricing²⁴.

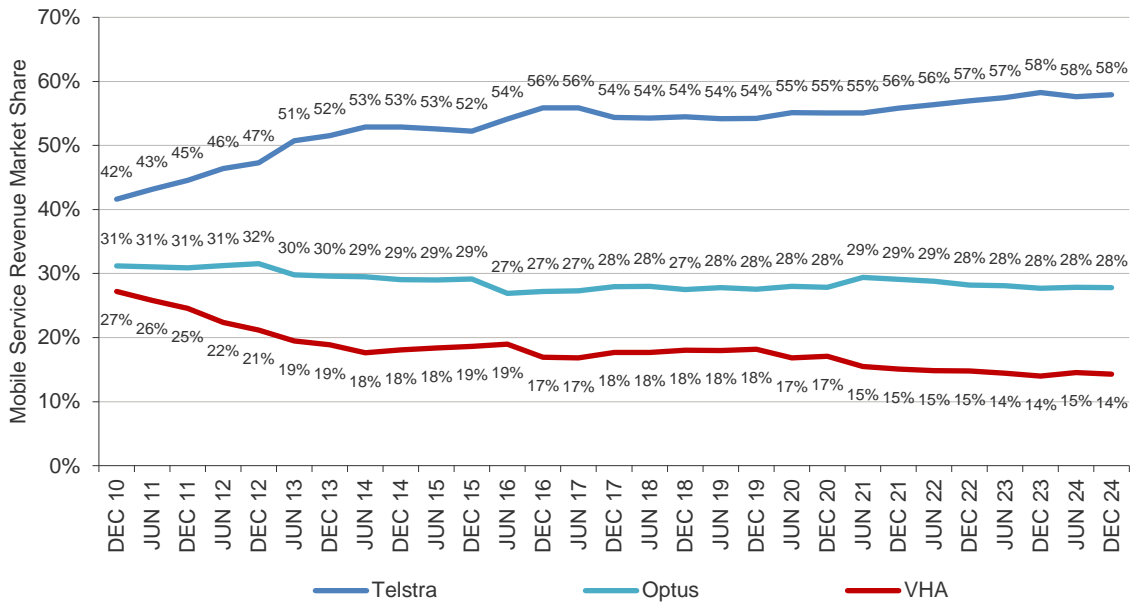
As explained in our previous paper, the geographic characteristics of Australia lead to much higher fixed costs than in many other advanced markets in providing the near universal levels of population coverage – c.99% – typically served in advanced markets. As a result, the operator with the most extensive coverage, Telstra, enjoys larger economies of scale than its smaller competitors, giving it a cost advantage that other MNOs find difficult to replicate. In particular, it is harder for other operators to match Telstra's coverage and investment in regional and remote areas. This reduces the intensity of competition and allows Telstra to consolidate its advantages in these areas. The fact that Telstra has lower costs and may be able to sustain a price premium over its rivals also means that Telstra's value for spectrum is higher.

²⁴ See page 5 of Preliminary views paper 4, <https://www.acma.gov.au/consultations/2025-04/expiring-spectrum-licences-stage-3-preliminary-views>

Due to its dominant market share Telstra benefits from vastly better economies of scale than Optus or TPG

A stark indicator of weakening competition can be seen in the development of market shares over the past decade and a half. Since 2010, Telstra’s mobile service revenue market share has risen from 42% to 58% at the end of 2024. Causality is difficult to judge, but significant amounts of spectrum – including 700 MHz and 3400-3700 MHz have been released to the market in this period. Due to its dominant market share Telstra benefits from vastly better economies of scale than Optus or TPG which gives Telstra competitive advantage. This level of dominance highlights the importance of protecting competition by ensuring that spectrum fees are affordable for all MNOs in the market. With only 14% share of mobile service revenue, TPG is particularly vulnerable to the level of ESL prices.

Exhibit 5: Evolution of mobile service revenue market shares



Source: Operator data

Higher spectrum fees reinforce the impact of network fixed costs, potentially exacerbating existing distortions of competition, whereas lower spectrum fees will promote competition by comparison.

Spectrum fees are a fixed cost; therefore, the level of spectrum prices will have an impact on competition if they are sufficiently large in comparison to the other fixed costs. Higher spectrum fees reinforce the impact of network fixed costs, potentially exacerbating existing distortions of competition, whereas lower spectrum fees will promote competition by comparison.

The existing distortions of competition in the Australian mobile market have been recognised in a number of key regulatory decisions as the following two examples show.

- The ACMA has set spectrum allocation limits in mobile spectrum auctions to promote competition and efficient use of spectrum resources which vary by frequency band and geographic area according to the potential risks to competition. The ACMA has intervened in the market recognising the public interest in deviating from a policy of assigning spectrum strictly based on the notion of market value in the interest of maintaining a competitive market. As a result, spectrum is assigned, and price is set according to wider criteria than efficient spectrum use alone which mirrors our argument for pricing ESLs.
- Risks to competition were also a key issue in the Australian Competition Tribunal’s decision to uphold the ACCC’s rejection of the Telstra-TPG MOCN deal in June 2023.

- The Australian Competition Tribunal found that the MOCN / merger would further increase Telstra's position of market strength in mobile telecommunications markets at both the retail and wholesale levels.
- One of the key reasons of the Australian Competition Tribunal, which reflects the importance of competition in mobile, is that the benefits of the deal to Telstra were likely to improve its competitive position vis-a-vis Optus and undermine Optus's incentives to invest in 5G in regional areas. This would have weakened the competitive constraint Optus provides to Telstra, enabling Telstra to maintain higher prices than otherwise and reducing its incentives to invest in and upgrade the network.

The preliminary price ranges still represent a significant cost to the mobile sector, though the ACMA recognised the falling trend in spectrum values in their benchmarking methodology. Hence, competition effects increase the asymmetric risks from setting ESL prices set too high and add to the case for reducing final ESL prices below the estimated market value of the spectrum.

We agree with the use of Mobile Service Revenue (MSR) as an adjustment factor through the MSR/MHz/pop index to determine future spectrum values. In using this index, the ACMA effectively recognises that there is a link between spectrum value and the revenues generated from the use of the spectrum. The index used is calculated at total market level, i.e. the total revenue and spectrum for all three the MNOs.

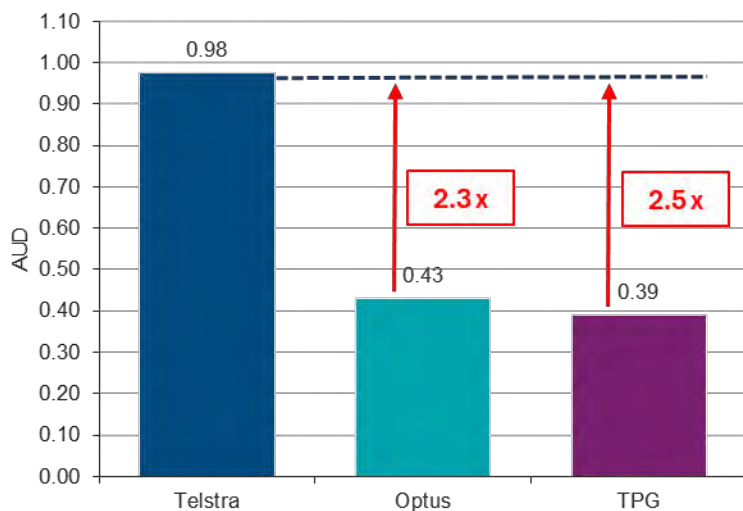
However, using an average masks the fact that Optus and TPG generate far less MSR/MHz/pop than Telstra. This poses a problem for competition and may lead to less investment by Optus and TPG.

Telstra benefits from significant economies of scale which gives it a significant cost advantage; spectrum licence renewal fees exacerbate the economies of scale problem and enhance Telstra's cost advantage.

Telstra's MSR/MHz/pop was 2.3 times higher than Optus and 2.5 times higher than TPG in 2024

Coleago has calculated the MSR/MHz/pop for Telstra, Optus, and TPG using the same methodology as set out in Preliminary views paper 4, appendix C²⁵. As shown in Exhibit 6, Telstra's MSR/MHz/pop is 2.3 times higher than Optus and 2.5 times higher than TPG.

Exhibit 6: MSR/MHz/pop by operator (2024)



Source: Coleago calculations based on public domain data

25 Minor differences in the values may be due to small differences in the data sources but this does not materially alter the conclusion and implication.

While we accept that asymmetric spectrum pricing is not appropriate, it is in the public interest to take account of the asymmetric impact of spectrum licence renewal fees. The lower the spectrum licence renewal fees, the lower the risk to competition

While it is the change in the MSR/MHz/pop index over time that influences the benchmarking through updating historical auction prices to FY25 and projecting forward price estimates to prospective renewal dates for ESLs, these significant differences in MSR/MHz/pop raise questions over which is the most appropriate measure of MSR/MHz/pop.

While we accept that asymmetric spectrum pricing is not appropriate, it is in the public interest to take account of the asymmetric impact of spectrum licence renewal fees. At a given renewals price, the fact there are asymmetric impacts will not change. However, the lower the spectrum licence renewal fees, the lower the impact on operators and hence the lower the risk to competition.

Secondly, since Optus and TPG are more than twice as much impacted by the cost of renewing spectrum licences as Telstra, the risk to investment is considerably higher for Optus and TPG. The more than 2x difference in MSR/MHz/pop gives Telstra far more room for manoeuvre in response to spectrum costs, both through investment and its options for retail pricing. The lower the spectrum fees the lower this impact and hence the risk that Optus and TPG might not be able to invest on a par with Telstra and ultimately would not be able to compete in a 6G world and competition in regional and remote areas would be particularly affected.

To reduce the risk to competition, we recommend the following (though these apply to other elements of the public interest too):

- That renewal prices are set conservatively: our adjustments to the ACMA's benchmarking indicate that ESL prices should be below the lower end of the range initially proposed by the ACMA
- Renewal prices must be affordable to TPG, the operator with the lowest MSR/MHz/pop, so that competition is not further weakened
- That the ACMA makes a recommendation to the Minister that a public interest discount is applied to MNOs renewing spectrum licences specifically to forestall the risks to competition

4.6 Supporting emergency services

WA WBB services also connect the community to emergency services and emergency warning alerts. 5G-SA roll-out is currently underway and from 2030 6G will be deployed. WA WBB could support a wider range of potentially innovative new service applications that take advantage of the improved latency and ability to provide guaranteed access through network slices. Possible innovations such as connected ambulances and tailored services for vulnerable people could improve both safety and quality of life.

Moreover, as mentioned above, LEOsat D2D services will also extend emergency services to those in terrestrial mobile network blackspots and provide resilience more widely in the event of serious disruption to terrestrial networks during a public emergency.

4.7 Inclusion

An indirect, but important public benefit of lower ESL prices is to promote greater inclusion through enabling wider and faster extension of coverage in regional and remote areas

The greater investment and innovation in increasing coverage in regional and remote areas (e.g. LEOsat D2D, the Optus-TPG MOCN as mentioned above) that would flow from lower ESL prices would also have a secondary impact on relevant policy objectives aiming to increase inclusion for First Nations and other communities living in peri-urban and more remote areas.

Increasing digital inclusion will be more essential than ever due to the anticipated digital transformation that advanced mobile communications will support. High quality mobile communications will be essential for such communities to participate in society, access fully digital public services and to support the local economies in these areas.

As a result, closing the gap between urban and less densely populated areas will require substantial investment.

4.8 Windfall gains

In our view, the risk of windfall gains from setting low ESL prices is low given MNOs' ongoing need for spectrum and not borne out by experience in the market

Telstra has previously claimed that public interest pricing (i.e. any pricing approach that reflects public interest criteria) risks creating windfall gains if ESL prices are set too low²⁶.

We believe that concerns MNOs might seek to realise windfall gains from ESL spectrum are unfounded and out of line with the reality of MNO spectrum needs and use.

First, we have found no evidence of MNOs achieving windfall gains in the last 30 years. In contrast, some companies without established networks, customers and traffic have traded spectrum they acquired at auctions to MNOs, and they may potentially may have realised windfall gains.

Second, the ACMA is proposing to renew ESL bands used by MNOs because the spectrum is currently in productive use and is needed to meet current and future end-user demand. Indeed, MNOs will need more spectrum over time as traffic growth continues and to deploy new technologies such as 6G.

Only in rural and remote areas might MNO needs for spectrum be limited, due to the low population needed to be served. However, this would also limit the resale value of the spectrum and hence any hypothetical windfall gain. In fact, MNOs would have more to gain from concluding third party agreements with alternative users or sharing spectrum with another MNO (absent competition issues) as with the Optus-TPG MOCN.

Hence, it is difficult to conceive that MNOs would seek to renew spectrum solely to chase a speculative windfall gain that would significantly reduce their ability to serve customers and their competitiveness. The vast majority of trades have happened for efficiency reasons rather than speculation, such as to allow band consolidation or as part of a frequency swap. This is very different from the rare situations where a player with no intention to deploy a network is able to acquire spectrum, exploiting loopholes in an auction design, solely to make a financial gain.

Finally, we note that the ACMA agrees there can be unintended consequences from seeking to prevent windfall gains. In Preliminary views paper 1²⁷, the ACMA recounts that limitations on the use of Terrestrial Outside Broadcast (TOB) spectrum (imposed due to windfall gain concerns given spectrum fees were discounted) have, in fact, been bad for spectrum efficiency and prevented trades or third-party agreements with alternative users despite spectrum being unused or interference not being an issue.

4.9 Summary

The evidence shows that there is a strong case for discounting ESL the prices range for WA WBB spectrum that would result from the ACMA's benchmarking analysis, after taking on board stakeholder comments, according to public interest pricing. We assume that prices will be set conservatively, both in terms of where they are set within the range of price estimates and how the ACMA ultimately implements the benchmarking approach it has proposed in Stage 3.

The next section sets out principles for how such public interest discounts could be applied to ESLs for WA WBB in practice.

²⁶ In its 2023 Submission on the Approach to Expiring Spectrum Licences Consultation

²⁷ See page 40, Preliminary views paper 1, <https://www.acma.gov.au/consultations/2025-04/expiring-spectrum-licences-stage-3-preliminary-views>

5. Implementing public interest pricing

5.1 Introduction

Estimating the opportunity cost of ESL spectrum in alternative use guards against the (relatively low) risk of misallocating spectrum if prices are discounted to reflect the public interest

Quantitative estimation of the net public benefits generated for each ESL spectrum band would, in our view, be impractical. The range of forward-looking effects that would need to be estimated and the high levels of uncertainty associated with them make producing a precise, evidence-based assessment challenging. An alternative approach would be to set discounts more qualitatively by way of comparison with NBN and Rail communications spectrum for which 50% discounts were applied in the last renewal process and are again expected to be applied this time around.

An alternative approach which is transparent, practical and that guards against (arguably low) possibility of misallocating of ESL spectrum through the renewal process is to estimate the opportunity cost of the spectrum in the next best alternative use as a lower bound for ESL prices – i.e. the opportunity cost of the spectrum. The effective discounts these would represent to the ACMA’s benchmarking estimates for existing WA WBB use can be calculated and sense checked against the discounts which have been applied previously for non-commercial ESL cases, such as NBN and Rail communications.

5.2 Opportunity cost

Opportunity cost should be used as a check that public interest prices are efficient, and for the avoidance of doubt, we do not recommend cost recovery pricing

Before setting out how this opportunity cost approach could be applied to ESL, we would first like to clarify how this approach fits in with the proposals we set out in our ESL pricing paper²⁸, and, in particular, nominal pricing.

The ACMA rejected the Optus / Coleago view that nominal pricing is in the public interest.

“We do not support the concept of nominal pricing for ESLs. Regarding the efficiency of allocation, we consider that previous spectrum allocations reflect efficiency at a point in time, given particular market, technology and policy settings. While we may consider that renewal of ESLs is in the public interest, we also consider that pricing can play an important role in the renewal process through providing incentives for spectrum allocations and utilisation to continue to promote the long-term public interest. As such, we consider ESLs should be priced based on market values (or opportunity cost), which is why we have implemented a benchmarking valuation methodology.”²⁹

The ACMA is concerned that spectrum allocations should continue to provide incentives for “efficient” use. This is referred to as dynamic efficiency. Spectrum licences are tradable which means the market will ensure efficient use during the licence period. If the value of a spectrum asset to prospective purchaser is higher than the value to the licence holder, the licence holder would sell the spectrum to the prospective purchaser. Since operators have not sold their spectrum, it follows that the spectrum is efficiently allocated. To assume the contrary would effectively discredit the whole notion of “market value” of spectrum. Moreover, the critical factor for MNOs to trade spectrum is not the *price paid* (and whether it’s below opportunity cost). It is the licensee’s *value of the spectrum* and whether someone is willing to pay more than that.

The ACMA concluded that re-auctioning spectrum is not in the public interest and proposes that spectrum licences should be renewed at a price that reflects “market value”. If renewals prices are very low, i.e. nominal, there is a risk that spectrum prices are below the opportunity cost of the spectrum in an alternative use, i.e. the price another potential user might be prepared to pay for the spectrum may be higher. It

²⁸ Attached to Optus ESL Stage 2 Submission, <https://www.acma.gov.au/consultations/2024-03/expiring-spectrum-licences-stage-2-information-gathering-and-views-uses-frequency-bands-and-alternative-licence-conditions>

²⁹ Expiring spectrum licences, stage 3, Preliminary views paper 4: Pricing for ESLs, April 2025, page 10

would therefore be useful to understand what this opportunity cost of the expiring spectrum licences is.

Spectrum auctions with low reserve prices and low prices give benchmarks for opportunity cost. Where new entrants/other uses had the opportunity to buy the spectrum but did not do so, winning prices must be marginally above opportunity cost

The ACMA favours benchmarking to determine the *market value* of spectrum. Similarly, we can use benchmarking in the case of ESLs to infer the *opportunity cost* of spectrum *in alternative uses* to the MNOs. The opportunity cost in alternative use is useful as a cross-check that ESL prices represent a fair return to the community. If ESL prices are above this level, it indicates that the regulator could not have got a better direct return for the community – in terms of spectrum fees – than if the spectrum had been allocated to another use³⁰. Of course, the community also benefits from continued use of ESLs by MNOs (with ongoing need of the spectrum) due to the public benefits of mobile communications use. We believe that these economic and social benefits, as discussed in section 4, will generate a much higher return for Australia than the underlying spectrum fees.

Looking at spectrum auctions outcomes with low reserve prices and low prices paid (in relation to auctions for similar frequencies in high income countries) can provide benchmarks for opportunity cost. In a spectrum auction open to incumbents and other bidders, such bidders e.g. new entrants or other users had the opportunity to buy the spectrum but did not do so³¹. This means the price paid by the winning bidder must be marginally above the opportunity cost.

Finland is one of the cases where the above stated conditions are met. It also has the advantage of having several similarities with Australia in terms of its scattered rural communities and low population density, flat topography, large land mass to be covered and advanced market economy. Relevant auctions and prices paid are as follows:

- 700 MHz: November 2016, AU\$ 0.296 / MHz / pop, with fees payable in five-year instalments for a licence which is effectively in perpetuity
- 3400 MHz: October 2018, AU\$ 0.057 / MHz / pop, for a licence which is effectively in perpetuity

At those prices no other bidder showed up. This indicates that the price paid is higher than the opportunity cost.

Both prices paid are well below the lower limit of the preliminary price range proposed by ACMA. They would be lower still, if the MSR/MHz/pop index were applied to update them to 2024/25 values so the ACMA can still be confident that the \$/MHz/pop price, after our suggested benchmarking revisions and set conservatively, is above the opportunity cost.

While the Finnish examples are very helpful in providing an upper bound estimate of the opportunity cost, the wider relationship between low spectrum prices and socio-economic development that we presented in our ESL Pricing Paper³² is also relevant.

Finland was the leading indicator of how low spectrum prices boost mobile data use and hence socio-economic development, but other countries in our analysis backed up this conclusion. For example, in Sweden, another country with a combination of metropolitan areas and substantial low population density areas, with a similarly advanced economy to Australia, the annualised cost of spectrum was 2.8% of annual service revenues. Although this was higher than Finland (1.4%), it was still well below the median of 6.2% for the 13 EU countries studied. More importantly, monthly mobile

As well as providing benchmarks for opportunity cost, Finland illustrates how low spectrum prices can boost mobile development

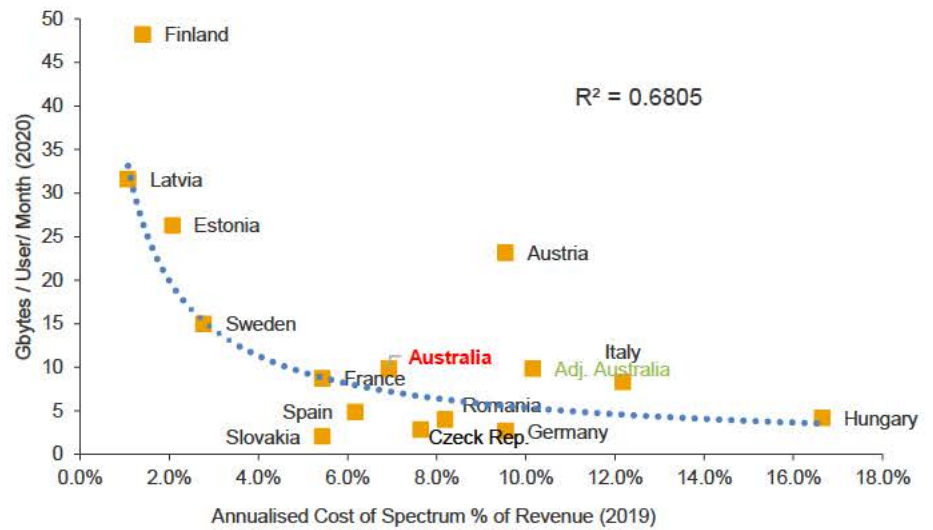
³⁰ Opportunity cost in alternative use is distinct from opportunity cost to an existing user – the costs the user would incur if it didn't have access to a block of spectrum. Looking at alternative uses addresses the question of securing an appropriate return to the community whereas opportunity cost to an existing user relates to its own decisions on acquiring spectrum.

³¹ New entrants may also acquire spectrum at/near the reserve price, particularly if spectrum is set aside for entrants or tight allocation limits are set on incumbents. In contrast, new entrants may sometimes pay significant prices for spectrum if the market is not competitive and the incumbents try to bid up prices to protect their monopoly profits.

³² Attached to Optus ESL Stage 2 Submission, <https://www.acma.gov.au/consultations/2024-03/expiring-spectrum-licences-stage-2-information-gathering-and-views-uses-frequency-bands-and-alternative-licence-conditions>

data usage at 15 Gbytes/user in 2020 was well above the median of 8 Gbytes/user. The chart is repeated below for reference.

Exhibit 7: Cost of spectrum and mobile data traffic (EU & Australia)³³



Source: Coleago. For Australia the data is 2022 revenue and cost of spectrum

5.3 Recommendations to improve the preliminary ESL pricing proposal

We recommend that the ACMA reviews the evidence and adjusts its benchmarking approach according, while setting its prices conservatively

As explained in section 4.5 Competition, due to the asymmetric impact of spectrum licence renewal fees on operators' ability to invest, innovate and compete, it is appropriate to reflect this is the level of spectrum licence renewal fees. We recommend the following:

- Set ESL renewal fees conservatively and take on board suggested improvements to the benchmarking methodology. The resulting prices would be below, the range generated by the ACMA's benchmarking methodology according to our estimates.
 - This accounts for the level of uncertainty in the benchmarking estimates given the noise in the data, the subjective assumptions needed for the preliminary price ranges and the asymmetric risk in setting ESL prices too high compared to the limited impact of the public interest if prices were too low.
- In the light of identified risks to competition and investment, other potential adverse public interest consequences and the investment challenges facing MNOs, it is in the public interest to apply a public interest discount to the ESL pricing, as recommended in the previous paragraph.

The Minister should set public interest discount and a consistent process should be used across different spectrum users

Assessing what discounts are appropriate for ESLs for WA WBB services is primarily a public policy judgement. We recommend the following principles in making an assessment:

- Consistency with previous decisions to provide discounts on ESLs in past renewal processes
- Consistent approach across different categories of user taking due account of differences between users and their spectrum use; for example:
 - The degree to which the end-user services provided by licensees can be considered essential services

³³ Note: Adjusted Australia is based on the average mobile service revenues for TPG and Optus multiplied by 3. This illustrates the cost of spectrum in response to the two operators in the Australian market which are facing significant affordability challenges in terms of not making their cost of capital.

- The potential range and scale of public interest benefits generated by spectrum use
- The extent to which the licensees are operating on a commercial or non-commercial basis: for example, previous recipients of discounts such as Rail Communications licensees are non-commercial state enterprises; NBN's fixed wireless services are currently loss-making, though it is expected to operate as commercially as possible subject to policy obligations and expectations.

In our view, a 50% discount would be consistent with past discounts for rail communications and NBN Co and would maximise the public benefits

5.4 Recommended public interest discount

Applying and setting the level of a public interest discount is a policy question and is ultimately a matter of judgement rather than an empirical process. However, we have set out our reasoning in this paper for why public interest discounts are justified for WA-WBB ESLs.

In our view, WA WBB services will deliver a wide range of public interest benefits that are at least as significant as those for other licensees such as rail operators and NBN. However, MNOs are fully commercial organisations, though current financial conditions in the industry are challenging. As a result, a substantial discount is still warranted on public interest grounds.

We note that the Minister for Broadband, Communications and the Digital Economy directed the ACMA in 2013 to give a 50% discount on the spectrum access charges for renewed licences for rail communications use of the 1800 MHz band in the last renewal process. Similarly, in 2020, the Minister of Communications, Cyber Safety and the Arts directed the ACMA to discount spectrum access charges by 50% for NBN Co's apparatus licences after conversion to spectrum licences in the 3.4 GHz band.

5.5 Recommendations on ESL prices after applying public interest discounts

A public interest discount of 50% would be consistent with other discounts given for spectrum pricing and would generate significant public benefits. The table below shows the impact this would have on our ESL price estimates adjusted for amendments to the benchmarking (Exhibit 3 above).

Exhibit 8: ESL Prices after enhancements to benchmarking and 50% public interest discount (Option 2 licence duration)

Band	Adjusted preliminary price ranges (AU\$/MHz/pop)		Change vs. ACMA proposals	
	Lower	Upper	Lower	Upper
700 MHz	0.2304	0.2546	-62%	-66%
850 MHz	0.2796	0.3089	-56%	-60%
1800 MHz	0.0914	0.1123	-52%	-52%
2 GHz	0.0542	0.0666	-66%	-66%
2.3 GHz	0.0177	0.0262	-68%	-61%
2.5 GHz	0.0198	0.0293	-65%	-58%
3.4 GHz	0.0606	0.0687	-61%	-65%

Source: Coleago

Exhibit 9: Estimated total industry bill before and after benchmarking enhancements and public interest discount (Option 2 licence duration)

Band	Total Bill with ACMA proposed prices		Est. Total Bill, benchmarking enhancements + public interest discount	
	Lower	Upper	Lower	Upper
	AU\$ mn	AU\$ mn	AU\$ mn	AU\$ mn

Band	Total Bill with ACMA proposed prices		Est. Total Bill, benchmarking enhancements + public interest discount	
700 MHz	1,591	1,946	605	669
850 MHz	724	885	318	351
1800 MHz	810	1,007	391	480
2 GHz	460	572	158	194
2.3 GHz	111	136	36	53
2.5 GHz	231	282	81	120
3.4 GHz	1,148	1,457	444	503
Total	5,076	6,286	2,032	2,369

Source: Coleago

Coleago's proposed prices for Option 2 would give a total industry bill of AU\$ 2-2.4 bn, a reduction on the ACMA pricing of 60-62%

We estimate that applying these adjusted ESL prices (under Option 2) to the spectrum allocations across the industry would result in a total industry bill of AU\$ 2-2.4 billion, a reduction of 60-62% on the ACMA's preliminary view pricing.

Adopting Coleago's proposed ESL prices in Exhibit 8 together with non ESL fees, would result in total annual spectrum fees (amortising the mid point of lower and upper range and noting 850e/900/3700 MHz/26 GHz are excluded) as a proportion of mobile service revenue as follows:

- Telstra 1.6% which is close to best practice as per Finland;
- Optus 3.1%; and
- TPG 3.0%.

This outcome would be significantly more affordable for all 3 MNOs compared to the current preliminary price ranges.

Exhibit 10 shows the difference in affordability between our proposed prices and the ACMA's preliminary ranges based on the measure total spectrum fees (ESL plus non-ESL) as a percentage of mobile service revenues.

Exhibit 10: ESL and non-ESL spectrum fees (amortised) as a percentage of mobile service revenue (Option 2)

	Coleago proposed final ESL prices	ACMA preliminary price ranges
Telstra	1.6%	2.7%
Optus	3.1%	4.6%
TPG	3.0%	6.7%
Total Industry	2.2%	3.8%

Source: Coleago, Optus

Coleago's proposed ESL pricing is much more affordable for the industry than the ACMA's preliminary prices which are particularly unaffordable for TPG as a % of mobile service revenue

Exhibit 10 shows how unaffordable ESLs would be for TPG under the ACMA's proposed Preliminary Price range and the stark difference compared to Coleago's proposed prices. It highlights the threats to competition and efficiency from setting ESL prices too high because if ESLs are unaffordable it will disrupt the basis for TPG's participation in the MOCN with Optus and increase industry pressure for consolidation. Our proposed pricing for the industry as a whole results in a figure of 2.2% which is higher than the 1.4% in best practice Finland, however it is significantly more affordable than the 3.8% for the ACMA proposals.

Finally, implementing our proposals for ESL pricing would have a much bigger impact on TPG than the other MNOs. As a result, this would create a more level playing field, increase the affordability of spectrum for the MNOs overall and for the weakest player in the market, TPG, which are critical to maintaining healthy competition in the market.

Appendices

Appendix A: Enterprise value and cost avoidance are not appropriate for ESL pricing

We believe that applying any of the alternative approaches listed below to calculating spectrum value to renewal fees involves substantial challenges will distort the market and create disincentives to efficiency and investment. Therefore, we do not consider them appropriate to setting renewal fees and are pleased the ACMA does not intend to use them. The disadvantages are summarised below:

- An enterprise value approach estimates the total discounted value of future cash flows that are made possible by holding the spectrum over the duration of the licence. It creates disincentives for investment and innovation which, in our view, would be incompatible with the long-term public interest. For example, an enterprise value approach would set an expectation that any future innovation which increases the value of the business could result in higher spectrum fees, effectively penalising success and potentially stifling innovation.
- Cost avoidance approaches seek to estimate the value of spectrum in terms of the additional costs operators would incur if they did not have access to a certain amount of spectrum. All the MNOs stated that cost avoidance is not appropriate for ESL pricing. In our view, the most serious drawback is that cost avoidance assumes MNOs can densify their networks without limit. This is not feasible, particularly in urban areas, due to physical limitations on deployment and so on. In addition, if based on actual operators' networks, cost avoidance does not calculate a unique price so deriving a uniform price is difficult. Moreover, as the ACMA notes, it may be difficult to gain access to and verify all the necessary information from the MNOs. On the other hand, defining a standardised operator to generate a uniform price introduces subjectivity and potential unintended consequences for competition, as set out in our previous paper³⁴.
- Auction avoidance involves estimating the market value of an ESL and adding the value of avoiding the uncertainty and the potential costs of gaining access to the spectrum via an auction. As stated in our previous paper, it appears counter-intuitive to charge operators for avoiding the negative impacts of an auction that the regulator would hypothetically impose. Moreover, we agree with the ACMA that auction avoidance is inappropriate given the asymmetric risks of setting ESL prices too high.

Appendix B: Estimated prices under Option 1

The table below presents our estimates for preliminary price ranges for Option 1, taking into account the amendments we suggested in section 3 and calculated using the spreadsheets supplied by the ACMA and then applying a public interest discount of 50%.

Exhibit 11: Estimated ESL prices Option 1 (20-year duration) & Option 2 (expiry in 2044)

Band		Option 1	Option 2	Difference Option 1 vs. 2
700 MHz	Lower	0.2673	0.2304	16%
700 MHz	Upper	0.2953	0.2546	16%
850 MHz	Lower	0.3083	0.2796	10%
850 MHz	Upper	0.3406	0.3089	10%

³⁴ If a reasonably efficient operator is chosen as the standard, spectrum prices are likely to exceed the value to smaller operators with fewer economies of scale, hence reducing their ability to compete and increasing existing competitive distortions in the Australian market.

Band		Option 1	Option 2	Difference Option 1 vs. 2
1800 MHz	Lower	0.1021	0.0914	12%
1800 MHz	Upper	0.1255	0.1123	12%
2 GHz	Lower	0.0725	0.0542	34%
2 GHz	Upper	0.0892	0.0666	34%
2.3 GHz	Lower	0.0214	0.0177	21%
2.3 GHz	Upper	0.0316	0.0262	21%
2.5 GHz	Lower	0.0231	0.0198	17%
2.5 GHz	Upper	0.0342	0.0293	17%
3.4 GHz	Lower	0.0742	0.0606	23%
3.4 GHz	Upper	0.0842	0.0687	23%

Source: Coleago, ACMA

Exhibit 12: Estimated total industry bill after benchmarking enhancements and public interest discount Option 1 & Option 2

Band	Option 1 - Total Bill, benchmark enhancements + discount		Option 2 – Est. Total Bill, benchmark enhancements + discount	
	<i>Lower</i>	<i>Upper</i>	<i>Lower</i>	<i>Upper</i>
	AU\$ mn	AU\$ mn	AU\$ mn	AU\$ mn
700 MHz	702	776	605	669
850 MHz	350	387	318	351
1800 MHz	437	537	391	480
2 GHz	211	259	158	194
2.3 GHz	43	64	36	53
2.5 GHz	94	140	81	120
3.4 GHz	544	616	444	503
Total	2,381	2,779	2,032	2,369

Source: Coleago

The logo for Optus, featuring the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA Consultation Paper

**Expiring spectrum
licences – Stage 3 –
Reply to Comment**

Public Version

July 2025

Section 1. EXECUTIVE SUMMARY

- 1.1 Optus welcomes the opportunity to provide further comments in response to the ACMA's consultation on expiring spectrum licences (ESLs).
- 1.2 All but one submission in ESL Stage 3 supported the ACMA's preliminary view that renewing expiring licences for a set price balances investment certainty, service continuity and fair return. Of particular note is that the ACCC and the ACMA are now aligned in their views that renewal of ESLs is in the public interest.
- 1.3 There was strong consensus across licensees in support of the renewal of ESLs at a price below the preliminary price range considered by the ACMA is in the public interest.
- 1.4 Central to these renewal arguments was the need to ensure that ESL prices consider:
 - (a) **Downward global trend in spectrum pricing over time.** Spectrum markets have matured in line with mobile markets – industry ROICs are generally low, and operators already operate under tight capex budgets and financial scrutiny. Increase in spectrum costs means investment will fall elsewhere.
 - (b) **The fact that licensees have deployed networks.** Spectrum is not a sunk cost, and any increase in spectrum costs will be trade-off with future network investment, customer experience and expectations, and prices consumers will pay for their services.
 - (c) **Continued provision of essential services dependent on mobile.** ESL renewal exists in the broader context of Government and public policy – without access to spectrum at a fair price, ensuring service continuity and supporting the implementation of key government policy objectives will be compromised.
- 1.5 There was also consensus in support for instalment payment options to better enable licensees to manage effective cashflow. A more balanced cashflow across licence duration enables MNOs to continue to invest in greater coverage, innovative services and improved social outcomes.
- 1.6 Optus also supports the views set out in the AMTA submission.

Section 2. RENEWAL OF MNO ESLs

- 2.1 There has been strong general consensus across the three MNOs in support of the renewal of ESLs at a fair price. The MNOs were also united in their support for instalment payment options.
- 2.2 We strongly support the ACCC's views that "in an environment where significant ongoing investments in mobile infrastructure are required to serve the needs of end-users, renewal of the expiring spectrum licences will provide regulatory stability to the industry and in turn encourage infrastructure investment in the long-term public interest."¹
- 2.3 We also support the views set out in the AMTA submission.

MNO consensus on further reductions in pricing range for ESLs

- 2.4 Optus notes that all three MNOs (and NBN Co) have arrived at very similar discount percentages despite our varying starting points and engagement of separate consultancies and different pricing analyses.
- 2.5 Without providing any further comment on the methods employed, we stress the importance of the unified low pricing for ESLs.
- 2.6 However, we do note that TPG and NBN Co have advocated for differential pricing, Optus does not agree with this position.

Instalment payment

- 2.7 Consensus exists between all licensees that instalment payments is an appropriate and required option for ESLs.
- 2.8 We also support Telstra's proposal for instalment payments to be linked to the government bond rate.

Licence expiry

- 2.9 Noting that Telstra have provided an additional Option 3, Optus reiterates its support for ACMA's Option 2 and opposition to ACMA's Option 1.
- 2.10 Optus' views are contingent on the ACMA providing the option for instalment payments for ESLs.

Secondary licensing arrangements

- 2.11 All MNOs expressed caution for the adoption of a proposed secondary licensing framework.
- 2.12 We note that prospective licensees supported the introduction of a secondary licensing framework without evidence that the existing secondary market mechanisms are failing policy objectives or their needs.

¹ ACCC Letter to ACMA Chair, Australian Communications and Media Authority Stage 3 consultation on expiring spectrum licences, 25 June 2025, p.2

Section 3. VIEWS BY OTHER STAKEHOLDERS

- 3.1 Optus provides limited comment on several submissions made as part of ESL Stage 3 consultations. These are set out below.

ACCC submission

- 3.2 Optus notes that the ACCC and ACMA are now aligned in their views that renewal of ESLs is in the public interest and will promote competition in the mobile market.
- 3.3 Optus agrees with the ACCC's position that there is no evidence to support the view there is potential for a new entrant in the market.

CSIRO submission

- 3.4 Optus notes the CSIRO paper highlighting the need for the regulatory and technical framework to be fit for purpose.
- 3.5 Optus considers that there are further opportunities for the ACMA and MNOs to work together to support spectrum requirements which can be used for both short-term and long-term DTM services, including sub-1GHz options. This is central to support future government policies such as UOMO which will focus on supporting activities and options to improve connectivity for regional and remote communities.
- 3.6 Optus reiterates that the ACMA decision-making should consider arrangements being set up today do not undermine the ability to support future long-term arrangements.

Rail submissions

- 3.7 Optus' position on rail ESLs is consistent with previous Optus and AMTA submissions.
- 3.8 Optus notes that both MNOs and Rail Authorities have a common interest in supplying coverage, capacity and capabilities to the rail corridors. There is significant demand by the Australian public to utilise mobile applications requiring high data speeds during train journeys.
- 3.9 Optus considers that there are opportunities for these needs to be met through further engagement between the MNOs and Rail Authorities. In addition, this can also address potential performance mitigations and offer commercial benefits for all parties through joint deployments.

TOB submission

- 3.10 The TOB submissions advocate for Defence cooperation and secondary use in the band. Optus notes that these issues are best addressed as part of TLG processes.

ACCAN submission

- 3.11 Optus supports the views set out in the AMTA submission.
- 3.12 In summary, Optus notes that the ACCAN submission is an outlier which has adopted a contradictory view to all other submissions. We question the central position of the submission that higher input costs will lead to lower consumer prices. Such a view is inconsistent with financial facts, economic theory and observed market behaviour.

- 3.13 ACCAN also states that the auction of ESL will lead to new entrant interest in Australia. Optus does not agree with this view, and we highlight that all MNOs have questioned the sustainability of current industry finances; and have had, and continued to have, return on capital below the cost of capital. Optus further notes that the ACCC submission agrees that new entry is unlikely.
- 3.14 To assist the ACMA to assess these claims, we commissioned Coleago Consulting to review the ACCAN paper and the attached report by Professor Holden. In summary, Coleago Consulting finds that:
- (a) The economic benefit of mobile broadband is at least 775 times greater than the value of potentially foregone revenue from auctioning ESLs claimed by ACCAN.
 - (b) The claim that the cost of spectrum does not impact investments is divorced from reality. High spectrum prices make the business case for mobile network investment less viable.
 - (c) Professor Holden’s claim that spectrum licence fees paid at auction are a “sunk cost” is theoretical and not consistent with real world investment decisions. High spectrum licence fees will reduce the cash available for investments, resulting in delayed upgrades for the network to the latest technologies and consequently reduced improvements in the service.
 - (d) Professor Holden’s claim that auctions are the dominant form for assigning radio frequencies to commercial users is true for new spectrum but not in a licence renewal situation.
- 3.15 In addition, Optus attaches again an expert paper by Dr Chris Doyle, a global expert on spectrum pricing and allocations, which shows that renewal of existing licences best promotes the long-term public interest. Dr Doyle concludes:
- In my opinion, where existing spectrum licence holders have made long term investments and the spectrum assets are being used to provide services in the market, there is no basis to reallocate spectrum licences. In other words, the current allocation of licences is in the long term public interest. This is further enhanced where there is an effective secondary market in place – so that alternate users of the spectrum (whether national or sub-national) have the opportunity to acquire spectrum during the existing licence term.²
- 3.16 Finally, Optus notes that the weight of evidence and expert opinion demonstrates the views put forward by ACCAN and Professor Holden are outliers, not supported by market evidence and inconsistent with economic and auction theory. Optus submits little, if any, weight should be placed on these views.

² CEPA, 2024, Renewing expiring spectrum licences: By Dr. Chris Doyle for SingTel Optus Pty Limited, May, p.4. This paper was originally submitted in Optus’ submission to ESL Stage 2.

Section 4. ATTACHMENTS

4.1 Optus attaches two separate reports to this submission:

- (a) Attachment 1 – Coleago Consulting, 2025, The ACMA ESL Stage 3 Consultation paper reply comments on ACCAN submission, July
- (b) Attachment 2 – CEPA, 2024, Renewing expiring spectrum licences: By Dr. Chris Doyle for SingTel Optus Pty Limited, May

The ACMA ESL Stage 3 Consultation paper reply comments on ACCAN submission

prepared for

Optus

19 July 2025



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Comments on ACCAN submission and supporting report

1. Executive summary

Coleago carefully reviewed the submission by ACCAN including the report by Professor Holden. We identified misleading conclusions and some errors. The main points are:

- ACCAN claims that an auction would enhance competition. New market entry is not plausible; indeed, further consolidation is more likely. This view is supported by ACCC.
- The economic benefit of mobile broadband is at least 775 times greater than the value of potentially foregone revenue from auctioning ESLs claimed by ACCAN. Furthermore, it is highly likely that prices paid for ESLs in an auction situation would be significantly lower than prices previously paid.
- The ACCAN hypothetical annual equivalent loss of \$200 million from not auctioning ESLs is tiny compared to a) total tax receipts, and b) the GDP contribution of mobile services, whereas auctioning ESLs poses significant risks in respect of maintaining a competitive market and ensuring investment in 5G-Stand Alone and later 6G.
- The claim that auctioning ESLs will produce an efficient outcome is not plausible. In a spectrum licence renewal situation, auctions are unlikely to produce an efficient outcome.
- ACCAN's misplaced priority for recommending maximisation of short-term revenue through auction does not align with the Government's objectives outlined in Ministerial Policy Statement.
- Professor Holden's claim that spectrum licence fees paid at auction are a "sunk cost" is theoretical and not consistent with real world investment decisions. High spectrum licence fees will reduce the cash available for investments, resulting in delayed upgrades for the network to the latest technologies and consequently reduced improvements in the service.
- Holden's view that conservative pricing "*serves the corporate interest of WBB operators*", is not supported by the facts. The big winner from mobile broadband services are consumers and wider society rather than investors. ACCC's figures show that between 2014 and 2022 mobile service retail prices declined by 79%. In contrast, in the period 2007 to 2025 Telstra's (TLS) share price increased by a mere 4.71% even though the Australian stock market index increased by 134.58%.
- Holden's claim that auctions are the dominant form for assigning radio frequencies to commercial users is true for new spectrum but not in a licence renewal situation. Leading mobile markets such as the US, Canada, the UK, and Finland have indefinite licences and others extended licences to as much as 40 years or renewed licences against rural coverage build-out programmes.

2. Misconceptions in ACCAN's submission

In its narrow focus on extracting revenue from spectrum licence fees, ACCAN fails to recognise the essential nature of mobile broadband services to Australian consumers, business, smart city enablement, public services delivery and wider society. Ensuring that mobile networks continue to deliver value for money for all users while investing in broader coverage, direct to device connectivity using LEOSats, 5G-Advanced and later 6G should be the main consideration when renewing spectrum licences. Without this, Australia risks falling behind in its digital nation building objectives.

ACCAN asserts that auctioning the ESLs would bring new network operators into the market, lead to lower prices for consumers while at the same time generating more money for the taxpayer. These claims are inconsistent with reality.

Since 2001 there have been many spectrum auctions in Australia, but during this period the number of mobile network operators did not increase. In fact, it reduced from four to three, as the cost of acquiring and deploying spectrum led to market consolidation. ACCC, which has the role to ensure consumer welfare and promote competition, agrees that new market entry is not a plausible scenario.

ACCAN believes that an auction that extracts more money from mobile operators in the form of spectrum licence fees, would create more competition and result in lower prices for consumers. Spectrum licence fees are a cost to mobile operators, and as for any cost, the increase ultimately flows to the prices paid by the consumers.

As regards rigging up an auction mechanism with the objective of maximising auction proceeds, this would in effect be a stealth tax on mobile users. Not only would this be a stealth tax, but due to the higher costs imposed on mobile operators this is likely to reduce network investment or result in higher retail prices, both undesirable outcomes.

ACCAN's commissioned report by Professor Holden claims that mobile operators have unlimited funds available to pay for spectrum licences, and that once a licence fee has been paid there is no need for investors to earn their money back. All businesses have capital constraints and would expect to break even and then make a return on their investment.

Holden claims that conservative pricing to renew ESLs only serves the corporate interests of WBB operators. However, the reality of the mobile business market is not that lucrative for investors. In the period 2007 to 2025 - during which several spectrum auctions were held - Telstra's (TLS) share price increased by a mere 4.71% whereas the Australian stock market index increased by 134.58%. At this rate, pension funds, private and corporate investors would actually be better off diverting their investments from telecom towards other more profitable industries.

ACCC's figures show that between 2014 and 2022 mobile service retail prices declined by 79%. As a result of the rapid improvement in affordability, almost all Australian's including children now have smartphones. The cost of mobile service is small relative to the cost of smartphones. The real winner from the mobile broadband revolution are consumers and wider society.

3. Comments on ACCAN submission

In the following we reference text in the ACCAN submission report and provide evidence as to why the conclusions drawn are flawed.

During the past years the mobile service industry has consolidated and there are no new entrants to compete at national level

ACCAN states: *“By reducing opportunities for new entrants to bid for spectrum, future competition in downstream markets may be weaker”*. (page 5).

New market entry is not a plausible scenario. The ACCC, which has the objective of “making markets work for consumers, now and in the future” notes that *“the ACMA received no interest from a prospective new entrant during its previous consultation, the ACCC agrees that renewing the expiring spectrum licences will likely promote competition in the mobile services market.”*

Testing ACCAN’s claim that spectrum auctions result in new mobile market entry against the reality in Australia, shows that since 2001 spectrum auctions did not result in new mobile network operators entering the market.

In the growth phase of the industry spectrum auctions resulted in new market entry. The increased competition drove coverage build out, quality improvements, and innovation. In 2000 Australia had five competing mobile network operators. With the demise of One.Tel in 2001 this quickly reduced to four competing operators. Between 2001 and 2016 there were several spectrum auctions but there was no new market entry. In fact, in 2009 Hutchison 3 Australia merged with Vodafone Australia creating VHA thus reducing the number of operators to three.

The 700MHz auction in 2013 with the express objective of maximising revenue from the sale of spectrum licences, saw only Telstra and Optus acquiring spectrum, leaving unsold spectrum and weakened competition because VHA did not have the business case to acquire the 700MHz spectrum licence at the high reserve price. In the April 2017 auction for the unsold 700MHz blocks, TPG Telecom acquired 2x10 MHz of the unsold 700MHz spectrum and VHA 2x5 MHz. It briefly looked as if there would be a new market entry in the form of TPG. However, in 2020 VHA merged with TPG Telecom and it was only after the completion of the merger, that the 700MHz spectrum acquired by TPG and VHA was deployed.

Ultimately the objective to maximise spectrum licence fee revenue from the sale of 700MHz spectrum backfired. For four years 2x15 MHz of the spectrum was left idle, there was no new market entry, and VHA the weakest operator was weakened further despite the merger with TPG. Since 2017, there have been several spectrum auctions, but none resulted in a new mobile operator to compete with Telstra, Optus, and TPG.

Australia is not alone in this development. In many countries around the world, we witnessed consolidation in mobile network operation, including USA, Canada, the UK, Spain, Brazil, Thailand, India, Netherlands, Taiwan, etc. This is clear evidence that at this mature stage of the mobile industry, new market entry is not a plausible scenario.

Since much of ACCAN’s rationale for auctioning ESL’s – such as resulting in lower retail prices - is conditional upon there being new market entry, this invalidates ACCAN’s conclusion.

The economic benefit of mobile broadband is 775 times greater than the value of potentially foregone revenue from auctioning ESLs

ACCAN is concerned that the Australian taxpayer might lose out from the proposed ESL renewal fees compared to auctions: *“Extrapolating this decrease across the 16-year licensing period identified by the ACMA may mean that taxpayers will be unable to benefit from approximately \$125 million and \$200 million per year in revenue from spectrum auctions.”* (page 8).

Let us put this into perspective. According to the Australian Bureau of Statistics in the year 2023-24 across all levels of government, total taxation revenue in Australia was \$801.7 billion, 30.0% as a percentage of GDP¹. \$200 million equates to 0.025% of total taxation revenue and 0.0075% of GDP.

In 2024, mobile technologies and services generated 5.8% of global GDP². 62% of the benefits came from the productivity effects and 25% came from the direct contribution of the mobile ecosystem).

Figures for Australia corroborate the significant GDP uplift due to mobile adoption. A 2014 study for the ACMA stated: *"We estimate that mobile broadband has increased the growth rate of the Australian economy by 0.28 per cent each year from 2007 to 2013."*³

A study⁴ focusing specifically on the impact of 5G adoption on the Australian economy identified significant benefits:

- *"Early estimates of the benefits of 5G forecast its adoption could add between \$1,300 and \$2,000 in additional Gross Domestic Product (GDP) per capita by 2030. More recent work suggests the adoption of 5G technology in Australia could increase the size of the economy by \$70 billion by 2030 in 2022 dollars.*
- *The benefits for key Australian industries are significant. Over the next nine years, the productivity benefits of 5G are forecast to be \$31 billion for health care, \$14 billion for smart cities and \$7 billion for manufacturing in 2022 dollars. In a separate study, the introduction of digital technologies to agriculture in Australia, many of which are enabled by 5G, would result in an increase of \$15 billion to the industry.*

The potential loss to the taxpayer claimed by ACCAN might be 0.0075% of GDP compared to a contribution to GDP by the mobile industry of around 5.8% (775 times greater) and an annual GDP growth accelerator of 0.28% (37 times greater).

The \$200 million loss figure claimed by ACCAN is not a feasible outcome; it is highly likely that prices paid for ESLs in an auction situation would be significantly lower than prices previously paid

ACCAN writes: *"A material decrease in spectrum revenue collection resulting from the absence of spectrum auctions may have a significant impact on the public interest programs undertaken by the federal government"*. (page 8)

The potential loss to the taxpayer of \$200 million is based on the prices paid when the spectrum was originally auctioned compared with the preliminary renewal price range. However, it is unlikely that if ESLs are re-auctioned, operators would pay the original price. This is because the spectrum values have declined due to the considerable amounts of spectrum acquired by mobile operators over the last 10 years for 4G and 5G. Furthermore, there have been major advances such as MIMO antenna technology that have enabled mobile operators to utilize their spectrum much more efficiently.

A key argument put forward by ACCAN is to enable new bidders. For this to be plausible, reserve prices would have to be low. Low reserve prices in combination with caps on how much a single operator can acquire are likely to result in very low spectrum prices, i.e. significantly lower than the ACMA's preliminary price range.

¹ <https://www.abs.gov.au/statistics/economy/government/taxation-revenue-australia/latest-release>, 3 July 2025

² The Mobile Economy 2025, GSMA

³ The economic impacts of mobile broadband on the Australian economy, from 2006 to 2013, Prepared for The Australian Communications and Media Authority, The Centre For International Economics, January 2014

⁴ 5G Unleashed: Realising the potential of the next generation of mobile technology, Deloitte, 2022, page 11

Risks of re-auctioning expiring spectrum considerably outweigh any potential gain from auctioning ESLs

From a public policy perspective, the risk of re-auctioning ESLs is high. For a potential (far from certain) gain equivalent to 0.0075% of GDP an industry which contributes 5.8% to GDP and 0.28% to GDP growth is placed at risk. Raising money by means of a spectrum auction would produce a negative effect for society.

In their 2010 research paper "What Really Matters in Spectrum Allocation Design" Hazlett and Munoz showed that setting high reserve prices does not maximise the value of spectrum to society: "[T]he ratio of social gains [is of] the order of 240-to-1 in favour of services over licence revenues...Delicate adjustments that seek to juice auction receipts, but which also alter competitive forces in wireless operating markets are inherently risky. A policy that has an enormous impact in increasing licence revenues need impose only tiny proportional costs in output markets to undermine its social utility. ...In short, to maximise consumer welfare, spectrum allocation should avoid being distracted by side issues like government licence revenues."⁵

In summary, the ACCAN hypothetical annual equivalent loss of \$200 million from not auctioning ESLs is tiny compared to a) total tax receipts, and b) the GDP contribution of mobile services. In contrast, auctioning ESLs poses significant risks in respect of maintaining a competitive market and ensure investment in 5G-Stand Alone and later 6G. Auctioning ESLs would be an unwise gamble.

In a spectrum licence renewal situation, auctions are unlikely to produce an efficient outcome

ACCAN asserts that "the ACMA should conduct auctions for ESLs to ensure that Australian taxpayers receive appropriate compensation for the use of spectrum assets and consumers receive the benefits of efficient spectrum allocation". (page 8)

Auctioning spectrum in a licence renewal situation is problematic and unlikely to be efficient. Let us consider the 700MHz band in Australia. The spectrum holdings are as follows:

- Telstra 2x20 = 40 MHz
- Optus 2x10 = 20 MHz
- TPG 2x15 = 30 MHz

In the context of auctioning the leftover 2x15 MHz of the 700MHz spectrum, ACCC recommended a spectrum cap of 2x20 MHz per operator: "We recommend that the Minister impose an allocation limit on the unsold 700 MHz auction such that no person or specified group of persons is able to hold more than 2x20 MHz in the 700 MHz band as the result of the auction. We consider such a limit is in the long-term interests of end-users."⁶

If the 700MHz ESLs were to be re-auctioned, Telstra could not bid for more because it has reached the allocation limit.

Scenario 1: The reserve price is set low to allow new entrants to bid. Optus could bid for more than 2x10 MHz but this would drive up the price. Given that TPG is the weaker bidder, Optus can be certain that TPG will not bid for more than 2x15 MHz. It would be rational for Optus to only bid for 2x10 MHz and for TPG to bid for 2x15 MHz. According to ACCC there will be no new entrant bidder. The result is that the spectrum is renewed at the low reserve price which, under this scenario, would be significantly

⁵ Hazlett and Munoz, "What Really Matters in Spectrum Allocation Design", 2010

⁶ ACCC advice on allocation limits for the auction of unsold 700 MHz spectrum - executive summary

lower than the renewal price proposed by the ACMA. This demonstrates that the loss of revenue to taxpayer argument does not hold.

Scenario 2: The reserve price is set high. This creates a significant risk that TPG will find itself unable to bid for all or some of the spectrum. Since the price is high, Optus would only bid for its existing 2x10 MHz. This is a reasonable assumption because in the original auction Optus only acquired 2x10 MHz and, although it had the opportunity, did not bid for more spectrum in the second auction for unsold blocks of spectrum. With Telstra having reached its allocation limit and no other bidder materialises due to high reserve prices, there is likely to be as much as 2x15 MHz of unsold spectrum. This scenario not only reduces the revenue from the spectrum auction but is also deprives Australians from the use of the scarce 700MHz spectrum, i.e. there is a loss of socio-economic value.

4. Comments on Spectrum License Renewals in Australia, Professor Richard Holden

The views and recommendations in ACCAN's submissions based on the paper by Professor Richard Holden are narrowly focussed on raising revenue for the State from spectrum auctions. The paper by Richard Holden is materially flawed and makes a number of inaccurate claims.

Holden's paper heading 1.2.1 Pricing Considerations

Holden's claim that in an auction prices cannot be set too high is contradicted by the Australian 700 MHz auction in 2012 where reserve prices were too high and 2x15 MHz of spectrum remained unsold

Holden writes:

The first thing to note here is that, to the extent that any of them are valid concerns, the risks outlined by ACMA follow exclusively from the fact that they are not using an auction mechanism. Indeed, the very notion of "setting prices too high" is only possible in a private-treaty-style process. By definition, prices cannot be "set too high" in an auction because prices are not set in an auction. (page 6)

Holden fails to recognise that an auction starts at the reserve price which is determined by the Government. In the 700 MHz auction in 2013 reserve prices were set "too high" and that is why initially only Telstra acquired 700 MHz spectrum which was critical to wide area 4G coverage. Vodafone Hutchison Australia (VHA) decided not to bid due to the extremely high reserve prices and 30 MHz of spectrum (1/3 of the spectrum) was only allocated in 2017. For four years Australian mobile users and wider society was deprived of the benefit of using the scarce resource for mobile.

This simple example from the 700 MHz auction demonstrates that Holden's assertion "By definition, prices cannot be "set too high" in an auction because prices are not set in an auction" is unequivocally wrong.

In Australian spectrum auctions, the Minister sets competition limits. Competition limits (also referred to as spectrum caps or allocation limits) have the effect of capping the total amount of spectrum that a single bidder can acquire in an auction. If revenue maximisation was the sole objective of a spectrum allocation process, then there would be no such competition limits.

The combination of reserve prices, competition limits, and licence obligations (e.g. deployment rules) have the effect that spectrum auctions are not a spectrum licence fee revenue maximisation mechanism but are designed to maximise overall societal benefit.

In this context the findings by Hazlett and Munoz's cited above are particularly relevant for Australia. ACCAN identified a potential gain to the Australian treasury equivalent to 0.0075% of GDP. The contribution of the mobile industry to GDP is estimated at 5.8% of GDP, i.e. 775 times greater.

Holden's misplaced priority for attempting to maximise short term revenue through auction does not align with the Government's objectives outlined in Ministerial Policy Statement (MPS).

Government action with regards to spectrum licences renewal is driven by stated policy objectives and these would not be achieved by using an auction mechanism to renew ESLs.

The "sunk cost" argument is theoretical and not consistent with real world investment decisions

Holden writes: *The amount they pay licences is both sunk, and immaterial, and the point where they consider optimal network investments.* (page 6)

This purely theoretical argument with regards to "sunk costs" has been debunked by academic research and empirical evidence. The notion that a bidder for a spectrum licence could bid any amount because the day after the auction the price paid becomes a "sunk cost" is not plausible.

Bidders for spectrum licences determine the price they are prepared to pay based on the return on investment over the term of the licences, typically 15-20 years. The licence fee is a cash out payment and reduces free cashflow i.e. the cash available to pay investors. The reduction in free cashflow decreases the value of the business (Enterprise Value) to investors.

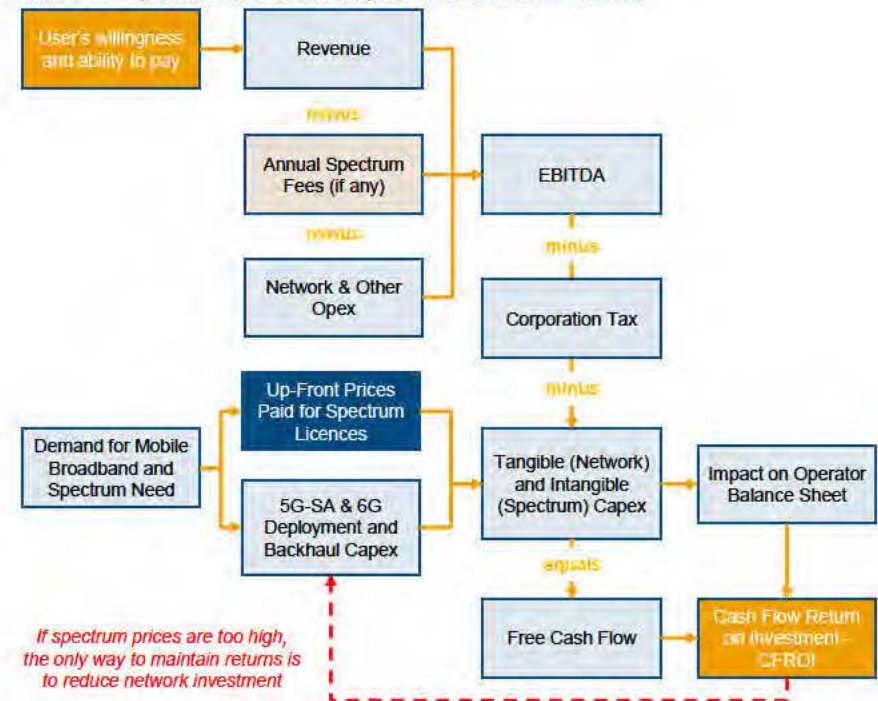
The claim that the cost of spectrum does not impact investments is divorced from reality

Holden writes: *The notion that higher prices for spectrum licenses leads to less network investment is what one might call the "lump of capital fallacy". ... "This "lump of capital fallacy" posits that firms such as Telstra and Optus have some fixed pot of money available for the combination of licence fees and network investments."* (page 6)

The assertion has no basis in reality. Telecom operators, like any business with large capital expenditures, as well as Government) have annual capital budgets. Financial planning in mobile operations involves careful balancing of cash outflows (operational expenditure, capital expenditure including tangible network assets and spectrum licence fees) with cash inflows (revenue). If there is insufficient cash left over to cover the cost of capital, investments cannot be financed. Holden's assertion does not meet the real world experience of running a business and making investment decisions. Holden seems to think that mobile operators have access to a magic money tree. In other words, the theoretical view of perfectly efficient capital markets has been found by many regulators to be far from the reality of the telecoms sector.

Operators need to generate cash to compensate investors or they would not be able to finance the investment in spectrum and network. Apart from raising retail prices – which may have a knock-on effect on market share or usage – the only other lever open to operators is to reduce tangible capital expenditure i.e. operators would invest less in the network to bring overall capital expenditure to a level that can be financed. The diagram below illustrates these trade-offs.

Exhibit 1: Spectrum licence fee impact on network investment



Source: Coleago

Evidence examining investment in mobile networks and the cost of spectrum licence fees is clear. The most recent report⁷ on the impact of spectrum fees on investment in found: A 10-pp higher spectrum cost to revenue ratio leads to coverage that is up to 6 pp lower. This effect is observed for both 4G and 5G coverage. There is a similar negative effect on network speeds. A 10-pp higher spectrum cost leads to a reduction in download speeds of 8%, and a reduction in upload speeds of 6%.

In short, high spectrum prices make the business case for mobile network investment less viable. This is all the more important because the outlook for investment in mobile is challenging in Australia and most other countries given the ongoing pressure to expand capacity in line with fast growing demand and deliver innovative services over 5G Stand Alone and later 6G. This is particularly challenging for operators with a smaller market share (Optus and TPG) due to the high level of fixed costs in the industry. Further, financially healthy and sustainable competitors are critical to constrain the incumbent's capacity to raise prices towards monopoly levels.

Furthermore, academic research⁸ supports the view that firms allocate sunk costs into pricing decisions to recover the cost of investing and hence higher spectrum fees are likely to lead to higher prices for consumers.

⁷ Global spectrum pricing, GSMA

⁸ Govindarajan & Anthony (1983), Shim & Sudit (1995), Guilding et al. (2005), Al-Najjar, Baliga & Besanko (2008)

Historical evidence demonstrates that the value of spectrum accrues to consumers and not to investors

Holden writes: *“In short, there is absolutely no case for ACMA’s “conservative pricing” approach. It is unjustified on the merits, simply serves the corporate interests of WBB operators, ...”* (page 7)

As regards the case for conservative pricing, there is a clear case for setting ESLs prices conservatively. Given that the mobile services contribution to GDP exceeds the ACCAN stated potential benefit to taxpayer if spectrum were to be auctioned by a factor of 775, it would be very unwise to put this huge societal benefit at risk from high renewal prices and / or the uncertainty of reauctioning ELS.

The assertion that conservative pricing *“serves the corporate interest of WBB operators”*, is not supported by the facts. The big winner from mobile broadband services are consumers and wider society rather than investors.

It is a fundamental fallacy to equate the prices operators paid for spectrum with the value of spectrum without stating the overall value from use of the spectrum and to whom that value ultimately accrues. In a competitive market, prices decline to the point where operators just earn their cost of capital. There is no evidence that low spectrum prices *“serve[s] the corporate interest of WBB operators”* i.e. increasing their enterprise value. Exhibit 2 shows that Telstra’s (TLS) and TPG’s (TPG) share price⁹ massively underperformed the Australian stock market index (XJO). In other words, investors would have been better off investing in other Australian businesses.

Exhibit 2: Australian Stock Market Index (XJO) vs. Telstra and TPG



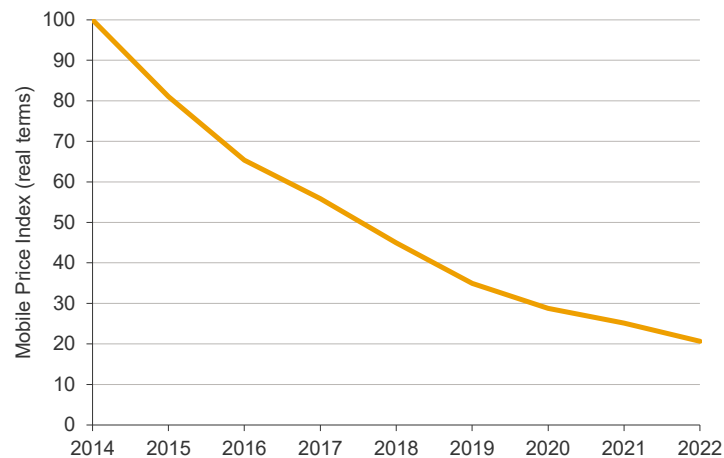
Source: Market Index website, July 2025

⁹ Optus is not a quoted company and hence not included in the chart.

In contrast to the poor case of investing in mobile networks, there is ample evidence that the investment in spectrum and network generates substantial consumer benefits. Exhibit 3 shows the decline in mobile retail prices in Australia between 2014 and 2022. The analysis is based on the price declines¹⁰ reported in the ACCC Communications Market reports covering this period. The price declines are reported in nominal terms. The observation covers eight years and hence we have adjusted prices for inflation¹¹ and calculated an index with 2014 = 100.

The data shows that between 2014 and 2022 retail prices declined by 79% in real terms. This demonstrates that the value of renewing spectrum licences accrues to consumers and not to investors.

Exhibit 3: Mobile retail price decline in Australia



Source: ACCC Communications Market reports and Coleago calculations

It is the return on investment, and not EBITDA, that defines the industry’s financial health and sustainability

Holden writes: *The claim that “a conservative pricing approach is crucial to support the sustainability of the telecommunications sector” is contrary to basic facts. Telstra and Optus generated Earnings Before Interest, Taxes, and Depreciation (EBITDA) of \$8.2 billion and \$3.6 billion respectively.* (page 7)

A “basic fact” is that EBITDA (Earnings before interest, tax, depreciation, amortisation) is a line in the income statement says nothing about whether operators generate a return on capital employed. The real return in an investment (debt plus equity) are cash flow to investors (free cashflow) which is EBITDA minus CAPEX (capital expenditure in network and spectrum licences) minus cash taxes. In using EBITDA as an argument illustrates Holden’s lack of understanding. Famously, Charlie Munger (Warren Buffetts’ partner and Vice Chairman of Berkshire Hathaway, the most successful investment fund), referred to EBITDA as “bullshit earnings”.

Exhibit 4 shows Optus’ free cash flow as a percentage of capital employed for the year ending 31 March 2024 and 2025. In both years the return was below the 10-year Australian government bond yield. The 10-year bond yield represent the risk-free return

¹⁰ Feature-adjusted price changes (%) for the hedonic approach

¹¹ All groups CPI and Trimmed mean, Australia, annual movement (%), Australian Bureau of Statistics

that can be earned by investing in government bonds. In contrast, investing in a business has an element of risk which means investors should expect a higher return when investing in Optus. However, the data below shows that investors would have been better off buying Australian government bonds.

Exhibit 4: Optus free cashflow return on capital employed

\$ Million	31-Mar-25	31-Mar-24
Free cash flow	647	356
Debt	6,672	6,666
Shareholder funds	9,066	9,197
Capital employed	15,738	15,863
Free cash flow / shareholder funds	4.1%	2.2%
Australian 10 Year Government Bond Yield	4.3%	2.7%

Source: Singapore Telecommunications Limited

A situation where the returns are consistently below the risk-free rate of return is not sustainable. Investment will decline and the Australian market will become less competitive. This is a very real danger for Australia.

Spectrum renewal pricing must consider the business case of weakest player

Furthermore, Holden only refers to Telstra and Optus but omits TPG. In a spectrum auction the price paid is determined by the weakest bidder, which, in the case of Australia, is TPG. During the last 5 years TPG's share price declined by 38.03% compared to an increase in the Australian stock market index (XJO) of 41.89%. TPG is on the way to becoming uninvestable which illustrates the high risk to competition arising from high ELS renewal prices.

Exhibit 5: Australian Stock Market Index (XJO) vs. TPG



Source: Market Index website, 2 July 2025

Holden's paper heading 1.2.3 Competition (page 12)

The argument that the auctions for spectrum renewal can enhance competition in the telecom sector lacks supporting evidence

Holden writes: *It is widely recognized among economists that competition in the telecommunications sector is enhanced by using auctions, rather than administrative sales.* (page 12)

Holden does not produce any evidence that assigning spectrum by auction increases competition. Firstly, Australian policy makers and the ACMA recognise that spectrum assignment is about delivering societal benefit and not simply revenue from an auction. Spectrum auctions were only ever meant to be a means to an end (i.e. efficient use of spectrum and not about raising revenue from the auction proceeds: *"The key goal of any auction is to guide goods to those who value them the most. Spectrum auctions help identify the highest value use and users"* New Zealand Ministry of Business, Innovation and Enterprise - May 2013.

In fact, spectrum auctions are likely to reduce competition because the value of spectrum to an operator with a high market share is much higher than for operators with a low market share. Recognising this, most policy makers, including in Australia, have capped the amount of spectrum an operator can acquire. In very liberal markets, such as the USA, spectrum auctions and consolidation of spectrum holdings has been a driver for industry consolidation with sub-scale operators selling out to larger operators.

New market entry is not plausible

Holden writes: *Auctions create opportunities for new entrants to acquire spectrum and challenge incumbent carriers. ... The auction process gives smaller carriers, regional providers, and new market entrants a fair chance to bid for the frequencies they need to compete.* (page 12)

New market entry is not plausible. The ACCC, which has the objective of "making markets work for consumers, now and in the future" notes that *"the ACMA received no interest from a prospective new entrant during its previous consultation, the ACCC agrees that renewing the expiring spectrum licences will likely promote competition in the mobile services market."*

As we show above by looking at the history of spectrum auctions in Australia since 2001, despite numerous spectrum auctions we witnessed further consolidation rather than new market entry. While in theory an auction gives a hypothetical new entrant the possibility to bid for spectrum, the reality is that we have seen consolidation in mobile networks not only in Australia but around the world.

Auctions are no longer considered a best practice for renewing expiring licenses

Holden's paper heading 2. The use of auctions world-wide (page 15)

Holden is right in observing that *"Spectrum auctions have become the dominant method for allocating radio frequencies to commercial users worldwide, fundamentally transforming how governments manage this valuable public resource."* (page 15).

While this might be the case for new allocations of spectrum, auctions are not the dominant form of dealing with expiring spectrum licences.

Holden cites the US as an example. He fails to mention that following the end of the initial term of a spectrum licence, there is no licence fee payable to retain the licence into perpetuity. Based on the US example, the ESL price in Australia should be zero. Canada and Finland have essentially the same approach to expiring spectrum licences.

In countries where expiring mobile spectrum licences have been re-auctioned in the past, approaches are changing. In France¹² and Portugal, licences have been reissued to the holders in an administrative process linked to providing commitments to extending coverage. In Spain, legislation was amended to allow 40-year spectrum licences and recently auctioned spectrum has already been awarded for 40 years.

Furthermore, secondary markets also provide ongoing incentives to maintain the efficient use of spectrum over time as technologies and market conditions change. Spectrum trading has happened regularly in Australia, showing that the secondary market is an effective mechanism for promoting efficiency.

Conclusion

In summary, the ACCAN hypothetical annual equivalent loss of \$200 million from not auctioning ESLs is tiny compared to a) total tax receipts, and b) the GDP contribution of mobile services, whereas auctioning ESLs poses significant risks in respect of maintaining a competitive market and ensure investment in 5G-Stand Alone and later 6G. Therefore, auctioning ESLs would be an unwise gamble.

¹² In 2018, the French government reached a legally binding agreement with MNOs to improve LTE coverage, especially in rural areas and across the road and rail network, in return for reissuing the 900, 1800 and 2100 MHz licences to the incumbents for ten years at unchanged licence fees.

Renewing expiring spectrum licences:

By Dr. Chris Doyle for SingTel Optus Pty Limited



24 May 2024

FINAL

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EXECUTIVE SUMMARY

This short paper addresses an important issue forming part of the ACMA's process regarding expiring spectrum licences (ESLs). A significant number of licences within the ESLs are held by mobile network operators, with the first set of licences in the 850 MHz and 1800 MHz frequency bands due to expire on 17 June 2028. The earliest date incumbent licensees can apply to renew spectrum licences is two years before the date of expiry.

The ACMA has three options in arriving at its decisions with regard to any renewal applications: (i) renew an ESL without varying the spectrum access conditions, (ii) partially renew whereby an ESL is renewed with substantive changes to the spectrum access conditions – that is, the frequency bands and geographic area included in the licence, and (iii) refuse to renew which could result in a reallocation of the spectrum frequencies

Under the Radiocommunications Act 1992 (the Act), the ACMA has the object of managing spectrum in the long-term public interest. In this paper I assess the three options set out above against this criterion, and also opine on whether the use of auctions in a renewal process is in the long-term public interest.

In my opinion, where existing spectrum licence holders have made long term investments and the spectrum assets are being used to provide services in the market, there is no basis to reallocate spectrum licences. In other words, the current allocation of licences is in the long term public interest. This is further enhanced where there is an effective secondary market in place – so that alternate users of the spectrum (whether national or sub-national) have the opportunity to acquire spectrum during the existing licence term.

I find that the frequencies used by the incumbent mobile network operators are not being sought by challengers. Indeed, the most recent challenger to the incumbents in the Australian telecoms market, Dense Air, sold its business to Telstra in 2023 and previously sold its 3.6GHz assets to TPG in 2021. And in the 2023 auction for frequencies in the 3.7 GHz band, the only bidders and winners were the incumbent mobile network operators. Further, the possibility to exchange spectrum rights facilitates efficiency enhancing trades among the ESL licensees. I also note that the existence of alternative licence types (like area wide licences (AWLs)) could be used by prospective licensees to enter markets.

Additionally, there is little to suggest that technological change will have a marked effect on how low and mid-band frequencies are used by incumbent mobile network operators. If anything, rising demand for mobile data will continue to put pressure on the incumbent mobile network operators to demand more spectrum and to densify further their networks.

As there is no obvious uncertainty about future usage of the frequencies in the ESLs, and given the highly unlikely emergence of new challenger networks, reallocation by auction would serve largely to amplify uncertainty and delay investments. Given the incumbent mobile network operators can trade spectrum rights, it is unlikely any reallocation would be superior to current holdings.

I observe that there have been some calls for auctions to be used to 'test' the market and ensure that the current allocation of spectrum is efficient. The argument is that auctions are a way of ensuring allocative efficiency; those who value spectrum most receive spectrum. However, secondary trading of spectrum allows efficiency gains to be achieved after initial allocation by auction. Therefore the primary argument in favour of an auction of the ESLs rests on whether there are challengers who could deliver higher long-term public interest. There is no clear evidence to suggest the latter.

Dr. Chris Doyle, May 2024

1. INTRODUCTION

Radio spectrum is an essential resource and its use contributes significantly to well-being and value added in Australia.¹ Its use for mobile broadband and related services is critically important in helping to drive forward economic growth and social cohesion.²

Competition for radio spectrum in many frequency bands and the possibility of harmful interference between uses and users requires spectrum management in every country. In Australia this is performed by an independent Commonwealth statutory authority the ACMA (Australian Communications and Media Authority).³

In managing radio spectrum, the ACMA oversees use and users across frequency bands through a policy of licensing. The procedures the ACMA follows for allocating radio spectrum licences are set in the [Radiocommunications Act 1992](#) (the Act). Section 60 of the Act gives the ACMA considerable discretion; licences can be allocated by auction, tender, for a pre-determined price or a negotiated price, by direct allocation or by a combination of these. Notwithstanding, the allocation procedures followed by the ACMA must be framed with the object of promoting “the long-term public interest”, as set out in section 3 of the Act.

Most in-force spectrum licences in Australia used for mobile broadband and related services are due to expire between June 2028 and October 2032. The ACMA is currently undertaking a review and consultation on addressing these expiring spectrum licences (ESLs).

In 2020 the Act was amended by the [The Radiocommunications Legislation Amendment \(Reform and Modernisation\) Act 2020](#) (the Modernisation Act), introducing new provisions for dealing with ESLs. In the ACMA’s Five-year spectrum outlook 2023–28 (FYSO 2023–28)⁴, it identified progressing activities relating to ESLs expiring between 2028 and 2032 as a key priority. These ESLs cover a range of bands, and are used to deliver wireless broadband, rail safety communications and certain electronic news gathering for broadcasting services.

Any uncertainty surrounding renewal applications of the ESLs is likely to impact adversely on public well-being and nationally economic value-added – in other words, the long-term public interest. In this short paper I emphasise how uncertainty regarding the renewal of ESLs is costly and if a policy decision were made to reallocate and auction the frequencies, this would damage investment incentives and adversely affect the long-term public interest.

To help mitigate uncertainty, the ACMA started its review of the ESLs five years before the first licences were due to expire. Notwithstanding, decisions with regard to licence renewal applications can only be made up to two years prior to the date of expiry of an ESL, so at the earliest from June 2026 onwards for the 850/1800MHz spectrum bands. Incumbent licensees therefore face a possibility that applications for renewal may be refused and current frequencies be reallocated by auction. This presents additional uncertainty and is likely to have a profound “chilling” effect on business decisions, especially on longer-term investment decisions. The ACMA is in a position to address this uncertainty, for example, by presenting a clear policy statement in regard of the use of auctions for licence renewals.

¹ In Commonwealth of Australia (2015) “[Spectrum Review](#)” it was noted radio spectrum’s “role as an economic driver, and the value it returns to society, is increasing.”

² For a good discussion on the impact of mobile services in Australia see Deloitte Access Economics (2022) “[5G Unleashed: Realising the potential of the next generation of mobile technology](#)” for the Australian Mobile Telecommunications Association. On the importance of radio spectrum in a modern economy more generally, see Frontier Economics (2022) “[Ensuring optimal value from spectrum](#)”, a report for DSIT (Department of Science, Innovation and Technology), UK government, June.

³ See <https://www.acma.gov.au/>

⁴ See https://www.acma.gov.au/sites/default/files/2023-10/five-year_spectrum_outlook_2023-28.docx

The additional uncertainty regarding the ESLs and renewal is taking place against a backdrop in which mobile network operators are facing challenging conditions. Although increasing use of data by consumers on mobile networks⁵ may imply a healthy commercial environment for mobile network operators, in recent years networks have experienced declines in average revenues per user⁶ and in many cases reductions in the return on capital employed (ROCE)⁷ significantly below the weighted average cost of capital (WACC). In the submission made by Optus to the ACMA in the first stage of consultation on the ESLs, it was shown that the return on invested capital (ROIC) has declined for all three main mobile networks in Australia since 2017.⁸ Some commentators have also expressed caution about the period over which networks will recover the costs of investing in new 5G networks.⁹

In my opinion, any probability of licence renewal application refusal only serves to undermine incentives for longer-term investments

I discuss why it would be in the long-term public interest to renew the ESLs and not to reallocate the frequencies by auction, and to make this a policy goal as soon as possible. In managing risk, it would be in the long-term public interest to make clear that the ESLs used for public mobile services will be renewed.

This short paper has the following sections. In section 2, I set out the spectrum strategy framework and spectrum management in Australia. I discuss in brief the duty for ACMA to pursue policies consistent with the long-term public interest. In doing this, I discuss how the ACMA applies a public interest test in which the focus is the attainment of economic efficiency. I set out what economic efficiency means and how the ACMA chooses its policies to reflect this.

In section 3, I discuss spectrum auctions, spectrum trading and the public interest. In this section I argue that auctions do have a role to play, but in the allocation of *newly released* frequencies rather than frequencies already in efficient use. I also make clear that the complementary policies of spectrum trading and spectrum leasing, both of which are part of the Australian spectrum management landscape, are necessary to ensure that initial efficient allocations achieved by auction remain efficient over time.

Section 4, looks at the option of setting renewal prices by auction and argues that this is not a good public policy for the ACMA. The purpose of auctions is to achieve efficient spectrum allocations and not revenue maximisation for government. In section 5, I present a short discussion on how the possibility of auctioning frequencies in the ESLs could lead incumbent mobile network operators to play a costly wait-and-see strategy. This risk can be mitigated by the ACMA announcing that it will renew the existing ESLs.

I conclude the paper by reaffirming my position that auctioning the frequencies in the ESLs is not in the long-term public interest and the ACMA should announce sooner, rather than later, a policy to renew all the ESLs.

⁵ Ericsson (2023) "[Ericsson Mobility Report](#)" November forecasts that globally, average monthly mobile data usage per smartphone is set to rise from 21 GB in 2023 to 56 GB in 2029 (see Figure 9: Global mobile network data traffic, page 12). Sarwat Zeeshan, a Telecom Analyst at GlobalData, has commented in regard of data usage and forecasts in Australia: "The average monthly mobile data usage in Australia is expected to increase from 14.4 GB in 2023 to 28.7 GB in 2028", see [Advanced Television \(2024\)](#) 26 March 2024.

⁶ Telecoms.com "[Telecoms revenue per user is falling despite 5G and fibre rollouts](#)" 13 October, 2022 Recently Ericsson (2024) "[Ericsson Mobility Report: Business Review](#)" has noted that globally ARPU has grown at a CAGR of 1.7 percent per year, or over 5 percent in total, since 2020. However, this increase in ARPUs reflects in part surging inflation over the period.

⁷ Ericsson (2024) "[Ericsson Mobility Report: Business Review](#)" notes "the financial landscape is hardening, with surging inflation and increasing costs of operating and maintaining networks. The economic situation is putting pressure on margins,..." p.5. For example, in the United Kingdom the regulator Ofcom has calculated that ROCE has been static or has fallen for the mobile operators since 2019, see Figure 6.2, p.60 in Ofcom (2022) "[Ofcom's future approach to mobile markets](#)" Discussion paper, 9 February.

⁸ See Figure 1 in Optus (2023) "Approach to expiring spectrum licences", submission to ACMA consultation paper, Public Version, August.

⁹ For example, a number of commentators express concerns in "[Operators' 5G investments show no clear signs of paying off](#)" Light Reading, 13 December 2022.

2. STATUTORY FRAMEWORK AND SPECTRUM MANAGEMENT

The ACMA is responsible for managing use of and access to radio spectrum in Australia. Under the Act and the Modernisation Act the ACMA has a duty:¹⁰

“to promote the long-term public interest derived from the use of the spectrum by providing for the management of spectrum in a manner that:

- a) facilitates the efficient planning allocation and use of the spectrum
- b) facilitates the use of the spectrum for:
 - a. commercial purposes; and
 - b. defence purposes, national security purposes and other non-commercial purposes (including public safety and community purposes); and
- c) supports the communications policy objectives of the Australian Government.”

In short, the object of the Act is the promotion of *the long-term public interest*. However, the Act does not define the long-term public interest. In practice it is understood economic efficiency is equivalent in general to the long-term public interest. Economic efficiency is when resource allocation is such that well-being is maximised, implying there does not exist another allocation that makes one or more persons better off without harming the well-being of at least one other person.¹¹

2.1. PUBLIC INTEREST TEST

In respect of the ESLs the ACMA proposed in ACMA (2023a) five criteria in regard of the public interest and the ESLs:¹²

1. Facilitates efficiency
2. Promotes investment and innovation
3. Enhances competition
4. Balances public benefits and impacts
5. Supports relevant policy objectives

The ACMA set out in detail its reasoning for the above criteria in stage 1 of the ESL process.

Facilitates efficiency

The ACMA applies a standard approach to describing efficiency, relying on economic concepts. In alignment with earlier guidance provided by the Productivity Commission (see footnote 11), the ACMA uses three relevant concepts for economic efficiency:¹³

- **“Productive efficiency** – occurs when inputs such as spectrum, equipment, capital and labour are deployed in a manner that generates the most output for the least cost. Technical efficiency is related to productive efficiency as it seeks to achieve the least spectrum used to provide the most output.

¹⁰ Section 3 of the Act.

¹¹ In economics this interpretation of efficiency is referred to as Pareto efficiency and is: “attained when individuals in society maximise their utility, given the resources available in the economy”, see Productivity Commission (2013) ‘[On efficiency and effectiveness: some definitions](#)’ Productivity Commission Staff Research Note May 2013.

¹² Pages 18-21, ACMA (2023a), *op cit*.

¹³ Pages 18-21 ACMA (2023a), *op cit*.

- **Allocative efficiency** – occurs when inputs (such as spectrum) are allocated in a manner that generates the most value or benefit for society. This is generally achieved at the initial time of allocation, but may change over time as consumer demands and technologies change.
- **Dynamic efficiency** – a spectrum management regime promotes dynamic efficiency if it enables technologies and allocations to change so that allocation and productive efficiency are maintained over time as technology and preferences change.”

When awarding licences and managing the use of spectrum, the ACMA will take account of both static and dynamic efficiency. Static efficiency is satisfied when spectrum is allocated to the highest value uses (allocative efficiency) and users (the licensees) provide services at lowest possible costs (productive efficiency) – with competition among users ensuring that prices paid by consumers for services tend towards cost (allocative efficiency).

Dynamic efficiency is satisfied when spectrum users undertake desirable investments in spectrum related technologies and processes ensuring that consumers have good quality services at the lowest possible prices. It is enabled by competition in the market for services and more generally in the capital markets providing the source of funding for investments.

The ACMA affirmed the public interest criteria and provided stakeholders with greater detail on each criterion. On the allocation of licences the ACMA stated:

“For allocating licences, we typically use a range of instruments, including guidelines, where we have expressly decided to make spectrum available by issuing apparatus or spectrum licences. These allocation exercises – especially for spectrum licences – are often price-based, where the ACMA has formed the view that the most efficient allocation of the spectrum resource is likely to be achieved by the market. In such circumstances, the Act provides for making and establishing a variety of tools (procedures, marketing plans, applicant information packs and auction guides) to assist prospective licensees to participate in a competitive allocation process.”¹⁴

It was made clear that should ACMA receive a request to renew a licence for 10 years or more it must “be satisfied that it is in the public interest to do so.” In assessing the public interest, the ACMA retains discretion to consider a wide range of matters, including the long-term public interest, the potential impact on competition and downstream markets, and the planned future use of the spectrum.

In deciding whether to renew a spectrum licence, ACMA must have regard to the matters it considers relevant to the renewal, and the effect that the renewal will have on radiocommunications. Subsection 77C(8) outlines in further detail what ACMA may have regard to, including any outstanding liability to pay an apparatus licence tax, spectrum licence charge, spectrum access charge or interim tax, compliance with conditions of the licence, and previous licence history for both the applicant and any third-party users. However, these serve only as an example, with ACMA also having the discretion to consider matters such as the potential impact on competition and downstream markets, whether renewal of the licence would be in the long-term public interest, the planned future use of the spectrum, or any additional matters it considers relevant.

¹⁴ Pages 15-16, ACMA (2023b), *op cit*.

3. AUCTIONS, SPECTRUM TRADING AND THE PUBLIC INTEREST

As stated above, the ACMA makes use of various interventions to determine how best to allocate radio spectrum resources. Modern spectrum management involves interventions ranging from command and control through to market mechanisms, as enshrined in section 60 of the Act.¹⁵ The ACMA usually auctions licences for newly allocated frequencies suited for public mobile services.¹⁶ Many of the ESLs used for public mobile services were initially allocated by auction.¹⁷

Auctions for newly released frequency bands are used by the ACMA because, while it is known there is competition for the spectrum, the agency does not know what amounts of newly released frequencies should be allocated to competing prospective users by geographical area to ensure an allocation is in the long-term public interest. Further, demand and the willingness to pay for newly released radio spectrum are not readily apparent and auctions are an effective way for both productive and allocative efficiency to be achieved.^{18,19}

In a well-designed spectrum auction, where bidders benefit from price discovery, each winning bidder pays a price no higher than their willingness to pay. Significantly, unsuccessful bidders reveal they are not willing to pay the closing prices in the auction process. More often than not, auctions adopt or incorporate in their design a second price rule where the winner pays the maximum willingness to pay of the second placed bidder – this calculates the opportunity cost of spectrum and ensures an efficient outcome. This means spectrum is allocated, at the end of an auction, to those who are willing to pay the most. This outcome is efficient and in the public interest.²⁰

The use of spectrum auctions by the ACMA can be interpreted as the application of mechanisms (i.e., a set of rules) designed to yield an efficient allocation of spectrum licences and achieve the long-term public interest. Spectrum auctions are regarded by economists and policymakers as the most effective way in the presence of competing users to achieve efficiency when awarding licences for *newly released* frequencies.

However, circumstances may change after an auction has concluded and an allocation that was efficient at the time of an auction may no longer be efficient. To maintain efficiency and the long-term public interest, modern spectrum management makes use of complementary policy tools to ensure that spectrum licences won in auctions are, over time, held by those who deliver the highest value. The primary tool is spectrum trading: allowing licensees to exchange in part or full licences with others. For example, if users' valuations change over time and/or technology changes, trading allows for welfare improving reallocations and is in the long-term public interest.

¹⁵ Spectrum management is discussed at length by Cave, Martin, Doyle, Chris and William Webb (2007) *Essentials of Modern Spectrum Management* Cambridge University Press.

¹⁶ See CEPA (2023) [Spectrum Auctions: Thirty years in the making](https://www.acma.gov.au/spectrum-auctions), CEPA Briefing Paper and <https://www.acma.gov.au/spectrum-auctions>

¹⁷ Several of the ESLs have been previously renewed subsequent to their allocation by auction.

¹⁸ Radio spectrum is a resource that commands value, but unlike other commodities it does not feature a high-volume secondary market. This means that market spot and forward prices for different frequencies are not directly observable.

¹⁹ On auctions and efficiency see Zhan, R.L. (2008). *Optimality and Efficiency in Auctions Design: A Survey*. In: Chinchuluun, A., Pardalos, P.M., Migdalas, A., Pitsoulis, L. (eds) *Pareto Optimality, Game Theory And Equilibria*. Springer Optimization and Its Applications, vol 17. Springer, New York, NY. https://doi.org/10.1007/978-0-387-77247-9_16

²⁰ In economics this outcome is formalised in what is known as the First Fundamental Theorem of Welfare Economics, which asserts that in a competitive economy, not subject to distortions, market determined prices will lead to decisions that result in a Pareto optimal outcome (in the sense that no further exchange would make one person better off without making another worse).

Spectrum trading is an example of a policy consistent with the Coase Theorem in economics. This states that under ideal economic conditions (specifically full information), where there is a conflict of property rights (e.g. use of spectrum by one party imposes a cost on the use of spectrum by another party) the involved parties can bargain or negotiate terms that will accurately reflect the full costs and underlying values of the property rights at issue, resulting in the most efficient outcome.

For efficiency to be maintained over time, the Coase Theorem suggests that it must be possible for parties to bargain or negotiate trades in spectrum licences. For example, a licence holder successful in an auction might choose to sell some or all of its spectrum licences to another party at some future date. Such spectrum trading is possible in law and has occurred in Australia.²¹

Indeed, it is relatively straightforward to broker a spectrum trade or arrange a spectrum lease in Australia, as the ACMA has a well-organised set of procedures in place.²² There have been a range of trades which have included all the large national spectrum licensees – Optus, Telstra, TPG Telecom and NBN – as well as Dense Air. While many of these trades were for the purposes of defragmentation (e.g., recent trade between NBN Co and Optus of 2.3GHz and 3.4GHz spectrum), it is still evidence that market mechanisms can and are used to promote efficiencies. It is also to be remembered that while the market may be characterised as relatively "thin" in term of volume, these are trades of high value assets, access to which informs significant downstream investment decisions by the licensees. The trading activity is itself evidence of a secondary market that moves spectrum towards its highest value use. The low volumes of trades suggest that the allocation is largely efficient.²³

Given the ease by which spectrum can be traded in Australia, the limited number of spectrum trades involving frequencies used for public mobile services indicates that the allocation of spectrum licences at the time of auctioning has achieved efficiency and these allocations remain efficient. Further, as demand for frequencies to support public mobile services has grown in Australia year on year and data use on all networks has continued to rise,²⁴ it would seem unlikely that trades involving these frequencies would yield overall net gains. There are some exceptions where reauctioning may be justified, however, for example where the original allocation is no longer fit for purpose and has resulted in complex arrangements that inhibit gains from trade because of 'transaction

²¹ In November 2023 it was reported that Telstra had acquired radio spectrum licences held by Dense Air (see <https://insidetowers.com/telstra-acquires-dense-air-australian-operations/>), including nationwide licences in the 2.6 GHz band that Dense Air acquired from TPG in exchange for city licences in the 3.6 GHz band in August 2021 (see <https://denseair.net/dense-air-acquires-new-spectrum-to-build-neutral-host-shared-wireless-networks-in-australia/>).

²² See <https://www.acma.gov.au/trade-your-spectrum-licence> and <https://www.acma.gov.au/buy-or-lease-spectrum-someone-else>

²³ See further ACCC discussion at p.20 of ACCC determination in TLS/TPG MOCN - which characterising the market as thin, but does not list defragmentation trades and notes that "TPG by contrast has disposed of spectrum licences in the secondary market, selling its holdings in the 2.5 GHz band to Dense Air Networks Australia, and concurrently buying Dense Air Limited's licences in the 3.4 GHz band. TPG (as Vodafone) has also historically had a spectrum access agreement in place with the sub-national MNO Pivotal, allowing Pivotal access to licensed 'LTE' spectrum. TPG and Telstra also have a separate spectrum access agreement in the 3.4 GHz band, with Telstra operating equipment at greater bandwidths than are licensed to them in selected capital cities."

²⁴ Reported data use on mobile phone services in Australia has risen every year since 2018, see Figure 23 in ACCC (2023) "[Communications market report 2022–2023](#)", December 2023.

costs'.^{25,26} Where there is inefficient spectrum fragmentation, priority should be given to reducing the costs that prevent efficient trading of this spectrum before using an auction to re-allocate.

The policy environment needed to ensure spectrum allocations are efficient – which lies at the core the long-term public interest – requires:

- i. Competitive auctions to oversee initial allocations of *newly released* frequencies; and
- ii. Spectrum trading and spectrum leasing/sharing arrangements to enable parties to negotiate gains from reallocations.

Australia has this policy environment in place which I believe means there is no benefit to re-auction the ESLs. However, the re-auctioning of the ESLs would make sense if technological change has rendered the current licensees as inappropriate holders of the frequencies. I do not see any evidence to suggest that this type of technological change has or is taking place or will in the future.

²⁵ A transaction cost is the cost associated with making an economic trade when participating in a market, and is entirely separate from production costs. Where frequency allocations have resulted in complex arrangements with potentially many primary and secondary users holding one or both of spectrum licences and apparatus licences, bargaining and negotiating trade involving potentially many parties can be time consuming and resource intensive (these would be the transaction costs). See Williamson, Oliver (1979) "Transaction-cost economics: The governance of contractual relations" *Journal of Law and Economics*, 22, 233-261.

²⁶ The ACMA has previously undertaken consultations on some frequency bands where apparatus and spectrum licences coexist and where past allocations have led, as a result of technological progress, to subsequent fragmented holdings and the presence of a multitude of licences and licensees which present substantial transaction costs militating against obtaining more efficient allocations. For example, the ACMA consulted in 2019 on optimising arrangements for the 3400–3575 MHz band, see [Options Paper](#), April 2019. In the Options Paper (p.11) the ACMA noted that such complexities may inhibit efficiency enhancing efficiency gains: "Under current arrangements in the band, any trades to support a defrag would require at least one licensee to trade all or part of a spectrum licence for an apparatus licence (and vice versa). Most licensees value the flexibility and tenure of a spectrum licence over that of an apparatus licence and will not make such a trade, particularly if the move is to site-based apparatus licensing arrangements. This issue appears to be what is inhibiting the use of third-party authorisations to affect an equivalent outcome. It is likely that the use of third-party authorisations would only be considered by licensees as a stop-gap solution if a defrag of actual licence holdings to the same or equivalent licence type is guaranteed to occur in the future." For the frequencies concerned, the ACMA concluded that an auction was the best course of action in the 3.4 GHz band and this occurred in 2023, see [auction results](#). The licence term was set at approximately 7 years, to align with the 13 December 2030 expiry date of existing spectrum licences in the 3.4 GHz band. Thus these licences fall within the ESLs.

4. LICENCE RENEWALS PRICING THROUGH AUCTIONS

Spectrum licences allocated in Australia and those allocated in many other countries tend to be awarded on a fixed-term basis although some are in perpetuity.²⁷ Towards the end of a fixed-term, a process starts which determines the policy of renewal – this policy may or may not be known ahead of the renewal period. In some countries, it may be stated that there is a ‘strong presumption of renewal’ (e.g. Canada and United States).

However, when considering the renewal of licences, there is always an option to re-allocate frequencies by auction. The case for doing this rests on evidence that the current allocation of frequencies is inefficient, as discussed above. In Australia this would amount to strong evidence showing an inefficient allocation among current users, or the existence of prospective users or uses that would deliver higher benefits than current users. In my view neither of these conditions are apparent.

If the current allocation were inefficient, spectrum trading and leasing, as well as spectrum sharing, ought to enable licensees to exploit gains from exchange and trade. If new uses were evident, there would have been clear instances of new entities outbidding incumbent MNOs in spectrum auctions in Australia and elsewhere.²⁸ As concluded above, in my opinion there is no evidence to support claims that auctions are required to ensure ongoing efficient use of spectrum assets.

However, it might be argued by some that reallocating spectrum by auction usefully identifies the market price that should be paid by incumbent licensees. The only justification for such an argument in the presence of the spectrum management policy environment would be to raise revenue.

But if the purpose of an auction is to discover prices with a view to raising revenue for government, this goes directly against the long-term public interest. This is because the initial allocation and the availability of mechanisms to support secondary market activity, and the fact that there have been few trades and limited effect of technological change (i.e., it can continue to be used to upgrade to next generation mobile technology) on the future use of ESL spectrum means the allocation of spectrum within the ESLs is efficient.

Further, given the spectrum in the ESLs is efficiently allocated, it would be a challenge to design an auction process for the ESLs that would easily reveal prices or valuations. This is because bidders would very likely bid on lots identical or very similar to what they previously held and this would result in little competition at the margin. This has occurred in a number of recent auctions, including Ofcom’s 2021 auction for frequencies in the 3.6-3.8 GHz band.²⁹

The views above have also been echoed in GSMA (2014), in which the authors set out international best practice in relation to the renewal of mobile spectrum licences.³⁰ While they recognised that auctions can be useful where there is uncertainty over the best use of the spectrum, they argue that auctions may bring unnecessary costs where

²⁷ Most countries allocate fixed-term spectrum licences, with varying terms up to typically no more than 25 years. The United Kingdom is an exception, it grants indefinite licences having an initial term (often as long as twenty years) and beyond the initial term the spectrum manager Ofcom applies spectrum charges in the form of annual licence fees. See Ofcom (2024) [Review of Ofcom’s market-based approach to mobile spectrum management: Response to Government](#) 11 January. However, Ofcom proposes to depart from indefinite spectrum licences in mobile in future spectrum awards.

²⁸ In all mature economies where spectrum auctions have occurred in recent years, spectrum has been acquired by incumbent licensees. For example, see <https://www.spqglobal.com/marketintelligence/en/news-insights/research/upcoming-global-spectrum-auctions-to-diversify-mid-band-options-for-5g>

²⁹ In the simultaneous multi-round ascending price auction, Ofcom offered 24 5 MHz lots in the 3.6-3.8 band and set a reserve price for each lot of £20 million. Four incumbent mobile operators qualified as bidders. Three bidders succeeded after limited competition, each winning 8 lots. Two bidders paid £21 million per lot and one bidder paid £22.05 million per lot. See Ofcom auction 2021 [results](#).

³⁰ GSMA (2014) “[Best practice in spectrum licence renewals: A toolkit for licensing authorities](#)”, December.

it is clear that the existing licence holders with established networks and customer bases value the licences more than others and if the best use of the spectrum is certain (which it is) then there is no need.

More recently the GSMA (2021) reiterated this position on the auctioning of renewal licences, stating that³¹ “While auctions can work well for initial spectrum assignments, they are almost always inappropriate in the case of renewing mobile spectrum licences that are expiring. The key focus for renewals should be to provide the predictability licence holders need to invest heavily in their networks throughout the term of the licence. If expired licences may be re-auctioned – and thus operators may lose access – then it becomes rational to limit investment in the network in the years preceding expiry. This can in turn negatively impact mobile coverage and broadband speeds and if the operator ultimately loses the spectrum can lead to sudden drops in network quality. Auctions are suitable for expired licences if the licensee does not want to renew the spectrum or if they have breached the terms of the licence. In cases where spectrum assignments are deemed to be unbalanced or inefficient then the market should be allowed to correct itself by facilitating spectrum trading. Laws which prevent expiring licences from being automatically renewed should be revised to better protect network investment and quality of service.”

Rather than auction and reallocate the frequencies in the ESLs, a better approach would be for the ACMA to determine the appropriate price when renewing the ESLs.

³¹ GSMA (2021) “[Auction Best Practice: GSMA Public Policy Position](#)”, September.

5. AUCTIONS AND THE COST OF WAIT-AND-SEE

The ACMA is currently leaving open the possibility of reallocating the frequencies in the ESLs by auction, either as consequence of a decision to partially renew or refuse to renew an ESL. This inevitably presents uncertainty for the mobile network operators, as there is a probability spectrum assets held by a mobile network operator would be lost at auction. This risk could lead to operators playing a *wait-and-see* strategy before committing substantial spectrum related irreversible investments, resulting in lost consumer surplus and hence against the public interest.

This response on the part of incumbent operators is echoed in the academic literature, which predicts that as uncertainty grows firms' business conditions become increasingly unclear, causing them to anticipate higher future cash flow dispersions (Bernanke, 1983; Dixit & Pindyck, 1994).³²

Biljanovska *et al.* (2017)³³ present a thesis that this form of uncertainty makes corporate decisions less likely to be implemented today, as firms fear that uncertainty increases the probability of costly mistakes.³⁴ Understandably in the face of elevated uncertainty, firms prefer to adopt a wait-and-see approach and withhold (perhaps even indefinitely) critical business decisions that can be postponed until much of the uncertainty is resolved.³⁵

Dreyer and Schulz (2022) argue “highly irreversible capital expenditure, hiring, and share repurchase decisions tend to experience sharp declines in periods of uncertainty”.³⁶ In a recent detailed econometric assessment of around 25,000 manufacturing plants in the US, Bloom *et al* (2022) conclude “investment is strongly and robustly negatively associated with higher uncertainty, with a two standard deviation increase in uncertainty associated with about a 6% reduction in investment”.³⁷

If the ACMA were to adopt a policy of auctioning the frequencies in the ESLs, this would present risks for the incumbent operators that would be managed by playing a wait-and-see strategy. The consequence of this would be to undermine the long-term public interest.

By contrast, if the ACMA were to renew the frequencies in the ESLs on terms to be settled, the risk of losing frequencies would largely be eliminated and there would be little need for the incumbent operators to play a wait-and-see strategy.

³² Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment. *Quarterly Journal of Economics*, 98(1), 85–106. <https://doi.org/10.2307/1885568> and Dixit, A. K., & Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton University Press.

³³ Biljanovska, N., Grigoli, F., & Hengge, M. (2017). Fear thy neighbor: Spillovers from economic policy uncertainty. International Monetary Fund.

³⁴ Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3), 623–685 presents an empirical validation.

³⁵ Many papers have emphasized this aspect of real option theory, for example see Grenadier, S. R., & Malenko, A. (2010). A Bayesian approach to real options: The case of distinguishing between temporary and permanent shocks. *Journal of Finance*, 65(5), 1949–1986. <https://doi.org/10.1111/j.1540-6261.2010.01599.x> and Schwartz, E. S., & Trigeorgis, L. (2004). *Real options and investment under uncertainty: Classical readings and recent contributions*. MIT press.

³⁶ Dreyer C, Schulz O. Investor horizons and corporate policies under uncertainty. *Rev Financ Econ*. 2022; 40: 5–19. <https://doi.org/10.1002/rfe.1129>

³⁷ Nicholas Bloom, Steven J. Davis, Lucia S. Foster, Scott W. Ohlmacher and Itay Saporta-Eksten (2022) “[Investment and Subjective Uncertainty](#)” NBER Working Paper Series number 30654.

6. CONCLUSION AND RECOMMENDATION

The debate surrounding ESLs has been framed around identifying public interest criteria. These were set out by ACMA in December 2023 following public consultation in May last year. The Minister has also endorsed the criteria and emphasised that “the ACMA explore future arrangements to reduce the barriers to entry for new users of spectrum for either new use cases or existing uses, as a dynamic and competitive telecommunications market is most likely to promote the public interest.”³⁸

In both instances, auctioning the ESLs is not given and there is an open question about public interest objectives regarding competition and entry versus continuity of service. In March 2024, the ACMA have invited prospective licensees “to supply their own market intelligence and analysis...(and) frame their submissions with reference to the public interest criteria and relevant guidance”. The final Ministerial Policy Statement Instrument published on 30 April 2024, to which the ACMA is to have regard in its decision-making on ESLs, recognises “the importance of the expiring spectrum licences to continuity of existing service coverage, the ACMA should consider where there may be scope to strengthen service offerings by enabling access for new entrants, smaller providers or innovative applications.”³⁹

In my opinion, unless compelling evidence were presented to suggest otherwise, I do not see any long-term public interest gain by refusing to renew the ESLs and choosing to reallocate frequencies by auction. Australia’s spectrum management policy environment is entirely consistent with an efficient allocation of the frequencies in the ESLs, making a reauction of the frequencies in the ESLs pointless.

Further, the cost of auctioning the ESLs could be substantial because of the risk associated with additional uncertainty. This risk can be mitigated by the ACMA if it clarified its policy regarding renewal applications and committed to a process of renewals.

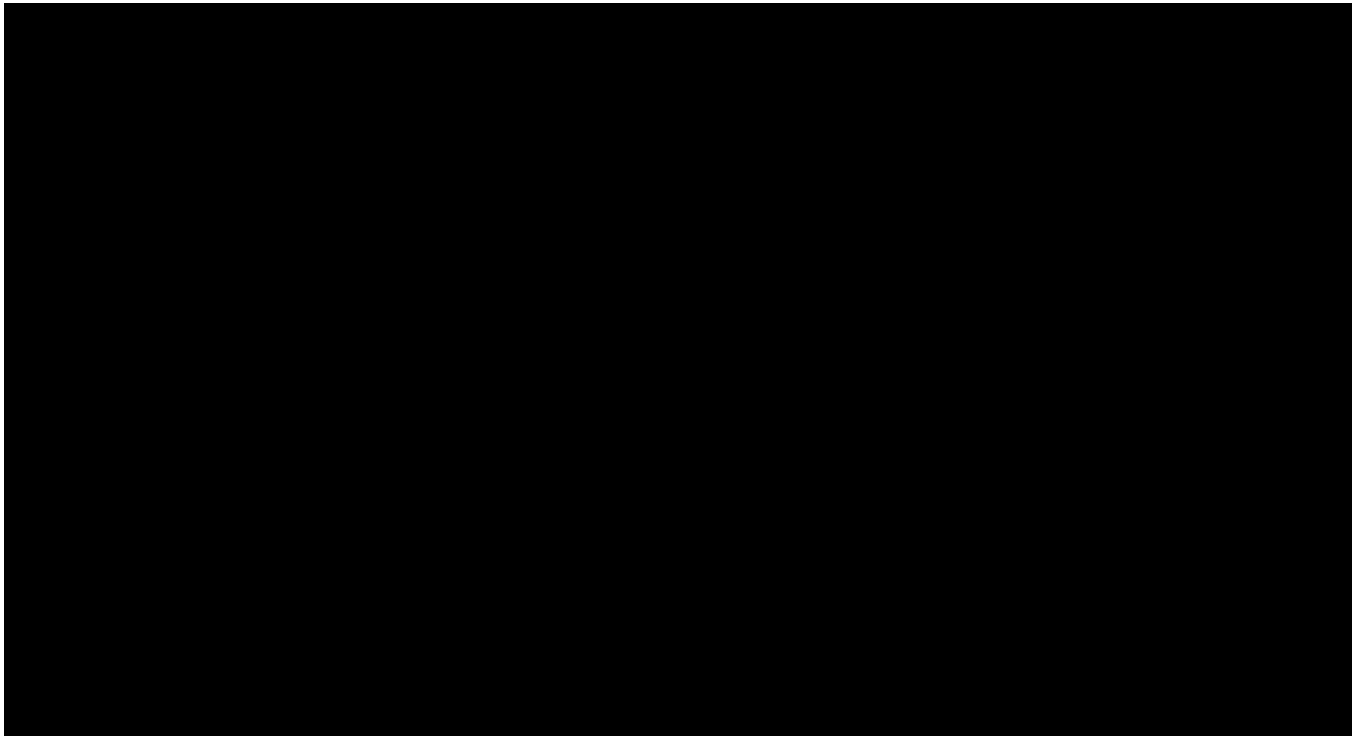
I also see no merit in using auctions to discover renewal prices. Instead, the ACMA would do better to determine appropriate renewal fees based on the principle of at least covering its cost of administering the licences.

³⁸ Section 7, [Ministerial Statement Radiocommunications \(Ministerial Policy Statement – Expiring Spectrum Licences\) Instrument 2024](#), March 2024.

³⁹ Section 7, Ministerial Statement (2024) *op cit*.

Table 1: Summary of ESLs

Band	Licensees	Current primary use	Renewal application period begins	Expiry
850 MHz	TPG, Telstra (original band) Optus (downshift)	WBB	18 June 2026	17 June 2028
1800 MHz	TPG, Telstra, Optus RailCorp (NSW); VicTrack; Queensland Rail; Department of Planning, Transport and Infrastructure (SA); Public Transport Authority of Western Australia	WBB Rail safety and communications	18 June 2026	17 June 2028
2.5 GHz	Telstra, Optus	WBB	1 October 2027	30 September 2029
2.5 GHz mid-band gap	ABC, Channel 7, Nine Network, Network 10	ENG (for example, television outside broadcast)	1 October 2027	30 September 2029
700 MHz	TPG, Telstra, Optus	WBB	1 January 2028	31 December 2029
2.3 GHz	NBN, Telstra, Optus	WBB	25 July 2028	24 July 2030
3.4 GHz	NBN, Telstra, Optus, TPG	WBB	14 December 2028	13 December 2030
2 GHz	TPG, Telstra, Optus	WBB	12 October 2030	11 October 2032



The logo for Optus, consisting of the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA Consultation Paper

**Expiring spectrum
licences, Stage 4**

**Proposed application and
decision-making process**

Public Version

February 2026

EXECUTIVE SUMMARY

Optus welcomes the opportunity to provide feedback on the ACMA's *Proposed application and decision-making process* as part of stage 4 of the expiring spectrum licences (ESL) process.

Clarity and certainty around the processes by which licensees can apply for the renewal of spectrum licences, and by which the ACMA will consider applications will underpin smooth renewal processes between 2026 and 2032. These processes should be designed to accommodate the practical business needs of applicants, while supporting the ACMA's legislative and policy obligations, including determining whether renewal is likely to promote the long-term public interest.

The application and decision-making process outlined in the ACMA's consultation paper makes a reasonable start, subject to some adjustments that we suggest will balance industry concerns around certainty with the ACMA's requirements.

Spectrum licence fee payment should be due 1 month prior to renewal

The ACMA's proposed due date for the payment of licence renewal fees is determined by the completion of the consultation process. This has the effect of licensees having to pay for renewal up to 19 months prior to licence issue, ultimately creating payment timing uncertainty. Optus considers it unreasonable to expect licensees to provide payment this early and, given the large sums of money involved, will be highly disruptive to the financial planning and cashflow management for licensees.

An ACMA renewal offer, and renewal notification provide sufficient certainty to licensees as they are legally binding on the ACMA, thereby providing the necessary certainty of renewal to licensees. Conversely, the risk to ACMA of a licensee defaulting on an accepted renewal payment is very low. The risk is significantly lower for renewal than for an auction, as expiring licenced spectrum has already been deployed in the networks where the removal would impact the network performance and customer experience.

The ACMA should issue a renewal offer and, upon acceptance of the offer, provide a renewal notification to the licensee with payment due 1 month prior to renewal.

Options for instalment payments should be revisited

Instalment payments provide a more efficient, sustainable and equitable approach to ESL renewal fees. They align payment timing with the period over which spectrum benefits are realised, improve cashflow management, and reduce the need for large upfront capital outlays that divert funds away from essential network investment. This supports continued investment in coverage, capacity, innovation and service quality—outcomes that are critical for consumers and the broader economy. For completeness, and as outlined above, we propose that payment of the first instalment should be due 1 month prior to the renewal of each licence.

The Spectrum Pricing Review 2018¹ (Recommendation 6) presents no apparent impediment for the ACMA to offer the option of instalment payments for spectrum renewals and we would welcome further response on this topic.

Repeated consultation on pricing reduces certainty and imposes unnecessary burden on licensees for the next four years

¹ https://www.infrastructure.gov.au/sites/default/files/spectrum-pricing-review_0.pdf page 9

ESL prices per MHz per population (**PMPs**) should be set at one time to provide certainty of the renewal cost of all ESLs and enable informed decisions to be made regarding substitutable spectrum.

Incorporating a small number of additional benchmark data points for each ESL – likely only one or two per band based on the existing dataset, is likely to have a negligible impact on PMPs, while the consequences of prolonged uncertainty are significant for mobile network operators (**MNOs**).

Moreover, the ACMA's plan to include new benchmark data from up until six months prior to each application window would force operators to complete extensive corporate governance processes, which are required for multi-million-dollar renewal, in compressed timeframes.

A modified application and decision-making process will overcome many of the issues highlighted above

We have made several suggestions to make the application and submission process more balanced and to better accommodate the corporate governance requirements of applicants mentioned above.

We support a transparent process and public release of all final renewal decisions

It is preferable and supports transparency for the ACMA to publish the outcomes of renewal decisions, ensuring all stakeholders receive consistent and timely information.

INTRODUCTION

In the following sections we respond directly to the four questions posed by the ACMA and then provide feedback on, and suggested improvements to the application and decision-making process. These suggestions aim to streamline matters, provide certainty to licensees and the ACMA, reduce the financial burden on licensees and recycle and re-use already available information to simplify decision making by the ACMA.

OPTUS RESPONSES TO CONSULTATION QUESTIONS

The following section sets out Optus' responses to the specific questions posed by the ACMA in the consultation paper.

Q1. Do you foresee any practical reasons that would prevent you from providing information that is accurate as of a date closer to when the application is made? (For example, accurate as of 30 days prior to when the application is made.)

Through conversation with the ACMA, we understand that the data requested by the ACMA is as follows, for each band that is being applied for:

- Consolidated outdoor coverage for all existing and planned (over the following 3-year period) sites using the band
- The information provided needs to be accurate to 31 January prior to the licence application per technology type
- Technology deployed on each site for the band
- Site location
- Individual site identifiers (RRL site ID or RFNSA site ID)

It is further understood that the information provided will be used solely for the purpose of assessing the application to renew the expiring licence(s) for the band.

With regard to the provision of three-year projected site and coverage data, the information provided will represent the current view of both site upgrades and greenfield sites. The coverage data may, in many cases, not indicate any increase in coverage area as bands are often deployed for the purposes of capacity enhancement or network densification rather than network extension. In relation to greenfield sites, nominal location and target areas may be provided where no candidate details are available.

Generation of coverage maps is a time and resource intensive exercise. Our expectation is that coverage data current to 31 January prior to the licence application should be sufficient for the ACMA's licence application assessment, noting the ACMA can request further information on a case-by-case basis if necessary.

Our current intention is to identify approximations of capacity upgrade target areas and greenfield separately to the coverage plots noting that this level of accuracy reflects the planned status of the work. We are open to further discussion with the ACMA on this proposed approach.

It is also our understanding that this information will be provided and considered on a confidential basis. We note the ACMA's acknowledgement that planned service coverage is subject to various factors and may change over time as the applicant's business plans and the broader market environment changes.

On the basis of our understanding above, we do not foresee any issues with the provision of this data.

Proposed amendment to the instrument

To align the text in the ACMA's *draft radiocommunications spectrum licence renewal – information and documents instrument* with the consolidated coverage requirements of the application process we propose the following minor amendments:

Information and documents – existing coverage

- (3) In relation to ~~each~~ mobile sites where ~~a~~ radiocommunications transmitters ~~is~~ are:
- (a) operated under any of the following:
 - (i) the subject licence; and
 - (ii) a related spectrum licence for the subject licence; and
 - (b) used for radio (mobile);
- an application must be accompanied by the outdoor coverage ~~for the mobile site~~, by frequency band for each technology type.

Q2. Do you foresee any practical issues that would prevent you from providing the proposed documents about existing and planned sites and coverage in the required format to the ACMA as part of a renewal application?

We do not see any issues in providing the information in the formats requested by the ACMA and anticipate the ACMA will consult on the proposed contents of the application and submission pack prior to the renewal application window opening.

Q3. Do you foresee any practical issues that would prevent you from providing the proposed documents about third-party authorisations in the required format to the ACMA as part of a renewal application?

Subject to appropriate commercial confidentiality protections being in place, we do not see any issue with the provision of this information.

Q4. Do you foresee any practical issues that would prevent you from paying the spectrum access charge in full within the proposed timeframes?

Noting that there is overlap between the application and process consultation and the updated preliminary price consultation, Optus repeats the same commentary on instalment payments and payment timing below:

Our submissions through the ESL process have advocated for instalment payments on the basis that they offer significant financial, operational, and policy advantages for both regulators and licensees. The key benefits can be summarised as:

a) Improved Cashflow Management for Licensees

Paying spectrum fees over time aligns costs with the period in which benefits are realised. It reduces large, immediate outflows that can strain financial resources and allows operators to better manage capital for ongoing investment in network rollout, upgrades, and customer service.

b) Alignment with the timing of economic benefit

Spectrum licences generate value gradually over the life of the licence, not all at the moment they are granted, and instalments mirror the way operators amortise spectrum on their balance sheets. Instalment payments more accurately track cost-avoidance and revenue benefits as they accrue over time.

c) Supports sustainable industry investment

Large upfront payments can divert funds from investment in infrastructure (5G/6G rollout, fibre backhaul, regional expansion) and innovation.

d) Reduces risk of market distortion or consolidation

Upfront lump-sum payments favour large incumbents with deep pockets. Instalment payments have the ability to reduce barriers for smaller operators or those with weaker balance sheets. This lowers the risk of market consolidation driven by cashflow constraints and higher funding costs and assists in maintaining and growing the competitive intensity in the market currently.

e) Increases certainty and predictability

Instalments provide a clear, predictable cost schedule which allows operators to plan budgets and financing requirements across many years, and regulators to benefit from more stable and recurring revenue streams. In addition, instalment payments reduce exposure to short-term interest rate or macroeconomic shocks at a single payment point.

f) Reduces real economic burden for industry

When lump-sum payments are required, operators often need to raise debt or reallocate capital rapidly. Operators face a higher cost of capital than government, which increases the overall real economic burden. Instalments smooth borrowing needs over time, reduce the likelihood of borrowing at unfavourable interest rates and lowers the overall cost of capital.

g) Reduced risk of non or partial renewal

For renewals in particular, instalments avoid forcing licensees into premature renew, exit or consolidate decisions driven by cashflow rather than value and reduces the risk that viable operators fail to renew spectrum simply because early, large payments are required.

Optus seeks further clarification on ACMA's ability to support instalment payments.

Recommendation 6 of the Spectrum Pricing Review 2018 has been referenced by the ACMA as a justification for requiring upfront payments for renewals.

Recommendation 6

For spectrum access charges determined by auction, the ACMA should generally require upfront lump-sum payments. There may be circumstances where instalment payments are warranted shortly after the beginning of a licence term. In considering use of instalments, the ACMA should assess the risks to the state of default and the potential impact on competition. The ACMA should generally receive upfront payments before the licence period begins because it protects against the risk of payment default. It reduces the complexity and increases the certainty of spectrum auction outcomes. Upfront payments also help to reduce speculative bidding. However, the Government recognises that long term licences require a large amount of capital. Therefore, there may be circumstances where Government or the ACMA approves short term deferrals. In considering these circumstances, the Government or the ACMA should take into account the risks to competition of payment deferrals (including the role the competition limits are playing), the number and type of bidders at an auction, and the risk to the Government of unpaid licence payments. In these circumstances, requirements such as

*a bank guarantee over a portion of outstanding funds are appropriate to reduce risk to Government.*²

It appears that this recommendation does not prevent the ACMA (or the Government) from providing an option for instalment payments for spectrum licence renewals, noting that the recommendation applies to spectrum charges determined by auction and makes no specific reference to renewals. This recommendation does provide the ACMA the ability to approve instalment payments after assessing risks for default and impact on competition. It also focuses on payments applicable to a single auction at a single point in time rather than a series of renewals due in relatively short succession. If the ACMA is able to consider instalment payments having regard to a single auction, it is reasonable to expect a similar assessment could be conducted for renewals, with specific recognition given to the short-term capital squeeze multiple renewals within a short time period creates. Whilst not the subject of this paper, it should be noted that when all the renewed ESLs are next up for renewal they will all fall within 1 year.

The ACMA has also noted that past instalment arrangements were enabled through Ministerial Direction, as occurred in the 700 MHz (2017) and 26 GHz (2021) auctions. Aside from relying on historical practice, the ACMA has not provided any substantive policy, economic, or legal rationale for requiring upfront payment of renewal fees.

Furthermore, international practice indicates that instalment arrangements are frequently offered by regulators in spectrum assignments, particularly where licence terms are long and amounts are substantial. This is reflected in DotEcon's treatment of benchmarking data, which includes adjustments to normalise for the presence of instalment payment structures—implicitly acknowledging their prevalence across jurisdictions. Recognising this global context, making instalment options available for ESL renewals would align the Australian framework with established regulatory practice and provide a balanced mechanism to manage cashflow without compromising policy objectives.

For these reasons, we again request that the ACMA give full and careful consideration to offering instalment payment options for ESL renewals. Instalments aligned with the amortisation schedules of each band would provide a more balanced, sustainable, and appropriate approach to renewal payments, while supporting continued investment and maintaining the financial health of the sector.

Practical issues with up-front payments within the ACMA's proposed timeframes

As the ACMA's proposed payment of licence renewal fees is determined by the completion of the application process, this introduces significant issues for operators as there is no certainty in payment dates. If renewal application is made early in the process this could result in payments being due up to 19 months prior to renewal.

Since licensees may submit renewal applications at any point during the application window, it follows that those who apply early, as encouraged by the ACMA, would face earlier decision dates and therefore earlier payment triggers. The ACMA has not committed to issuing renewal decisions on a fixed schedule and there is a potential for further delay should additional information requests be required. Therefore, the resulting processing times and consequently payment dates may vary significantly by licence, thereby further increasing uncertainty for operators.

Further, the proposed process is misaligned with established practice. Historically, both auctioned licences and renewals require payment close to licence commencement, usually

² https://www.infrastructure.gov.au/sites/default/files/spectrum-pricing-review_0.pdf page 9

around one month beforehand. Requiring payment up to 19 months early represents a significant and unjustified departure from long-standing regulatory practice.

Requiring spectrum renewal payments at an uncertain time, and potentially up to 19 months before the renewed licence takes effect, creates a range of significant financial and operational challenges for licensees: These challenges extend well beyond standard cashflow considerations and have material implications for business planning, investment cycles, governance processes, and competitive neutrality.

a) Cashflow Volatility and Budgeting Uncertainty

Spectrum renewals involve large, multi-million-dollar payments. Without certainty on when these payments will fall due, operators cannot accurately forecast cash needs or allocate capital. This level of uncertainty is inconsistent with prudent financial management in a capital-intensive industry.

The ACMA has made it abundantly clear that early submission of licence renewal applications is preferred. If licensees follow this direction and apply at the start of the application window for the 850/1800 MHz bands (18th June 2026), then payment would fall within this current calendar year. This outcome is entirely unexpected for operators and has not been incorporated into approved budgets. Noting that Optus use April to March financial year, this would bring forward our 1800 MHz licence payment by two financial years. To align with our current financial forecasting, Optus would need to apply no earlier than October 2027 assuming payment 5 months later, for payment in financial year 2029 as previously forecasted.

b) Impact on Debt, Financing, and Capital Structure

The scale of the current renewal obligation represents a step-change relative to the previous ESL cycle. For Optus, the prior ESL bill was approximately \$700 million, whereas the current renewal liability is in the order of ~\$2 billion (if fully renewed). This material increase significantly amplifies the cashflow, financing, and opportunity-cost implications of a lump-sum payment model.

When the timing of large regulatory payments is uncertain, operators are forced to maintain higher cash reserves, reducing capital available for investment. Early payments of months or years ahead of licence commencement, mean operators must carry the debt or cost of capital for that period without receiving any benefit from the renewed licence.

c) Pressure on Corporate Governance and Board Approval Processes

Spectrum renewals require extensive internal governance, involving board approval, risk assessments, financing plans, investment trade-off analysis and shareholder reporting (for listed entities). These processes cannot be performed efficiently unless the operator knows the payment amount, and when payment is due. If Ministerial Policy Statements are released only shortly before the application window opens, and payment may be required immediately after ACMA approval, the governance cycle becomes compressed and rushed, increasing legal, financial, and operational risk.

d) Misalignment of Costs and Benefits

Requiring payment up to 19 months prior to licence commencement forces operators to incur the full cost of renewal long before receiving the legal right to the spectrum, the operational benefit, or the revenue/cost-avoidance value the spectrum provides. This creates a major negative working capital impact, inconsistent with how spectrum value is realised (which occurs gradually throughout the licence term).

e) Distortion of Long-Term Investment Priorities

Large, early payments divert capital from network deployment and upgrades, resilience improvements, rural and regional coverage investments, and technology upgrades (such as 5G to 6G). Uncertain payment timing forces operators to delay or cancel planned network programs to preserve liquidity until a renewal payment date becomes clear.

f) Disproportionate Impact on Smaller Operators

Early payment timing advantages operators with larger balance sheets, deeper capital reserves, or easier access to debt markets. Smaller operators are disproportionately affected by early, uncertain payments, increasing the risk of competitive disadvantage, weakened financial performance, or reduced ability to renew all spectrum bands. This is particularly problematic in a renewal process, where spectrum is already fully integrated into networks and critical for competition.

g) Administrative and Operational Disruption

Operational processes tied to renewal including network planning, vendor contracting, capacity forecasting, and workforce allocation, depend on knowing when renewal will occur and the certainty that the licence can be renewed. Uncertainty in payment timing cascades through to delays in procurement and deployment, misalignment of rollout schedules, and complexity in managing multi-year investment programs. This creates unnecessary operational inefficiency for both the operator and the broader ecosystem (vendors, contractors, equipment suppliers).

h) Sovereign Risk and Financial Reporting Issues

Uncertain payment timing, particularly when disconnected from licence commencement, creates challenges in financial reporting and provisioning, potential impacts on credit ratings, and increased perceptions of sovereign/regulatory risk among investors and lenders. These factors can directly influence the cost of capital and long-term investment appetite in the Australian telecommunications sector.

We do not support the proposed Spectrum Access Charge (**SAC**) adjustments and consider that a fixed payment date is the most appropriate way forward. The SAC adjustments will introduce unnecessary complexity and have consequences beyond the renewal process, as discussed below.

- a) CPI is an insufficient motivator for an operator to pay early, as it does not represent the cost of capital. Instead of CPI, the relevant metric for timing a payment decision used by operators as well as government, is the weighted average cost of borrowing / capital (**WACC**). The ACMA is currently using the long-term, post-tax nominal WACC recommendation provided by Frontier Economics of 8.49%³, which is more than double CPI (3.8% October 2025). As the spectrum renewal charges are large, and the WACC is significantly greater than CPI, this will result in considerable incentives for operators to pay and therefore apply as late as possible in the window.
- b) The SAC adjustment may adversely impact secondary market trading as licensees have paid different amounts based on the timing. This can result in different views on paid

³ <https://www.acma.gov.au/sites/default/files/2025-05/Preliminary%20views%20paper%204%20-%20Pricing%20for%20ESLs.pdf> p46

prices between different licences which could complicate any secondary market negotiations.

Operators are afforded certainty of renewal via an ACMA renewal offer and subsequent renewal notification, as both are legally binding commitments by the ACMA. These instruments give operators assurance that their licences will be renewed, without requiring payment many months in advance. Optus disagrees with the premise that certainty only arises once payment is made. A legally binding renewal offer by the ACMA provides all necessary certainty to MNOs. Additionally, there is no precedent for the ACMA rescinding such an offer. Doing so would represent a significant sovereign-risk event with likely legal implications.

Conversely, the risk to the ACMA of a licensee defaulting on a renewal payment is extremely low. No Australian mobile operator has ever defaulted on a mobile spectrum auction or spectrum renewal payment. The risk is even lower in renewal scenarios compared with auctions, because the expiring spectrum is already fully deployed in networks and underpinned by billions of dollars in infrastructure investment, meaning operators have strong commercial incentives to complete payment. For these reasons, requiring payment up to 19 months before licence commencement is neither justified nor proportionate, and provides no additional certainty beyond what is already delivered by the ACMA's own legally binding renewal offer and notification.

The ACMA should instead issue a renewal offer and, upon acceptance of the offer, provide a renewal notification to the licensee with payment due 1 month prior to renewal.

In support of this position and as an alternative to the process proposed by the ACMA, we have set out an alternative process and timeline for decision making in subsequent sections.

[CIC]

FURTHER CONSIDERATIONS AND ARGUMENTS

Repeated consultation on pricing reduces certainty and imposes unnecessary burden on licensees

There are significant resource commitments associated with the ACMA's proposed renewal process over the 2026–2032 period.

Releasing PMPs incrementally over four years introduces ongoing uncertainty that is difficult for licensees to manage and delivers only limited analytical benefit. Based on the current dataset, each update is likely to incorporate only one or two additional benchmark data points per band, resulting in minimal change to PMPs. This modest benefit is outweighed by the challenges created when PMP updates occur close to application windows, particularly given the need for operators to complete detailed internal governance processes. Where new benchmark data may be added from up until six months prior to an application window opening, renewal processes risk becoming compressed and operationally complex.

The 850MHz and 1800 MHz bands illustrates this challenge as the first ESLs to enter the renewal process. Although the original intention was to release PMPs one year prior to the application window, PMPs are now expected to be available only as the window opens.

Until PMPs are finalised for each band, further assessment and internal review by potential applicants will necessarily be required. The pricing for substitutable spectrum will influence the long-term business planning decisions for the licensees, and in turn, the amount of spectrum that is considered for renewal. A holistic view of pricing for all bands delivers investment certainty and confidence to renew and deploy using expiring licences.

These processes involve substantial time and effort across regulatory, spectrum, and executive teams and typically require engagement with external advisers. Repeating these activities over multiple years adds material operational and financial burden without a commensurate policy or market benefit.

As population figures are also required to determine absolute ESL price, Optus seeks further clarification from the ACMA on the proposed population methodology.

To support efficient planning and decision-making, we maintain the position that all ESL PMPs should be released prior to the 850/1800 MHz bands application window opening, consistent with the previous ESL 2012 Ministerial determination, to provide clarity on the total ESL bill and enable fully informed decisions across substitutable spectrum bands.

ACMA decisions on multiple licences in the same band

Optus considers that if an operator holds multiple licences within the same band, and the application is made for these licences in a single instance, then the ACMA should release the decision for all of these licences at the same time.

The ACMA should adopt a transparent approach to publishing decision outcomes

While ACMA renewal decisions are not confidential and applicants are free to independently announce whether they have been accepted, it would be preferable and more transparent for the ACMA to publish these outcomes itself, ensuring all stakeholders receive consistent and timely information.

[CiC]

The ACMA’s proposed process leaves applicants with significant uncertainty and governance challenges

While we recognise the ACMA’s intention to provide greater certainty to renewal applicants, there are aspects of the proposed application and decision-making framework that do not achieve this outcome. The process provides significant flexibility for the ACMA but does not adequately account for applicants’ internal governance, compliance requirements, or decision-making timeframes, particularly as applications must be lodged without confirmed pricing information. This introduces substantial timing uncertainty for both applicants and the ACMA, a challenge further compounded by the proposal to vary the SAC based on payment timing. Taken together, these elements create unnecessary risk at a point in the process where stability and predictability are critical. We have proposed adjustments to the timelines and process flows below.

Suggested amendments to the ACMA renewal and payment timeline

For MNOs, there are 4 key critical dates within the application process (in order of importance):

- Licence Fee Payment date
- Operator full/partial acceptance of ACMA Offer date
- SAC Determination/ACMA Offer date
- Application date

Figure 1 below illustrates a potential revised timeline which:

- a) introduces a 2-month period after the ACMA’s spectrum access charge determination to allow licensees to execute internal governance and provide formal acceptance of the offer before the ACMA issues the invoice for the ESL, and;
- b) provides for payment occurring 1 month prior to commencement of the licence as discussed earlier in this submission.

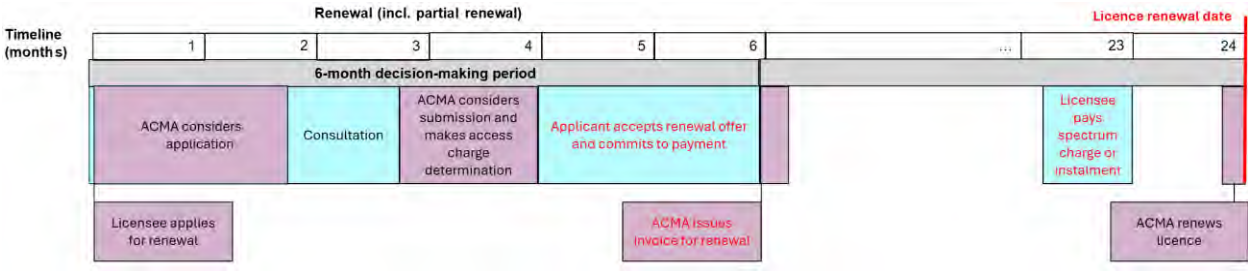


Figure 1 Estimated timeframes for undertaking application and decision-making process steps – Updated

The remaining internal ACMA timeframes appear reasonable.

Suggested amendments to the end-to-end renewal and decision-making process

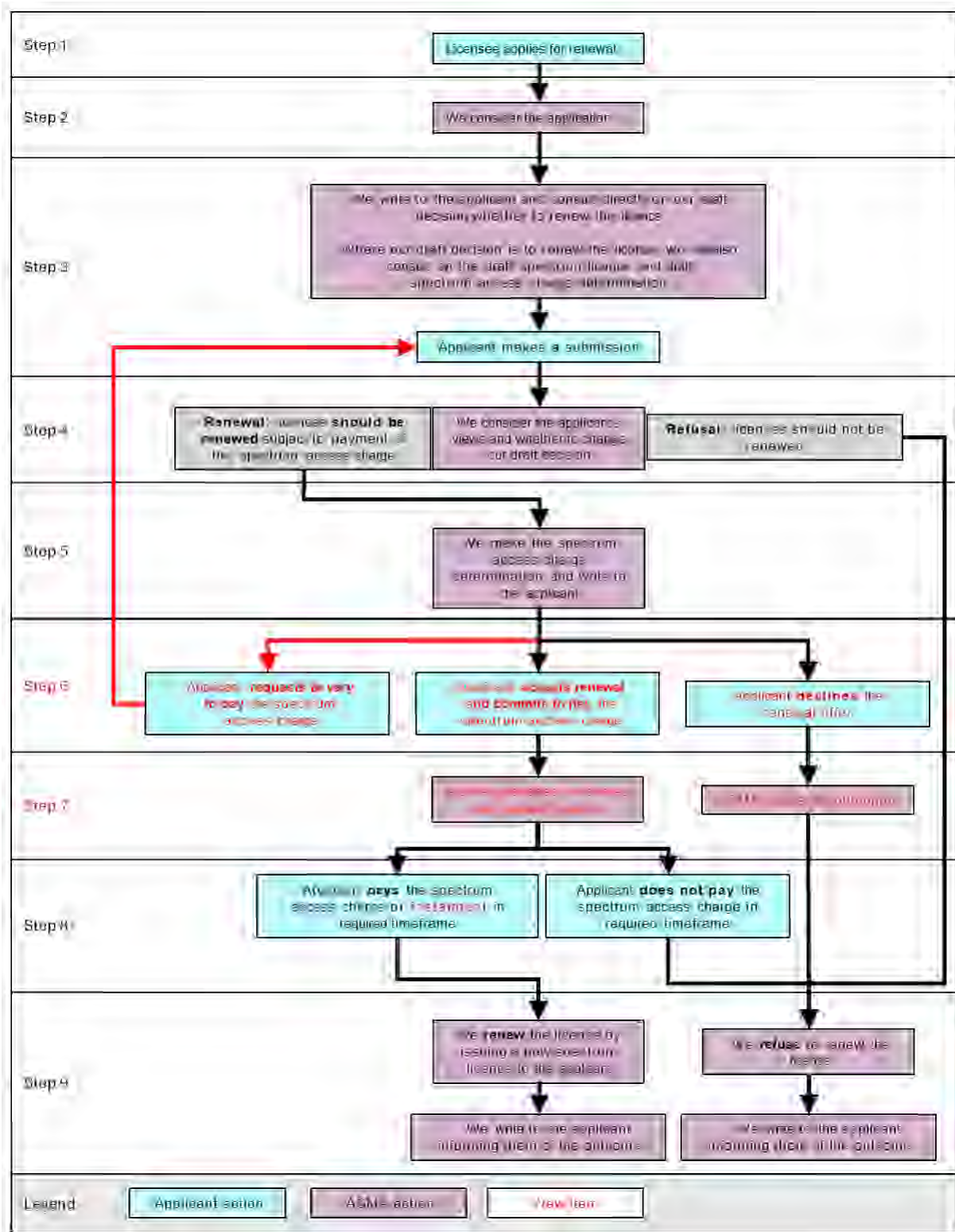


Figure 2: Flowchart of application and decision-making process steps - Updated

Step 1 – Licensee applies to renew.

This is an application to participate in the renewal process but should not be considered a commitment by the applicant to proceed further in the renewal process.

Optus requests that the ACMA confirms the population information at this stage. Optus considers using population determined from the most recent ACMA published, Hierarchical Cell

Identification Scheme (HCIS) - List of Population Data⁴ (Population Documents) at the time of application window opening, as a reasonable approach. The population statistics at this stage should persist through the entire application process and licence duration and maintained per band.

Step 2 – ACMA considers the application.

No proposed changes.

Step 3a – The ACMA provides a draft spectrum access charge determination

This occurs if the ACMA's draft decision is to renew the licence (full or partial).

MNOs should see the final prices at this point, including population, MHz by licence and licence areas defined by HCIS blocks. Further changes to this data should only occur in the event that any information is found to be in error and the ACMA and the applicant agree to a correction.

Step 3b - The applicant makes a submission.

An applicant can decide to accept, decline or propose a variation to the licence at this stage. It is worth noting an applicant may choose to withdraw from the process at this stage or any subsequent stage before commitment to pay.

Step 4 – ACMA decides whether to offer a renewal

No proposed changes.

Step 5a – ACMA makes the spectrum access charge determination and writes to the applicant

This forms the ACMA offer to the applicant and includes the absolute price and population by licence and by licence areas and cannot be rescinded unless the applicant fails to meet its licence payment obligations.

NEW Step 6 - The applicant decides whether to accept the ACMA offer.

a) Applicant accepts renewal and commits to pay the spectrum access charge

At this stage the applicant should be provided at least 2 months to gain internal approval and to decide whether to accept or reject the ACMA's renewal offer. This time is required for the applicant to complete internal corporate governance and approvals processes and is consistent with the time allowed for auctions between registration and pre-bidding.

b) Applicant wishes to vary renewal

As applicants receive final pricing in Step 5, licensees may reconsider their decision on full or partial renewal. This may relate to a reduction in the MHz requested by the applicant and/or the geographical extent of licence areas. In this case, the applicant will make a new submission under Step 3 of the application and decision-making process.

c) Applicant declines renewal offer

Licence is not renewed

NEW Step 7 - The ACMA announces renewal decisions.

⁴ https://channelfinder.acma.gov.au/hcis_to_kml/ASMG-PopulationData-2021.zip 2021 Census

The ACMA should publicly announce any renewal decisions. All spectrum holders should be aware of the outcome and timing of any decisions.

Step 8 (previous Step 6) – The applicant pays the Spectrum Access Charge upfront or instalment

The ACMA issues a payment notification with two options: an upfront payment one month prior to renewal or instalment payments over the life of the licence in-line with amortisation. Further details are contained in our response to Question 4.

Step 9 (previous Step 7) The ACMA issues the renewal licence to the applicant

The following measures should be adopted to facilitate a simple and efficient transfer of registrations from old to new licences:

- a) Automatic transfer of all existing registrations to the new licences. Re-registering devices and assignments would be an unnecessarily time-consuming and costly exercise and would impose a significant administrative burden on both operators and the ACMA.
- b) Grandfathering of all existing registrations to ensure continuity and certainty for licensees during the transition.
- c) Preservation of original registration dates, which is critical for maintaining "first-in-time" protections used in interference management scenarios. Retaining these dates ensures that existing users' priority rights are not inadvertently undermined by the transition to new licence instruments.

The logo for Optus, consisting of the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA Consultation Paper

**Expiring spectrum
licences Stage 4:**

**Updated preliminary views
on pricing**

Public Version

February 2026

EXECUTIVE SUMMARY

The prices that the ACMA set for renewal of expiring spectrum licences (**ESLs**) between 2028 and 2032 will have significant consequential impacts on Australian consumers' continued access to world class mobile capabilities over the next 2 decades. Ensuring that renewal prices are reasonable is essential to sustaining a competitive and innovative mobile market in Australia. Getting pricing right will enable mobile network operators (**MNOs**) to continue investing in faster network speeds, greater capacity, broader and better coverage, innovation and next generation capabilities, supporting the digital needs of consumers across Australia. Getting pricing wrong will mean MNOs will face difficult trade-offs around future investment with corresponding impacts on consumers.

Across the earlier ESL pricing consultation stages, spectrum licensees provided broadly aligned feedback supporting the retention of the Mobile Service Revenue (**MSR**) index, use of spot pricing exchange rates, inclusion of renewal benchmarks, exclusion of outliers and the application of public interest pricing considerations.

The DotEcon methodology deviates significantly from the earlier preliminary approach. These modifications have a substantial influence on the resulting price levels. DotEcon's peer review concluded that the original methodology in Stage 3 was reasonable; however, the updated approach departs from several of its core elements.

This paper responds to the ACMA's issues for comment by setting out Optus' concerns with the changes the ACMA has adopted to the benchmarking methodology in stage 4 of the ESL process, offers suggestions for how these concerns can be addressed, proposes an alternative pricing methodology based on benchmark data for consideration and addresses 'other pricing considerations' as proposed by the ACMA.

Optus has also commissioned an independent assessment of the DotEcon price benchmarking methodology by Coleago Consulting. This is attached as Appendix 1. Key insights from that analysis are referenced or included throughout this submission where appropriate.

The outcomes of price benchmarking are heavily influenced by modelling choices

At its core, price benchmarking is an exercise in applying statistical methods to a set of known existing data points to derive a reasonable estimate of a current price. Inherent in adopting a benchmarking approach is acceptance that the datapoints are relevant and getting the statistical approach right is critical. To this end, there are several key aspects of the stage 4 benchmarking methodology that must be addressed to ensure the approach generates reasonable pricing:

1. Addressing outliers in the data sets

Benchmarking analysis undertaken with a small number and very wide spread of data points is highly sensitive to outliers. Adopting a reasonable outlier removal approach will lead to benchmarking outputs that are more statistically sound and appropriately representative of spectrum valuations in comparable markets. Coleago¹ have outlined a recommended approach to identifying outliers and has calculated the impact of their removal on price per MHz per population (**PMP**) for each band in the table below.

¹ Appendix 1, section 11.3

	Coleago outlier removal method reduction %
Sub 1 GHz Band	4 - 7%
Lower 1 – 3 GHz Band	8%
Upper 1 – 3 GHz Band	11%
3.4 GHz Band	22%

Table 1: Summary of Outlier removal impact on single price per band

2. Accounting for strong evidence of downward trends in spectrum prices

Using a central estimate methodology to set a single price on a data set that shows a clear and long running downward trend in spectrum prices will inherently produce a price that is above current valuations of spectrum. Extrapolating trends provide a reasonable sense check on the outputs of a benchmarking approach. The simplified diagram below illustrates the significant overvaluation that can occur without appropriate trend-based adjustment.

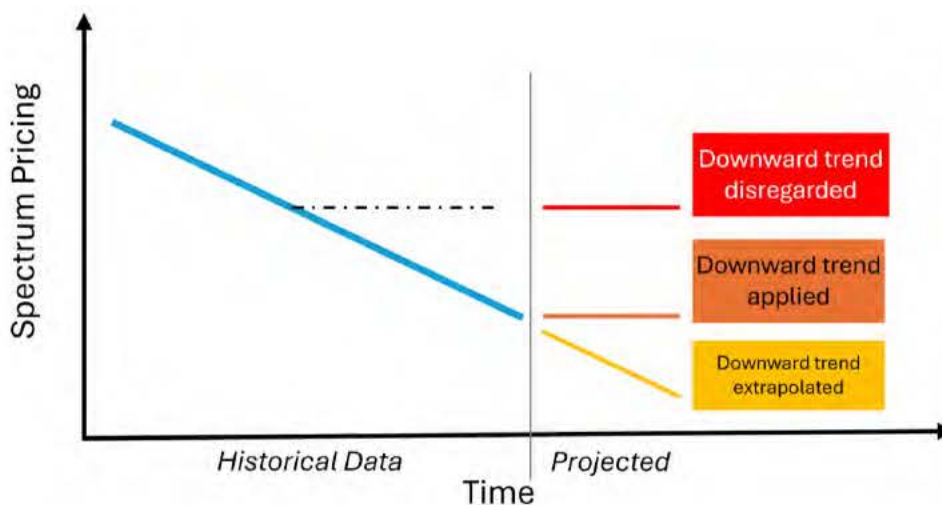


Figure 1: Illustrative impact of trend-based adjustment on spectrum pricing

3. The indexation approach taken to make historical (and future) valuations current

While there is an attractive simplicity in the idea of using Consumer Price Index (CPI) data to adjust spectrum valuations over time, CPI is fundamentally disconnected from the realities of spectrum valuation by operators. This is particularly exacerbated by the significant divergence between general consumer inflation and the real reduction in telecommunications prices (and telecommunications sector specific CPI) over the last 10 years. Put simply, using CPI in the benchmarking methodology will lock in an inflationary driver to one of the largest cost components of running a mobile network over the coming decade, leading to higher consumer prices and less capital available for network investment. The ACMA should revert to the far more representative MSR index which reflects the value of spectrum to MNOs relative to their ability to generate revenues.

4. Currency conversion method selection

Using spot exchange rates, appropriately smoothed to reduce short term volatility, is a more representative means of converting international spectrum prices into Australian dollars for the benchmarking process than using Purchasing Power Parity (PPP). PPP, as with CPI above, is constructed based on a basket of household goods and services which has limited relevance to the financial considerations (including global equipment sourcing) of running a mobile network.

5. Dataset selection (exclusion of renewal prices)

In contrast with the treatment of outliers by DotEcon (i.e. data points that have the least relevance to Australian spectrum values have not been removed from the dataset), renewal datapoints have been removed. This is particularly concerning as renewal data points best represent the policy considerations that regulators and governments have when considering spectrum renewals, and therefore these data points are likely to be the most relevant in a benchmarking process aimed at setting renewal prices. Optus strongly recommends renewal data points be re-instated to the benchmarking data set.

While assessment of each of these aspects in isolation will naturally involve pros and cons and will elicit different views from stakeholders, it is concerning that for each of these aspects the ACMA has taken the position that results in an inflationary impact on the price outputs of the benchmarking, as illustrated by figure 2 below.

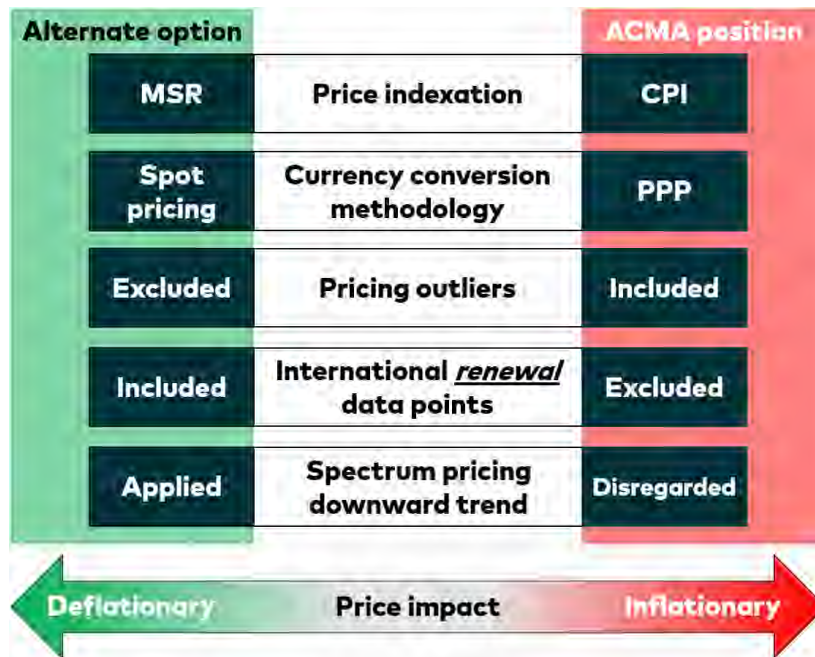


Figure 2: Summary of benchmarking measures and DotEcon/ACMA's position in updated preliminary pricing

Adopting our proposed adjustments to the treatment of outliers and the indexation method (as explained in this paper) alone result in a reduction in the industry spectrum cost to ~\$4.8 billion (down from \$7.3 billion).

Risk based pricing offers a simpler alternative approach to deriving prices from the benchmarking methodology

If the ACMA is not minded to adopt adjustments to the benchmarking approach as outlined in this paper, it is open for the ACMA to consider an alternative approach to deriving prices from the benchmarking dataset. Coleago has proposed a risk-based construct that avoids many of the data set complexities and assumptions inherent in the DotEcon benchmarking methodology. This approach treats the benchmark data points as a range where the highest priced data point represents the highest level of risk, and the lowest data point being the lowest risk. Risk in this context represents the likelihood of one or more MNOs electing not to fully renew their licence. A price is then set at a point in the range that represents the regulator's risk appetite.

Coleago suggest setting prices at a point where 20% of benchmarked data points for the band sit below the proposed price and 80% above, which is in line with the mode (the most likely outcome) of the data set. This would indicate a confidence level of 80% that all licensees would renew their spectrum holdings in the band in full. The ACMA would be reasonable in seeking to

reduce risk of partial non-renewal and the subsequent flow on effects of spectrum /market consolidation and/or spectrum lying fallow and therefore be cautious about increasing the risk profile beyond 20% non-renewal 80% renewal proposed by Coleago.

For completeness, figure 3 below sets out the range of possible price outcomes for industry and Optus driven by each of: the benchmarking approach with indexation and outlier adjustments applied, two variants of the Coleago risk-based pricing approach based on 20% / 80% (including and excluding CPI) and includes the stage 3 envelope and the updated preliminary pricing from stage 4.

	Industry	Optus
ACMA Preliminary Price Range Stage 3	\$5.0 - \$6.2 billion	\$1.19 - \$1.48 billion
ACMA Updated Preliminary Price Stage 4	\$7.3 billion	\$1.92 billion
Coleago DotEcon Adjusted	\$4.8 billion	\$1.16 billion
Coleago 80% Risk based Benchmark Inc CPI	\$3.3 billion	\$0.79 billion
Coleago 80% Risk based Benchmark Exc CPI	\$2.8 billion	\$0.67 billion

Figure 3: impact of methodology changes on spectrum prices

Adjusting the risk level under a risk-based pricing approach would have a corresponding impact on pricing. This is expanded upon in the Coleago paper attached at Appendix 1.

Spectrum licence fee payment should be due 1 month prior to renewal, with the option for instalment payments made available

Finally, and as outlined in our submission in response to the ACMA’s application and decision-making process consultation, the ACMA should adjust the proposed processes to require payment for renewed licences to be due 1 month prior to the renewal taking effect and should reconsider the case for supporting instalment-based payment arrangements. This will provide a more efficient, sustainable and equitable approach to ESL renewal fees.

UPDATED PRELIMINARY VIEW OF ESL PRICING

This section sets out Optus' responses to the specific issues posed by the ACMA in the discussion paper.

Revisions to the benchmarking study and updated preliminary pricing

- Issue 1. Revisions to our benchmarking methodology, such as expanding the benchmarking dataset, focusing on purchasing power parity (PPP) exchange rates, amending our indexing methodology, applying time trend adjustments, and our approach to deriving a single preliminary price for each ESL band.
- Issue 2. Our updated preliminary views on pricing for each ESL band with wide-area wireless broadband (WA WBB) or fixed wireless access (FWA) use

The Stage 3 ESL preliminary pricing methodology was developed with advice from Plum Consulting, Ian Martin Advisory and Frontier Economics—organisations well established in the Australian telecommunications regulatory landscape, and with Plum Consulting previously engaged by the Department during the 2009–2010 renewal process. This earlier methodology formed the basis for extensive consultation with stakeholders and was broadly understood, stable, and supported.

In contrast, the updated benchmarking study and accompanying peer review by DotEcon represents a substantial departure from that framework. Many elements of the original methodology have been either removed or materially altered, resulting in two sets of pricing outputs – prepared by respected experts using the same underlying data concept, that nevertheless diverge significantly. This inconsistency underscores an inherent limitation in relying on international benchmarking as the primary tool for determining renewal pricing.

Several of the strengths of the preliminary benchmarking methodology canvassed during the Stage 3 consultation have not been retained in the updated approach. The shift away from previously considered elements – such as the MSR index and spot pricing for currency conversion, combined with the introduction of new adjustments, has resulted in materially higher prices across spectrum bands, well outside the preliminary range previously consulted upon for three of the four data sets.

Benchmarking also faces structural limitations when used for renewal pricing. Changes in technology, spectrum supply, and market conditions mean that the value of licences at the time of reissue may diverge materially from historical auction outcomes. This challenge is compounded by the risk that the benchmarking methodology could be modified before each application period, creating meaningful uncertainty for licensees and increasing pricing risk for operators preparing renewal decisions.

There is no single international market value for spectrum. No global market for spectrum exists and spectrum is not transferable between countries, with each market defined by their own domestic characteristics placing upward or downward pressure on prices.

Spectrum holders do not value spectrum based on global benchmarks as they are irrelevant to the domestic market. This is demonstrated through the significant variability in each of the data sets showing that different markets assign very different values to spectrum.

DotEcon Updated Methodology and Benchmarking Data

While Optus supports the intention to simplify the approach and adopt assumptions that are transparent and consistently applied, the revised methodology now incorporates a number of new assumptions and metrics. Taken together, these changes significantly distort the earlier price range and introduce a high degree of sensitivity to variable selection.

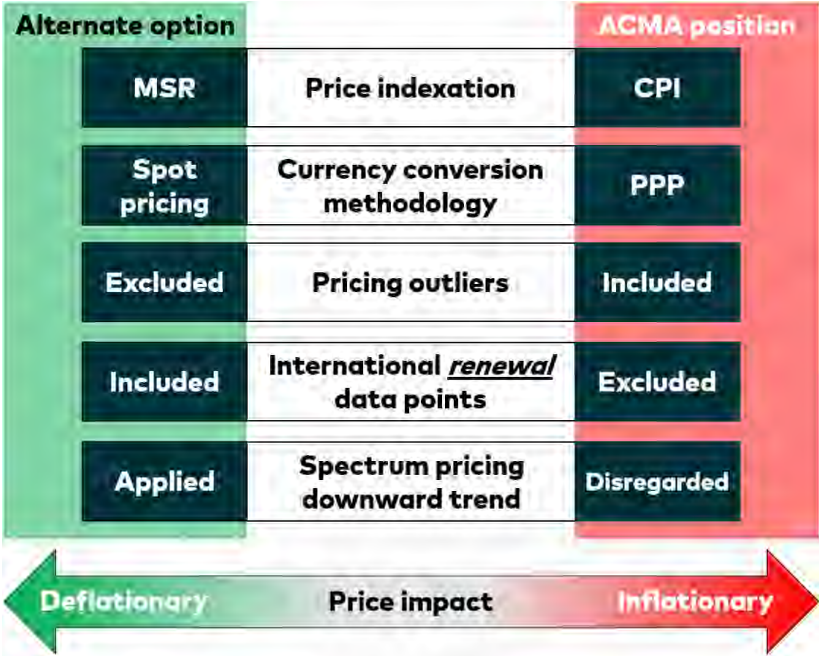


Figure 4: Summary of benchmarking measures and DotEcon/ACMA’s position in updated preliminary pricing

Figure 4 summarises the key metrics used in DotEcon’s spectrum benchmarking report along with the impact on pricing for each option. It is concerning that at every step DotEcon and the ACMA have adopted a combination of adjustment measures which inflates the spectrum prices.

It would be equally concerning if the selection of all measures in a combination simply drove down the price. A balanced approach would identify the bias impact of each decision in combination with other settings, with the collective impact of the chosen settings being used to derive a reasonable spectrum renewal price. It is noted that many of the metrics are interrelated and that positions on individual elements may change depending on views on other individual elements.

The interdependencies among the measures is beyond the scope of this response due to the vast permutations and combinations it may deliver. The following sections therefore set out Optus’ responses to each of the benchmarking measures separately and as independent variables.

Treatment of Outliers in the Benchmarking Dataset

The inclusion of outlier points in the benchmarking dataset materially inflates the preliminary pricing outcomes and overstates the likely market value of spectrum in the Australian context. Optus considers it important to test the validity of the assertion that the median and geometric mean ensure that extreme values do not disproportionately influence the final price.

This section demonstrates how sensitive the single price per band is to the presence of outliers. If a small number of points wield a significant influence on the band single price, then it casts doubt on the applicability of central estimate methodology to that dataset. Graphs for each benchmarking dataset based on the Stage 4 DotEcon Excel files illustrate the outlier points. We

then draw on the analysis of Coleago Consulting to outline the a priori justifications for removing the identified outliers.

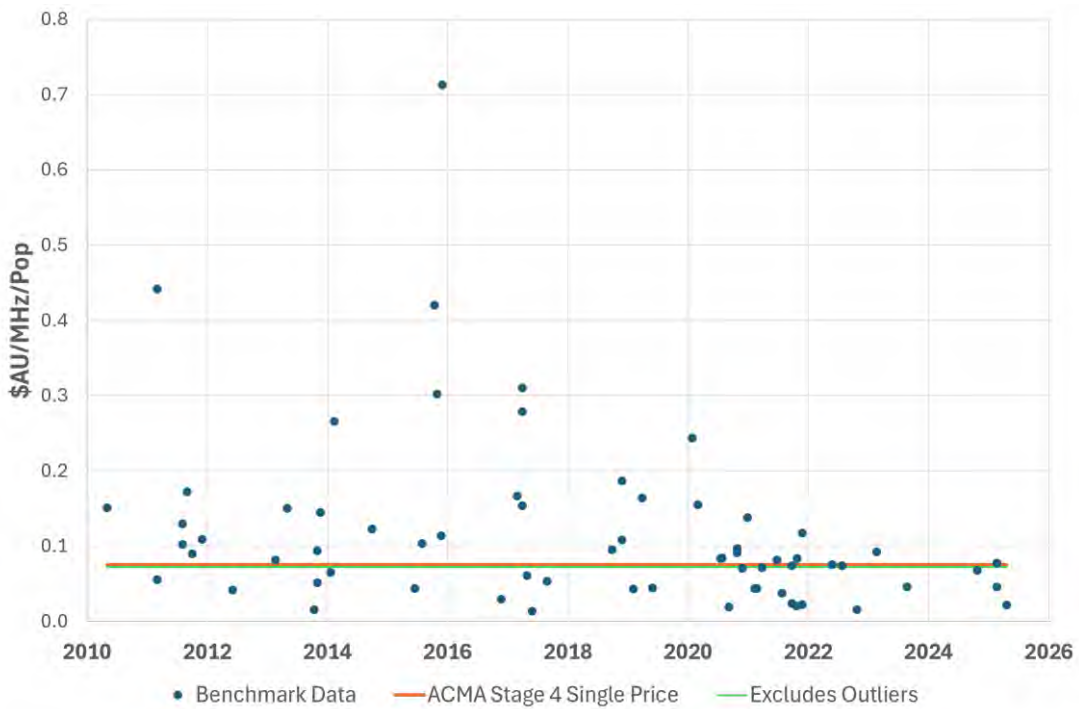


Figure 5: Sub 1GHz benchmark data

Figure 5 charts the benchmarking data used in the DotEcon analysis for the Sub 1 GHz Band. This has been plotted using the \$AU/MHz/Pop/year data and clearly identifies some outliers. Note that this chart uses a linear vertical scale to provide a simpler visual representation of the data (as opposed to the logarithmic scales used in the ACMA consultation papers).

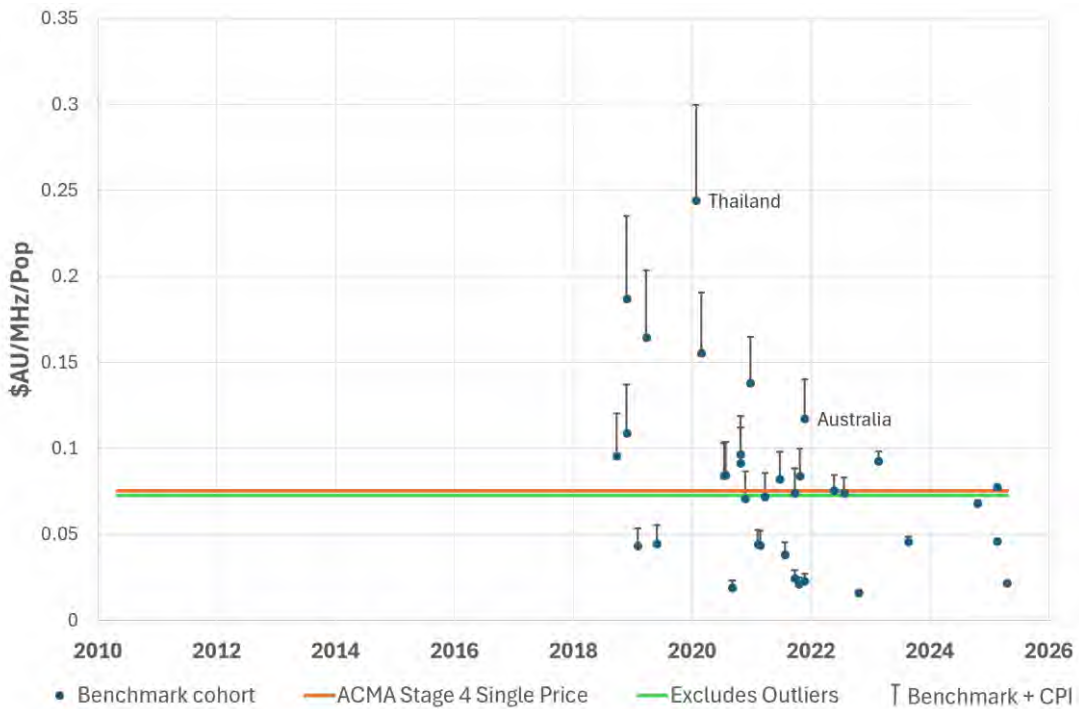


Figure 6: Sub 1 GHz benchmark cohort data and CPI used to determine Stage 4 single price

Figure 6 shows the cohort data which is used for the central estimation of prices for the sub 1 GHz Band. For this band the cohort was restricted to 2018 onwards in which the Thailand data point appears to be an obvious outlier. The chart further illustrates the impact of CPI data on the benchmarks by the bars per point. Whilst it is well understood that application of CPI increases the prices of older data more compared to more recent prices, and that applying a percentage increase to a large figure is greater than to a small figure, the chart clearly illustrates how much CPI further exacerbates the impact of distant outliers to the data set.

	\$AU/MHz/Pop	Reduction %
ACMA Stage 4 Single Price	0.0755	
Removal of Outlier - Thailand	0.0725	4%

Table 2: Sub 1 GHz band single price and outlier impact

Table 2 shows the ACMA Stage 4 Single Price and the re-calculated single price (using the same geometric mean methodology) with the Thailand data point excluded. The removal of this single data point results in a 4% reduction in price. It is a reasonable assessment that when reviewing this metric in isolation from the other steps, this outlier data point should be removed from the calculation.

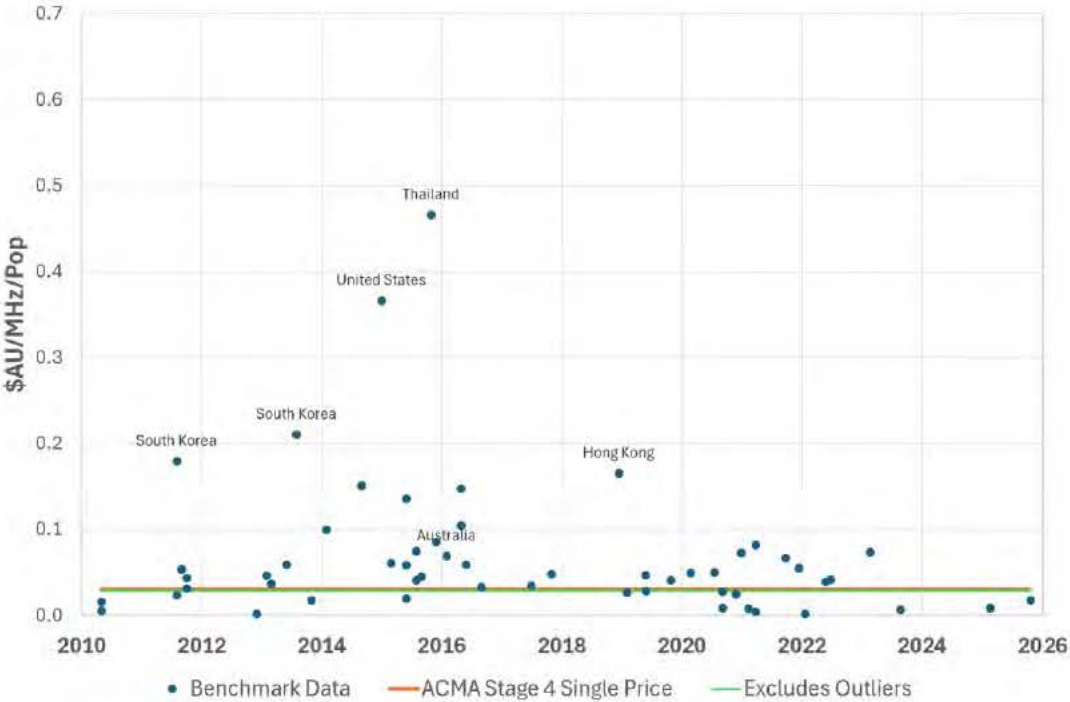


Figure 7: Lower 1-3 GHz benchmark data

Figure 7 charts the benchmarking data used in the DotEcon analysis for the lower 1-3 GHz Band. This has been plotted using the \$AU/MHz/Pop/year data against the date. Note that the chart uses a linear vertical scale to provide a simpler visual representation of the data (as opposed to the logarithmic scales used in the ACMA consultation papers).

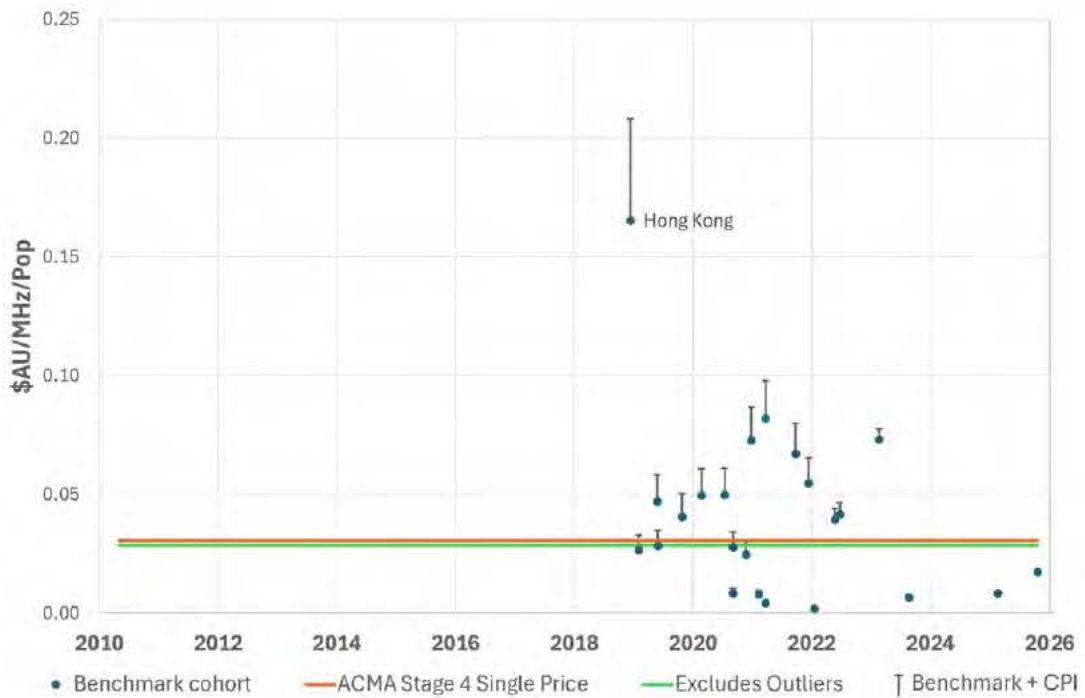


Figure 8: Lower 1-3 GHz Benchmark Cohort Data and CPI used to determine Stage 4 single price

Figure 8 shows the cohort data which is used for the central price estimate for the lower 1-3 GHz Band. The vertical scale has been reduced from the full benchmark data to show greater granularity of the data points. For the lower 1-3 GHz Band the cohort was restricted to Dec 2018 onwards. The chart illustrates the impact of CPI data on the benchmarks by the bars per point. Similarly to the sub 1 GHz Band, the chart illustrates how much CPI further exacerbates the impact on obvious outliers to the data set.

For the lower 1-3 GHz band, the upper bound of the population density cohort IQR is the final step in the calculation of the single price point. However, as it is an adjustment to the geometric mean, it does not influence the outlier impact.

	\$AU/MHz/Pop	Reduction %
ACMA Stage 4 Single Price	0.0310	
Removal of Outlier – Hong Kong	0.0285	8%

Table 3: Lower 1-3 GHz band single price and outlier impact

Table 3 shows the ACMA Stage 4 Single Price and the re-calculated single price (using the same geometric mean methodology) with the Hong Kong data point excluded. This results in an 8% reduction in price. Optus considers the inclusion of the Hong Kong point in this cohort dataset to be in error. It is the first point to be included and the decision to restrict the data based on time is not uniform between the sub 1 GHz and the lower 1- 3 GHz bands.

The removal of a single point in the lower 1-3 GHz band results in an 8% reduction in the benchmark price. The Hong Kong data point should not be included in the calculation.

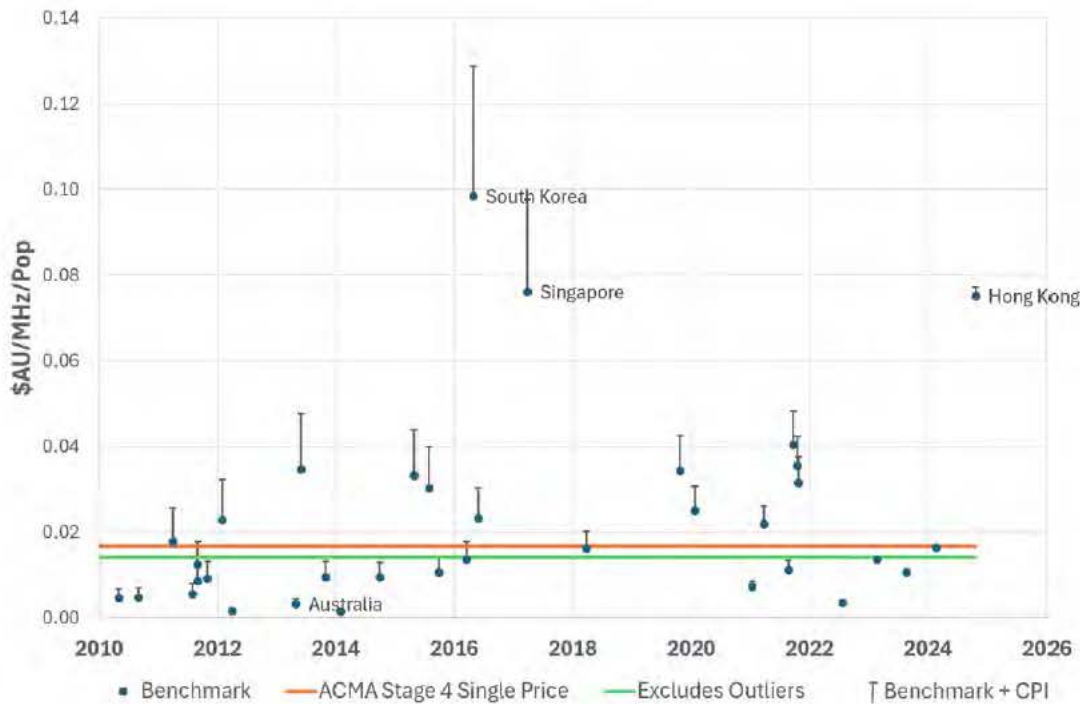


Figure 9: Upper 1-3 GHz Benchmark Data and CPI used to determine Stage 4 single price

Figure 9 charts the benchmarking data used in the DotEcon analysis for the upper 1-3 GHz Band. This has been plotted using the \$AU/MHz/Pop/year data against the date. Note that this chart uses a linear vertical scale to provide a simpler visual representation of the data (as opposed to the logarithmic scales used in the ACMA consultation papers).

For this band the full dataset from 2010 is used as the cohort data. The chart indicates the impact of CPI data on the benchmarks by the bars per point. Similarly to the sub 1 GHz and lower 1 – 3 GHz Bands, the chart illustrates how much CPI further exacerbates the impact on large outliers to the data set.

	\$AU/MHz/Pop	Reduction %
ACMA Stage 4 Single Price	0.0167	
Removal of Outliers – South Korea, Singapore	0.0149	11%
Removal of Outlier – South Korea, Singapore, Hong Kong	0.0142	15%

Table 4: Upper 1-3 GHz Band Single Price and Outlier Impact

Table 4 shows the ACMA Stage 4 Single Price and the re-calculated single price (using the same geometric mean methodology) with the outlier points removed. This has been calculated for 2 scenarios, one being South Korea and Singapore removed and the other with South Korea, Singapore and Hong Kong removed. The results are a 11% reduction in price for the South Korea and Singapore removal and a 15% reduction in price for the South Korea, Singapore and Hong Kong removal.

Optus considers that these outliers should be removed from the benchmark as they have a material impact on the single price.

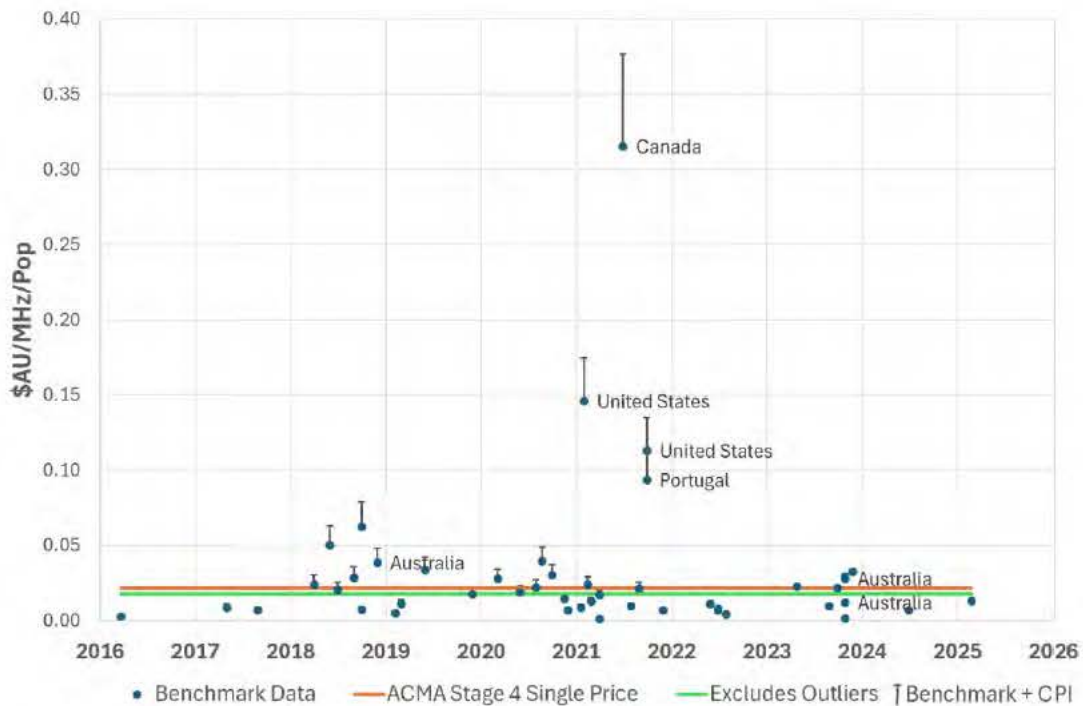


Figure 10: 3.4 GHz Benchmark Data and CPI used to determine Stage 4 single price

Figure 10 charts the benchmarking data used in the DotEcon analysis for the 3.4 GHz Band. This has been plotted using the \$AU/MHz/Pop/year data against the date. Note that this chart uses a linear vertical scale to provide a simpler visual representation of the data (as opposed to the logarithmic scales used in the ACMA consultation papers).

For this band the full dataset is used as the cohort data, noting the time series starts in 2016 rather than 2010 as per previous bands. The chart indicates the impact of CPI data on the benchmarks by the bars per point. Similarly to the sub 1 GHz, lower 1 – 3 GHz and upper 1 - 3 GHz Bands, the chart illustrates how much CPI further exacerbates the impact on large outliers to the data set.

	\$AU/MHz/Pop	Reduction %
ACMA Stage 4 Single Price	0.0217	
Removal of Outliers – Canada	0.0208	4%
Removal of Outliers – Canada, United States	0.0189	13%
Removal of Outliers – Canada, United States, Portugal	0.0178	18%

Table 5: 3.4 GHz Band Single Price and Outlier Impact

Table 5 shows the ACMA Stage 4 Single Price and the re-calculated single price (using the same median methodology) with the outlier points removed. This has been calculated for 3 scenarios, one being Canada removed, the second with Canada and 2 x United States points removed and the third with Canada, 2 x United States and Portugal removed. The results are a 4% reduction in price for the Canada removal, a 13% reduction in price for the Canada and 2 x United States removal and a 18% reduction for the Canada, 2 x United States and Portugal removal.

Optus considers that these outliers should be removed from the benchmark as they have a material impact on the single price.

Benchmarking Methodology and Outlier removal – Coleago

As described by Coleago, the updated benchmarking methodology departs significantly from established statistical practice regarding the treatment of outliers. In particular, DotEcon’s position that outliers should not be removed unless there are explicit a priori reasons is inconsistent with its own long-standing approaches in regulatory work for Ofcom and ComReg (2013–2021). In those studies, DotEcon applied systematic outlier-removal criteria, most notably, excluding data points that lie more than three times the inter-quartile range above the 75th percentile, on the basis that extreme observations distort market value estimates and compromise the reliability of central estimates.

DotEcon’s decision not to remove outliers in the Australian ESL benchmarking dataset represents a significant and unjustified departure from these earlier methodologies. The decision appears driven more by a desire to retain maximum sample size (and consequently increase calculated prices) rather than by adherence to sound statistical reasoning.

Optus supports the view, consistent with Coleago Consulting’s analysis, that outliers must be removed from the data set used to derive a single price. This is particularly true in cases where extreme values arise due to structural differences between Australia and the countries sampled – such as very high population densities, artificially induced spectrum scarcity, or non-comparable auction environments. These characteristics constitute clear a priori reasons for exclusion.

Coleago Exhibit 35: Extreme outliers identified by applying DotEcon’s criteria

Su- 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Thailand (2020)	Hong Kong (2018)	Singapore (2017)	Canada (2021)
		South Korea (2016)	Portugal (2021)
			US (2021)
			US (2021)
			Italy

Source: Coleago

Coleago’s analysis (exhibit 35) identifies nine extreme outliers across the four band groups. These outliers are overwhelmingly associated with markets such as Singapore, Hong Kong and South Korea – jurisdictions with population densities that are 176 – 2,747 times higher than Australia. These market characteristics fundamentally alter the economics of spectrum deployment and valuation, making these data points highly unsuitable for direct comparison and inappropriate as inputs for Australian renewal pricing.

Coleago have provided additional insight as to why the specific outliers should be removed from the dataset in sections 3 and 11.3 of their paper.

DotEcon’s claim that the removal of outliers would have only a “minimal impact” on pricing is inconsistent with the quantitative evidence presented by Coleago. Coleago’s Exhibit 40 shows that removing extreme outliers materially lowers the geometric mean in every band category:

Coleago Exhibit 40: % decrease in geometric mean by removing outliers

	Sub 1GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Extreme outliers	-4%	-8%	-11%	-22%
All outliers (including extreme)	-7%	-8%	-11%	-22%

Source: Coleago

These are substantial impacts, particularly given that the geometric mean is used as the basis for deriving the single renewal price per band. The continued inclusion of these extreme observations materially inflates the preliminary pricing outcomes and overstates the dataset benchmark values and the likely market value of spectrum in the Australian context.

In summary,

- DotEcon’s deviation from its own historic outlier-removal methodology lacks justification and inflates ESL prices.
- Extreme outliers arise from markets with economic and demographic characteristics that are fundamentally incomparable to Australia.
- Coleago analysis shows that removing these outliers materially reduces calculated prices (up to 22% in the 3.4GHz band).
- Extreme outlier inclusion compounds other methodological issues (CPI indexing, MSR removal, small sample sizes), producing renewal prices that cannot reasonably be interpreted as reflecting Australian market value.

For these reasons, the ACMA should reinstate outlier-removal procedures consistent with international best practice.

Recognition of Downward Pricing Trends in Spectrum Markets

A consistent and well-documented downward trend in global spectrum prices over the past decade has been acknowledged by regulators, industry bodies and independent consultants, including the ACMA’s own advisers in Stage 3 of the ESL process. The trend reflects structural market dynamics such as increased spectrum supply, improvements in spectral efficiency, maturing mobile markets, and the diminishing marginal value of additional bandwidth for established operators.

Multiple international studies, including those by the GSMA, confirm that spectrum prices have fallen materially over the last 10 – 15 years, even before adjusting for underlying revenue and profitability trends in the mobile sector. This decline is further illustrated in the long-term MSR index used in the ACMA’s preliminary benchmarking methodology, which demonstrated substantial real-term reductions across all major band categories. In effect, operators are generating lower revenue per MHz than in previous cycles, while the volume of available spectrum continues to rise. This places strong downward pressure on the sustainable market value of spectrum.

Given this backdrop, benchmarking methodologies must properly recognise the long-term direction of spectrum prices rather than relying on nominal, unadjusted auction results. Benchmarking models that fail to incorporate declining price trends risk producing distorted price estimates that are neither representative of global market conditions nor aligned with the economic realities of the Australian mobile sector. This risk is particularly acute where methodologies introduce inflationary components – such as CPI uplift, or exclude mechanisms

like the MSR index, which was explicitly designed to adjust for downward revenue and price trajectories.

A robust and credible benchmarking framework must therefore apply trend adjustments that reflect the well-established decline in global spectrum prices and ensure that benchmarked prices reflect the economic value of spectrum in a mature, substitutable, highly competitive mobile market.

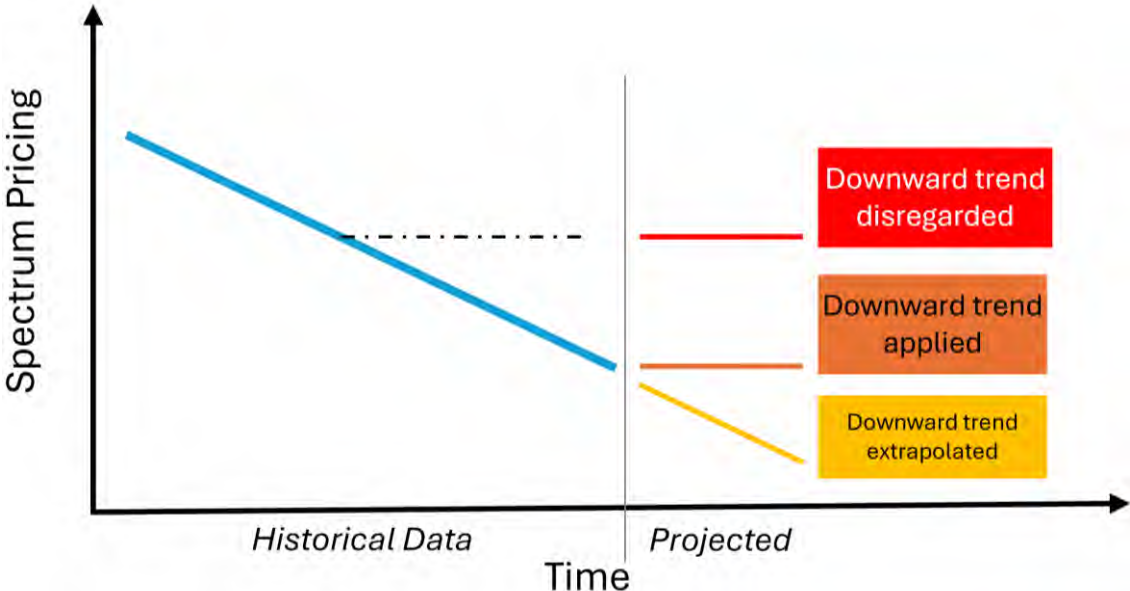


Figure 11: Illustrative impact of trend-based adjustment on spectrum pricing

Figure 11 is a representation of the historical downward trend in international spectrum prices. When using a central estimates methodology to determine a single price, if the trend is disregarded, the result would be the average of the datapoints, i.e. midway between the highest and lowest points. This scenario is illustrated in the chart as the red line in the projected trend time. This is the methodology used in the DotEcon analysis, and this delivers the highest value. If the downward trend is considered, then the lowest point would be the basis of the projected line. Using this and assuming that there is no further downward trend would result in the orange line. If the downward trend is expected to continue then the yellow line represents an extrapolation of the trend, and this would then be used to determine a variable price over the projected timeframe.

Recognising the downward pricing trend is not optional – it is essential to ensure that ESL renewal prices are evidence-based, economically grounded, and aligned with the long-term public interest objectives of investment, innovation, and sustainable competition in the Australian mobile sector.

There remain inherent challenges with the use of benchmarks to set future pricing. The GSMA has also expressed concern regarding use of historic benchmarks particularly due to falling prices, *“Regulators should not anchor administratively set prices to historical prices either those observed in other markets, or the market in question. Given the falling price of spectrum over the past decade, they are unlikely to reflect the current reality of the domestic market.”*²

² GSMA – Spectrum prices May 2025

This issue is compounded by benchmark selection focused on perceived market value and based on global spectrum auction prices to set renewal prices. Optus does not support this approach, particularly the exclusion of spectrum renewal prices observed in other jurisdictions.

DotEcon’s analysis of long-term price trends (section 4.3, Figure 2) indicates a downward trajectory in spectrum auction values across all bands, even where pre-2018 data is excluded.

Discontinuing CPI Adjustments and Restoring the MSR Index

Optus recommends that the ACMA reject the use of CPI indexation in the benchmarking methodology and reinstate the MSR index, which was a core element of the preliminary pricing model and remains the only economically relevant inflator/deflator for spectrum valuation.

CPI Is Not Relevant to Spectrum Valuation

The application of Australian CPI to historic auction prices is inappropriate and introduces significant upward distortions into renewal pricing. CPI reflects changes in pricing of consumer goods and services, most of which bear no relationship to the cost drivers or valuation methodologies applied to mobile networks. Spectrum is a production input, not a consumer good, and is valued by operators based on long-term traffic forecasts, technology efficiency, site deployment costs and discount rates, and how all of these factors contribute to an ability to generate profitable revenue.

Further, the telecommunications sector has experienced substantial real-term price declines over the last decade in comparison to all other sectors in the CPI. As illustrated in figure 12 below, the Australian telecommunications sector has experienced sustained deflation since 2015, with telecommunications prices falling by more than 20%. This makes it the weakest-performing sector within the Australian CPI index.

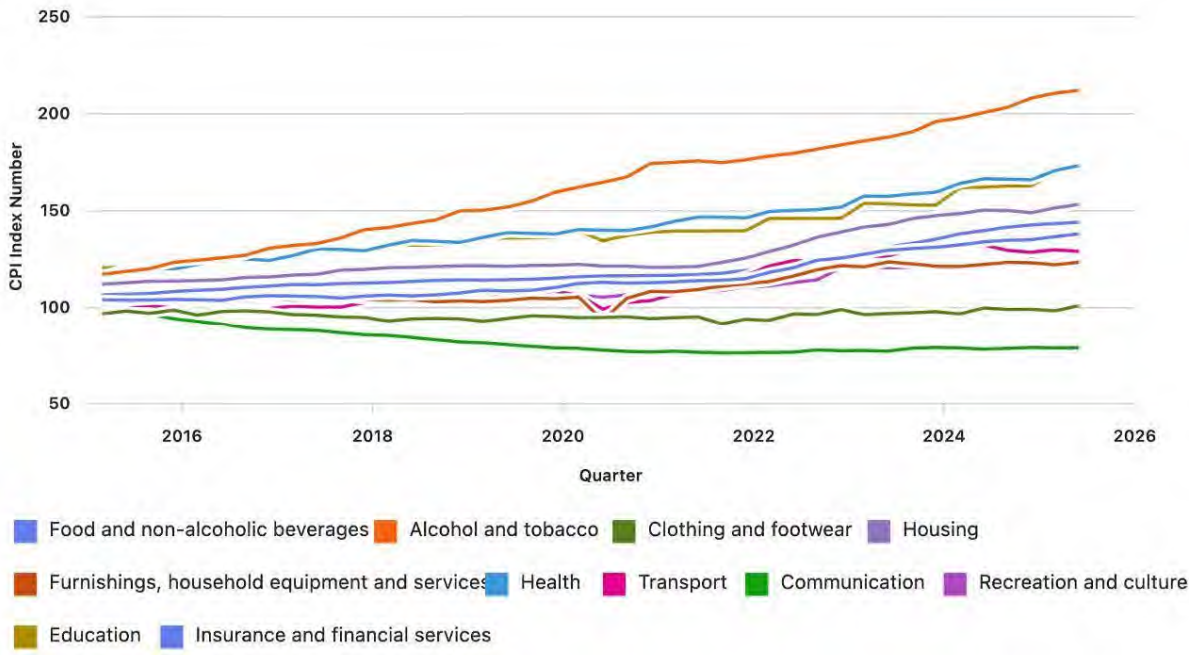


Figure 12: ABS CPI data indexed to 2015, chart from ATA³

³ Australian Telecommunications Alliance Submission to Treasury Re 2025-26 Pre-Budget submission

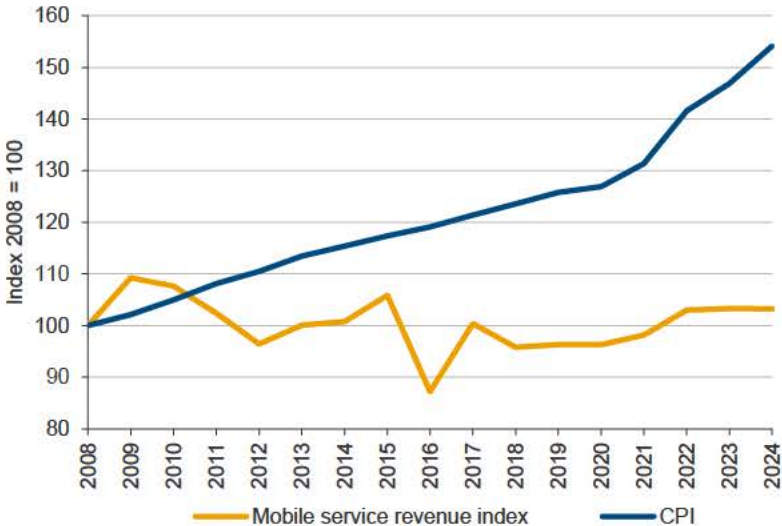
Notwithstanding the inappropriateness of using CPI over the MSR index, if CPI was to be used it would be more appropriate to use the telecommunications sector specific CPI rather than the headline, whole of Australian economy CPI. Using the sector metric would result in an ESL price reduction, which is appropriate for an industry that has experienced sustained declines in revenue and profitability.

Mobile retail prices have fallen significantly while CPI has risen, demonstrating that sector-specific cost and price dynamics diverge substantially from broad CPI trends. Applying headline CPI therefore artificially inflates spectrum values and contradicts both industry economics and historical price behaviour.

The use of CPI is also inconsistent with the ACMA’s own past conclusions. In the previous ESL renewal process, the ACMA’s consultants explicitly rejected CPI adjustments, noting that inflating auction receipts using CPI would overstate value and fail to account for increased spectrum supply and technological change. Those same conditions apply today, only more acutely given the substantial planned release of additional low, mid and upper band spectrum over the coming years.

Coleago’s exhibit 31 clearly shows that there is no relationship between Australian headline CPI and the MSR index. CPI is not an appropriate measure of indexation for spectrum pricing.

Coleago Exhibit 31: CPI vs Mobile Service Revenue Index



Source: Coleago

As demonstrated by the Coleago analysis using DotEcon’s own dataset, spectrum prices exhibit a significant downward trend across all benchmark samples.

Coleago Exhibit 45: Price declines since 2013

	Sub 1GHz	Lower 1-3GHz	Upper 1-3GHz	3.4GHz
Annual price declines	-6.6%	-11.1%	-7.6%	-1.5%
Real price decline from 2013-2025	-48%	-67%	-53%	-12%

Source: DotEcon

This decline is even more pronounced when CPI adjustments are applied to express prices in real terms. In this context, the suggestion that there is “no proof” the observed downward trend will continue sits uneasily alongside the ACMA’s decision to rely on global benchmark data to inform Australian ESL pricing. If international benchmarks are considered sufficiently robust to guide renewal pricing, it follows that the long-term trend evident in those benchmarks should also be recognised and incorporated into the pricing.

Standard forecasting practice relies on historical data supplemented by additional evidence, such as upcoming spectrum allocations and sustained declines in real mobile revenues—both of which create downward pressure on spectrum values. No contrary evidence has been presented to indicate that the historically observed price trajectory is no longer relevant.

The ACMA has itself acknowledged this trend, noting publicly that “over the last 10 to 15 years, spectrum prices internationally have fallen significantly”⁴. However, this acknowledged decline does not appear to be reflected in the updated ESL pricing methodology, particularly following the removal of the MSR index, which previously captured reductions in mobile service revenues relative to spectrum supply.

MSR reflects actual spectrum price trends

The MSR index directly captures the long-term decline in spectrum prices relative to mobile service revenues, adjusted for population and MHz availability. It reflects the economic reality that:

- a) Mobile service revenue has been flat or declining in real terms for over a decade.
- b) Total available spectrum has increased materially and will continue to rise.
- c) Spectrum efficiency improves with each generation of technology, reducing the cost per GB.
- d) Operators’ willingness to pay for spectrum is constrained by declining returns on capital.

MSR therefore provides a transparent, empirically supported, and industry-aligned measure of spectrum value trends. It adjusts prices in a manner consistent with how operators evaluate renewal spectrum—through changes in demand, efficiency, and long-term cost avoidance—not through consumer inflation.

MSR was previously supported by all stakeholders

The use of MSR was strongly supported by all MNOs, by Coleago, by other industry consultants and by the ACMA itself in Stage 3. The ACMA previously noted that MSR was the most appropriate proxy for long-run value trends, particularly where profit-based indices are volatile and difficult to construct. The sudden removal of the MSR index in the updated preliminary pricing, without adequate explanation, represents a significant departure from the earlier methodology and has produced inflated results.

CPI creates upward bias to single price calculations; MSR produces evidence-based prices

The combination of CPI uplift, inclusion of outliers, and removal of the MSR index is the primary cause of the dramatic escalation in updated preliminary ESL prices. CPI alone increases nominal auction prices by up to 52% in some bands, with no economic basis for doing so. In contrast, the MSR index reflects the well-documented downward trend in global spectrum prices

⁴ ACMA Chair Nerida O’Loughlin, 10 February 2026, Senate Environment and Communications Legislation Committee.

and ensures that renewal pricing aligns with operators' capacity to pay and long-term industry sustainability.

Reinstating the MSR index would:

- a) Correctly reflect the downward trajectory of spectrum values;
- b) Ensure benchmarking aligns with real-world operator economics;
- c) Remove inflationary distortions introduced through CPI;
- d) Improve comparability of historic auction results;
- e) Support public interest objectives of investment, innovation and sustainable competition.

Given the clear deficiencies and inflationary effects of CPI indexation, and the strong empirical, economic and policy arguments for the MSR index, Optus recommends that the ACMA remove CPI from all components of the benchmarking methodology, including both historic price adjustments and carry-forward calculations, and reinstate the MSR index as the primary mechanism for trending prices to renewal dates and through the licence period.

Spot Exchange Rates as the Preferred Conversion Method

Optus does not support the use of Purchasing Power Parity (PPP) for converting international auction prices into Australian dollars and continues to recommend the use of spot exchange rates.

Spot rates provide a transparent, market-based, and economically grounded method of currency conversion that directly reflects the actual cost of acquiring spectrum, at the time, in international markets. Unlike PPP, which is constructed from consumer price baskets and therefore unrelated to the capital-intensive nature of telecommunications networks, spot rates accurately capture the financial conditions faced by operators when assessing spectrum acquisition costs.

Spot exchange rates better reflect the economic reality of the mobile sector for several reasons:

- a) **Relevance to spectrum valuation:** Spectrum valuation and network deployment decisions are heavily influenced by global equipment markets, international vendor pricing, and cross-border capital flows. These costs are not affected by relative domestic purchasing power, making PPP an unsuitable basis for translating spectrum prices across currencies. Spot rates, by contrast, align with the actual financial exposures borne by operators in global supply chains.
- b) **Transparency and replicability:** Spot rates are observable, objective, and easily verifiable; they do not rely on assumptions about consumer goods, inflation differentials, or theoretical economic parity. This makes spot conversion more transparent and consistent with best-practice benchmarking methodologies.
- c) **Managing exchange rate volatility:** Concerns regarding short-term volatility in spot exchange rates can be effectively addressed by applying smoothing techniques such as multi-year or multi-quarter averaging, or by using forward rate adjustments. These approaches retain the economic validity of spot pricing while mitigating temporary market fluctuations, without resorting to PPP, which introduces structural distortions unrelated to spectrum markets.
- d) **Avoiding Inflationary Bias:** PPP is inherently inflation-based, reflecting GDP levels that often have no relationship to the drivers of spectrum value. Applying PPP conversion artificially inflates benchmark prices for countries with lower GDP levels and higher PPP adjustments, which bears no connection to spectrum demand, network cost structures,

or competitive dynamics. This introduces an upward bias into the benchmarking model, overstating the implied value of spectrum in the Australian context.

Given these issues, the continued application of PPP produces results that are neither economically justified nor consistent with sound regulatory practice. Spot exchange rates, appropriately averaged to address short-term volatility, provide the most accurate and policy-aligned method for currency conversion in the benchmarking process.

Optus therefore strongly recommends that PPP be removed from the updated methodology and replaced with a spot-rate-based approach to ensure accuracy, reliability, and alignment with internationally accepted valuation principles.

Incorporating Renewal Outcomes into the Benchmark Dataset

Optus strongly supports the inclusion of renewal award data within the benchmarking dataset, as renewal outcomes provide the most relevant and reliable reference points for setting renewal prices in Australia.

Renewal awards reflect regulatory decisions in circumstances more directly comparable to the Australian ESL process and incorporate policy considerations, market maturity, and operator economics that are not captured in auction data for new spectrum allocations.

Renewal data is fundamentally different from auction outcomes for newly released spectrum. Auctions often reflect unique, time-specific market dynamics, such as scarcity events, new entrant bidding behaviour, or the valuation of entirely new use-cases, that do not apply to the renewal of long-held, fully substitutable spectrum.

In contrast, renewal pricing reflects the public policy objectives that overseas regulators apply when assigning ongoing access to essential mobile spectrum. These decisions typically consider investment incentives, competition, capacity to pay, and continuity of service, all elements central to the Australian regulatory framework. Benchmarking that excludes renewal awards therefore omits the most relevant international comparators.

There are key differences between the methodologies employed in valuing spectrum for auctions and renewals. Common to both scenarios of renewals and auctions is cost avoidance. Incremental revenue is generally only considered for auctions and has the effect of increasing the attributable value of spectrum at auction compared to the same spectrum when available for renewal. This means the results of spectrum auctions when applied to renewal prices will result in an inflated outcome.

The omission of renewal data has additional methodological consequences. By excluding renewal outcomes which tend to be priced lower than auction awards due to the absence of scarcity premiums, the dataset results in an inflated view of price levels. This undermines the representativeness of the central estimate and increases the risk that renewal pricing will be set above the weakest operator's value. This may elevate the risks of non or partial-renewal resulting in spectrum lying fallow and subsequent market consolidation. Incorporating renewal awards improves the statistical validity of the dataset, expands the sample size, and ensures the central estimate reflects the full range of relevant global practice rather than only high-variance auction results.

Renewal pricing decisions by regulators in other jurisdictions also provide important insight into policy alignment. Many international agencies including Ofcom, ComReg, and regulators across Europe and Asia apply renewal frameworks that explicitly moderate prices to support long-term investment, sustainable competition, consumer welfare, and service continuity. These outcomes are not captured in global auction data, which instead reflect competitive tension and market conditions at a single moment in time. Including renewal awards ensures that Australian ESL

pricing remains consistent with broader global regulatory practice rather than being anchored to auction results that have limited relevance to renewal valuations.

For these reasons, Optus strongly recommends that renewal award data be reinstated and treated as a core component of the benchmarking dataset. Renewal outcomes provide the most appropriate reference points for determining Australian ESL renewal prices because they:

- a) Reflect regulatory decisions in contexts directly comparable to Australia;
- b) Align with cost-avoidance valuation methodology used by existing operators;
- c) Improve the representativeness and stability of central estimates;
- d) Reduce upward bias introduced by auction-only datasets; and
- e) Promote alignment with public interest objectives, including competition, investment, and service continuity.

A benchmarking methodology that excludes renewal data cannot produce reliable, policy-aligned or economically grounded renewal pricing for Australia. Incorporating renewal outcomes is therefore essential to ensuring a reasonable, evidence-based and sustainable ESL pricing framework.

Further benchmarking recommendations from Coleago Consulting

Coleago Consulting's assessment includes a review of the DotEcon methodology, the statistical validity of the data and analysis, and provides an alternative risk minimisation method to develop a single price for each spectrum band, which Optus considers to be a more reasonable approach.

Coleago have recommended the following refinements to the DotEcon methodology to support a robust, transparent, and repeatable benchmarking framework:

- a) **Exclude Outliers:** Excluding anomalous datapoints will improve the representativeness of the sample and reduce the influence of atypical market conditions.
- b) **Remove CPI-Based Inflaters:** CPI does not reflect telecommunications sector dynamics, which are characterised by declining retail prices and technology-driven cost efficiencies.
- c) **Reinstate the MSR Index:** The MSR index was strongly supported across stakeholders and was previously justified by the ACMA as an appropriate mechanism for reflecting revenue trends where profit data is volatile. It provides a consistent and transparent link between sector revenues and spectrum valuation.
- d) **Refine the Central Estimate Method:** Improving sample consistency and reducing variability will enhance reliability and repeatability of benchmark-derived estimates. The choice of central estimate metric should reflect the characteristics of the dataset.
- e) **Adopt a Risk-Based Pricing Approach:** Using the distribution of benchmark results above or below a particular renewal price as an indicator of renewal likelihood provides an objective, evidence-based method for assessing pricing risk.

Preliminary modelling undertaken by Coleago in Exhibit 48 indicates that implementing three adjustments of exclusion of outliers, removal of CPI and the reinstatement of the MSR index, would reduce the estimated total industry ESL cost by approximately 35%, from \$7.3 billion to \$4.8 billion. This represents a more sustainable and proportionate outcome consistent with long-term market trends and public interest objectives.

	Prices adjusted for outliers and CPI (AUD, full licence)		Total Industry bill (AUD million)		
	ACMA	Adjusted	ACMA	Adjusted	Change
700	0.7405	0.5462	1,945.9	1,435.3	26%
850	0.7558	0.5575	858.9	633.6	26%
1800	0.3030	0.2182	1,295.5	933.1	28%
2100	0.2757	0.1986	801.5	577.3	28%
2300	0.1596	0.0697	322.9	141.0	56%
2600	0.1621	0.0708	661.6	289.0	56%
3400	0.2052	0.1073	1,502.5	785.4	48%
Total			7,388.8	4,794.7	35%

Coleago assessed that the central estimate methodology used to derive a single renewal price per band does not produce results that are representative of the underlying benchmark samples. Several interrelated issues limit the reliability of the central estimate as presently constructed.

Coleago’s analysis (Exhibits 2–10 in Appendix 1) demonstrates that datapoints across all four spectrum band categories are heavily clustered at the lower end of the observed ranges. In each band:

- Datapoints are not clustered around a central value
- Distributions are not normal
- Samples exhibit substantial positive skew
- Extreme outliers are present
- Internal variability is high

Under these conditions, the choice of a central estimate—particularly where DotEcon use the mean or median—does not reflect the underlying distribution of values and is highly sensitive to small changes in the dataset.

A methodology that produces renewal prices materially above the most commonly occurring values in the benchmark sample does not appear representative of the data set as a proxy for typical market outcomes.

Risk-based methodology

Coleago recommends adopting a risk-based methodology for determining renewal prices. Under this approach, the pricing point would be informed by the proportion of the benchmark distribution lying above or below each value, providing a proxy for the probability of renewal by incumbents.

Coleago proposes a 20% threshold, reflecting the mode of benchmark datapoints, and the objective of ensuring at least 80% confidence that incumbents will renew all licences in full. These figures are not absolute, should the ACMA have a higher tolerance for risk then a 30% threshold could be used, although would represent a higher risk that some spectrum may not be renewed in full.

This approach would support continuity of service provision and reduce risks to competition in mobile markets. A risk-based method also offers a transparent mechanism for setting prices that align with both market evidence and public interest objectives.

365-day price / MHz / pop AUD 2025	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
20% benchmark price limit (real values)	0.0455	0.0083	0.0070	0.0087
20% benchmark price limit (nominal values)	0.0381	0.0083	0.0055	0.0071
ACMA updated preliminary price	0.0755	0.0307	0.0167	0.0217
% reduction (real values)	40%	73%	58%	60%
% reduction (nominal values)	49%	73%	67%	67%

	Risk based price - AUD / MHz/ pop full licence			Industry bill - AUD millions and % change vs. ACMA		
	ACMA	CPI excluded	CPI included	ACMA	CPI excluded	CPI included
700	0.7405	0.3743	0.4465	1,945.9	984 (-49%)	1,173 (-40%)
850	0.7558	0.3820	0.4558	858.9	434 (-49%)	518 (-40%)
1800	0.3030	0.0819	0.0820	1,295.5	350 (-73%)	350 (-73%)
2100	0.2757	0.0745	0.0746	801.5	217 (-73%)	217 (-73%)
2300	0.1596	0.0529	0.0668	322.9	107 (-67%)	135 (-58%)
2600	0.1621	0.0537	0.0679	661.6	219 (-67%)	277 (-58%)
3400	0.2052	0.0669	0.0823	1,502.5	490 (-67%)	603 (-60%)
Total				7,388.8	2,801 (-62%)	3,274 (-56%)

Source: Coleago and ACMA

This approach offers several benefits including:

- Improved representativeness, by recognising actual clustering of datapoints
- Greater methodological stability, as results are less influenced by outliers
- Better alignment with market behaviour, through probability-based assessment
- Enhanced confidence, by ensuring a high likelihood that incumbents will renew

As referenced earlier, Coleago proposes an 80% confidence level (with a 20% threshold reflecting the mode) as an appropriate benchmark for assessing renewal probability, resulting in ESL prices of \$2.8 billion (CPI excluded) to \$3.3 billion (CPI included). This would align renewal pricing with observed data distributions while supporting continuity of service and competitive outcomes in the Australian mobile market.

ESL General Comments

Historically, the ACMA acknowledged that, in renewal settings, the risk of setting prices too high—with potential for non-renewal, market consolidation and/or spectrum lying fallow—exceeds the risk of setting prices too low, and indicated a conservative approach would better promote continuity, competition, and investment. The updated preliminary total of ~\$7.3 billion – a 18 – 46% increase over the earlier \$5.0 - \$6.2 billion range appears inconsistent with that earlier stance and heightens over-pricing risk at renewal.

The Stage 4 updated benchmarking methodology introduces elements that systematically push the single price points upward, exacerbating the risk that renewal prices exceed operators'

economic value and capacity-to-pay. This direction stands in contrast to a conservative calibration that would prioritise operator capacity to pay, and renewal certainty.

Spectrum costs are not sunk costs but inextricably linked to the amount of network investment and development of mobile services. There is also growing global understanding by regulators that high spectrum prices negatively impact consumers and efforts to maximise revenues from spectrum auctions can damage the wider economy.

High upfront spectrum costs can impact on business decisions in several ways:

- Cost recovery – high spectrum costs will weigh on the business decisions made throughout the duration of the licence term, as well as affect the operator’s approach to future spectrum awards.
- Consumer welfare trade-offs – high upfront spectrum will impact on network investments, which may lead to long-term downsides for consumers (eg. cost burden may be passed onto customers through higher prices or lower quality of service, or indirectly through delayed network investments).
- Licensees may be forced to make difficult trade-offs around partial or non-renewal, including weighing increasing site numbers to overcome reduced spectrum holdings for the purposes of capacity and customer experience.

Importantly the price of spectrum should not be confused with its value to operators – acquiring spectrum rights may allow an operator to extend its coverage, increase network capacity, improve the quality of an existing service, or offer new services. Operators must still be able to make positive commercial returns, i.e., achieve a ROIC at or above the WACC.

An effective ESL renewal price should factor industry sustainability and competition, to ensure both increased investment and increased innovation, while continuing to meet consumer outcomes and influence downward pressure on retail pricing.

Public interest

Optus reiterates that public interest pricing for spectrum licence renewals is warranted based on the essential nature of telecommunications.

The essential nature of mobile services has been repeatedly stated by the ACMA and the government in public statements. This view was supported by all the MNOs and their respective consultants.

The ACMA has emphasised that ESL pricing should align with public interest criteria and broader policy objectives such as investment, innovation, sustainable competition, service continuity, and consumer outcomes, and indicated that a Step 6C “policy check” could adjust prices where required. However, the ACMA stated that it “has not needed to use this step” in forming updated preliminary prices, leaving unaddressed whether the materially higher prices advance or hinder the public interest criteria/ Ministerial Policy Statement objectives in practice.

Optus refers to Coleago’s paper on public interest (see Appendix 1, section 9).

Cost avoidance has been used previously

The ACMA previously used a cost avoidance methodology to determine the spectrum renewal pricing across the 850 MHz, 1800MHz, 2100MHz spectrum bands (2012). Benchmarking was only used for 2300 MHz and 3.4 GHz as there were no existing mobile services in those bands and the cost avoidance values could not be calculated. During the previous ESL process, Plum Consulting valued the spectrum using cost avoidance/reduction to ensure the spectrum offered

value for money and was affordable for all incumbent operators to reduce the risk of non-renewal.

The cost avoidance method compares the cost of deploying incremental sites (green fields, upgrades sites) using their existing spectrum versus deployment of additional spectrum (either acquired or renewed) to determine the least cost option.

The rationale for using the cost avoidance of the lowest market share Australian MNO (not global) was that it was used as a proxy for determining the market price of spectrum under a competitive auction scenario. The principle being, the bidder with the lowest bid limit/and or value, scales back bidding by quantity first which sets the final auction price, to ensure the spectrum renewal offered value to all the operators at or below the value of the spectrum for all existing operators.

DotEcon similarly recognises that “the large majority of spectrum value typically comes from the avoided cost of additional network equipment that would be required to meet expected data traffic projections in the counterfactual in which that spectrum was not won.”⁵

The ACMA has not conducted any form of cost avoidance valuation for the spectrum being renewed or any form of valuation for an operator.

Cost avoidance is also likely to be a primary test considered by operators as part of the corporate governance process used to assess individual licensee’s decision to renew. Without undertaking a similar assessment, the ACMA risks the renewal price being higher than the value to the operator and some of the spectrum not being renewed.

[CiC]

Capacity to Pay

Optus supports the application of a capacity to pay test on the pricing to determine if all operators can afford to renew, to reduce the risk of spectrum consolidation, market consolidation and/or spectrum lying fallow. Such a test could provide insight into whether the ESL renewal prices encourage renewal based on capacity to pay and which operators are likely to apply to renew fully, partially or not renew across each of the bands and licence areas.

Capacity to pay remains an acute issue in this market, with only Telstra achieving a ROIC at or above the weighted average cost of capital WACC. This severely limits Optus and TPG being sustainably competitive with Telstra. It also impacts Optus and TPG’s ability to renew all their spectrum. We are pleased that the ACMA have stated they have sought advice on capacity to pay, which Optus requests be made available in the interests of transparency.

Overall spectrum price impacts

The industry level and Optus ESL licences pricing has been summarised below along with the Coleago scenarios:

⁵ DotEcon, 2025, Review of the ACMA expiring spectrum licence pricing, Prepared for the ACMA, September, p18

	Industry	Optus
ACMA Preliminary Price Range Stage 3	\$5.0 - \$6.2 billion	\$1.19 - \$1.48 billion
ACMA Updated Preliminary Price Stage 4	\$7.3 billion	\$1.92 billion
Coleago DotEcon Adjusted	\$4.8 billion	\$1.16 billion
Coleago 80% Risk based Benchmark Inc CPI	\$3.3 billion	\$0.79 billion
Coleago 80% Risk based Benchmark Excl CPI	\$2.8 billion	\$0.67 billion

Figure 13: impact of methodology changes on spectrum prices

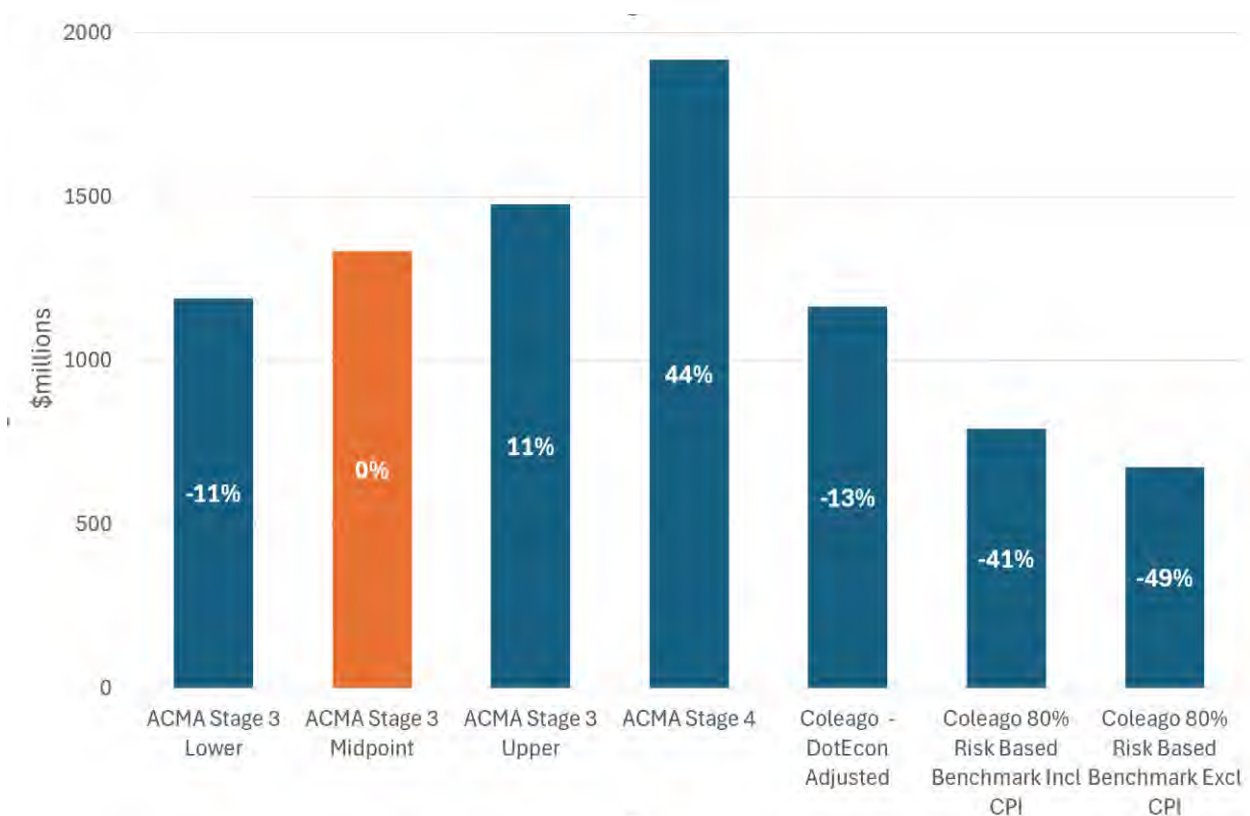


Figure 14: Optus ESL Pricing and percentage change from ACMA Stage 3 Midpoint

Figure 14 shows the Optus ESL pricing per ACMA Stage and the Coleago scenarios. The percentage change in price referenced to the ACMA Stage 3 Midpoint is included on the bars. This represents the impact of the various scenarios to the preliminary pricing midpoint from Stage 3.

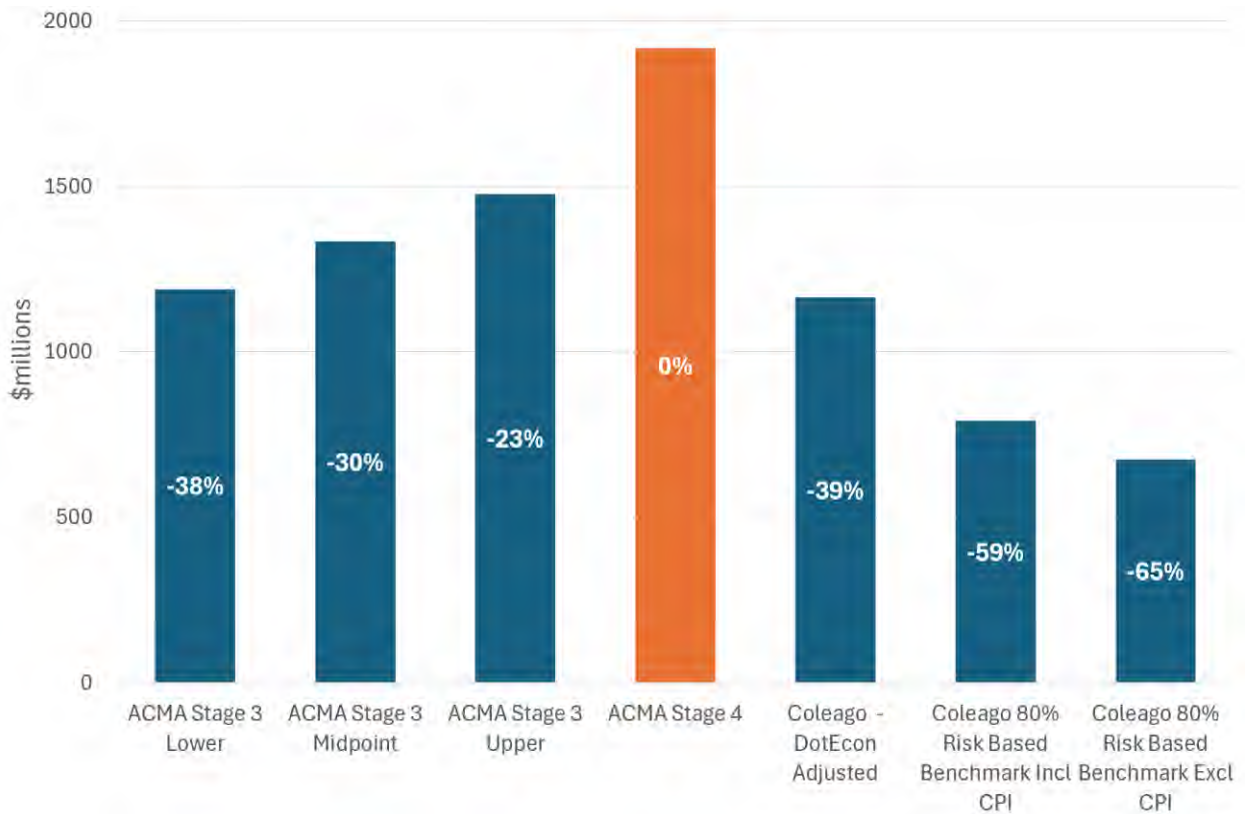


Figure 15: Optus ESL Pricing and percentage change from ACMA Stage 4 updated preliminary pricing

Figure 15 shows Coleago’s re-baselining of the DotEcon methodology (\$4.8 billion industry ESL) which is comparable to ACMA Stage 3 lower pricing (\$5.0 billion industry ESL).

The Optus total price of \$1.92 billion is a marked increase from the Stage 3 values of \$1.19 - \$1.48 billion. This represents a \$585 million or 44% increase from the ACMA Stage 3 Midpoint and indicates the large impact of the changes in methodology in the Stage 4 paper. We note that the industry wide increase is 30% (from \$5.6 to \$7.3 billion).

Optus requests that the proposed modifications to the DotEcon benchmarking methodology be adopted. In addition, an alternative price setting approach that the ACMA can consider for a simpler single price exercise is a risk-based methodology as it includes an increased focus on the likelihood of renewal of some or all of the spectrum, as outlined in detail in the Coleago paper.

Updated preliminary views on pricing for rail and TOB

Issue 3. Our updated preliminary views on pricing for rail communications use in the 1800MHz band and television outside broadcasting (TOB) use in the 2.5GHz mid band

No further comment from our previous submissions.

Other pricing considerations

Issue 4. The proposals on the other pricing considerations chapter including updating benchmark data beyond the release of our preferred views on pricing, and adjusting spectrum access charge amounts for different payment timing

Optus reiterates its position that ESL renewal pricing should be set upfront for all bands prior to commencement of the first application period for the first tranche of ESL bands due to expire.

Noting that there is overlap between the application and process consultation and the updated preliminary price consultation, Optus repeats the same commentary on instalment payments and payment timing below:

Our submissions through the ESL process have advocated for instalment payments on the basis that they offer significant financial, operational, and policy advantages for both regulators and licensees. The key benefits can be summarised as:

a) Improved Cashflow Management for Licensees

Paying spectrum fees over time aligns costs with the period in which benefits are realised. It reduces large, immediate outflows that can strain financial resources and allows operators to better manage capital for ongoing investment in network rollout, upgrades, and customer service.

b) Alignment with the timing of economic benefit

Spectrum licences generate value gradually over the life of the licence, not all at the moment they are granted, and instalments mirror the way operators amortise spectrum on their balance sheets. Instalment payments more accurately track cost-avoidance and revenue benefits as they accrue over time.

c) Supports sustainable industry investment

Large upfront payments can divert funds from investment in infrastructure (5G/6G rollout, fibre backhaul, regional expansion) and innovation.

d) Reduces risk of market distortion or consolidation

Upfront lump-sum payments favour large incumbents with deep pockets. Instalment payments have the ability to reduce barriers for smaller operators or those with weaker balance sheets. This lowers the risk of market consolidation driven by cashflow constraints and higher funding costs and assists in maintaining and growing the competitive intensity in the market currently.

e) Increases certainty and predictability

Instalments provide a clear, predictable cost schedule which allows operators to plan budgets and financing requirements across many years, and regulators to benefit from more stable and recurring revenue streams. In addition, instalment payments reduce exposure to short-term interest rate or macroeconomic shocks at a single payment point.

f) Reduces real economic burden for industry

When lump-sum payments are required, operators often need to raise debt or reallocate capital rapidly. Operators face a higher cost of capital than government, which increases the overall real economic burden. Instalments smooth borrowing needs over time,

reduce the likelihood of borrowing at unfavourable interest rates and lowers the overall cost of capital.

g) Reduced risk of non or partial renewal

For renewals in particular, instalments avoid forcing licensees into premature renew, exit or consolidate decisions driven by cashflow rather than value and reduces the risk that viable operators fail to renew spectrum simply because early, large payments are required.

Optus seeks further clarification on ACMA's ability to support instalment payments.

Recommendation 6 of the Spectrum Pricing Review 2018 has been referenced by the ACMA as a justification for requiring upfront payments for renewals.

Recommendation 6

For spectrum access charges determined by auction, the ACMA should generally require upfront lump-sum payments. There may be circumstances where instalment payments are warranted shortly after the beginning of a licence term. In considering use of instalments, the ACMA should assess the risks to the state of default and the potential impact on competition. The ACMA should generally receive upfront payments before the licence period begins because it protects against the risk of payment default. It reduces the complexity and increases the certainty of spectrum auction outcomes. Upfront payments also help to reduce speculative bidding. However, the Government recognises that long term licences require a large amount of capital. Therefore, there may be circumstances where Government or the ACMA approves short term deferrals. In considering these circumstances, the Government or the ACMA should take into account the risks to competition of payment deferrals (including the role the competition limits are playing), the number and type of bidders at an auction, and the risk to the Government of unpaid licence payments. In these circumstances, requirements such as a bank guarantee over a portion of outstanding funds are appropriate to reduce risk to Government.⁶

It appears that this recommendation does not prevent the ACMA (or the Government) from providing an option for instalment payments for spectrum licence renewals, noting that the recommendation applies to spectrum charges determined by auction and makes no specific reference to renewals. This recommendation does provide the ACMA the ability to approve instalment payments after assessing risks for default and impact on competition. It also focuses on payments applicable to a single auction at a single point in time rather than a series of renewals due in relatively short succession. If the ACMA is able to consider instalment payments having regard to a single auction, it is reasonable to expect a similar assessment could be conducted for renewals, with specific recognition given to the short-term capital squeeze multiple renewals within a short time period creates. Whilst not the subject of this paper, it should be noted that when all the renewed ESLs are next up for renewal they will all fall within 1 year.

The ACMA has also noted that past instalment arrangements were enabled through Ministerial Direction, as occurred in the 700 MHz (2017) and 26 GHz (2021) auctions. Aside from relying on historical practice, the ACMA has not provided any substantive policy, economic, or legal rationale for requiring upfront payment of renewal fees.

⁶ https://www.infrastructure.gov.au/sites/default/files/spectrum-pricing-review_0.pdf page 9

Furthermore, international practice indicates that instalment arrangements are frequently offered by regulators in spectrum assignments, particularly where licence terms are long and amounts are substantial. This is reflected in DotEcon's treatment of benchmarking data, which includes adjustments to normalise for the presence of instalment payment structures—implicitly acknowledging their prevalence across jurisdictions. Recognising this global context, making instalment options available for ESL renewals would align the Australian framework with established regulatory practice and provide a balanced mechanism to manage cashflow without compromising policy objectives.

For these reasons, we again request that the ACMA give full and careful consideration to offering instalment payment options for ESL renewals. Instalments aligned with the amortisation schedules of each band would provide a more balanced, sustainable, and appropriate approach to renewal payments, while supporting continued investment and maintaining the financial health of the sector.

Practical issues with up-front payments within the ACMA's proposed timeframes

As the ACMA's proposed payment of licence renewal fees is determined by the completion of the application process, this introduces significant issues for operators as there is no certainty in payment dates. If renewal application is made early in the process this could result in payments being due up to 19 months prior to renewal.

Since licensees may submit renewal applications at any point during the application window, it follows that those who apply early, as encouraged by the ACMA, would face earlier decision dates and therefore earlier payment triggers. The ACMA has not committed to issuing renewal decisions on a fixed schedule and there is a potential for further delay should additional information requests be required. Therefore, the resulting processing times and consequently payment dates may vary significantly by licence, thereby further increasing uncertainty for operators.

Further, the proposed process is misaligned with established practice. Historically, both auctioned licences and renewals require payment close to licence commencement, usually around one month beforehand. Requiring payment up to 19 months early represents a significant and unjustified departure from long-standing regulatory practice.

Requiring spectrum renewal payments at an uncertain time, and potentially up to 19 months before the renewed licence takes effect, creates a range of significant financial and operational challenges for licensees: These challenges extend well beyond standard cashflow considerations and have material implications for business planning, investment cycles, governance processes, and competitive neutrality.

a) Cashflow Volatility and Budgeting Uncertainty

Spectrum renewals involve large, multi-million-dollar payments. Without certainty on when these payments will fall due, operators cannot accurately forecast cash needs or allocate capital. This level of uncertainty is inconsistent with prudent financial management in a capital-intensive industry.

The ACMA has made it abundantly clear that early submission of licence renewal applications is preferred. If licensees follow this direction and apply at the start of the application window for the 850/1800 MHz bands (18th June 2026), then payment would fall within this current calendar year. This outcome is entirely unexpected for operators and has not been incorporated into approved budgets. Noting that Optus use April to March financial year, this would bring forward our 1800 MHz licence payment by two financial years. To align with our current financial spectrum cost forecasting, Optus would need to apply no earlier than October 2027 assuming payment 5 months later, for payment in financial year 2029 as previously forecasted.

b) Impact on Debt, Financing, and Capital Structure

The scale of the current renewal obligation represents a step-change relative to the previous ESL cycle. For Optus, the prior ESL bill was approximately \$700 million, whereas the current renewal liability is in the order of ~\$2 billion (if fully renewed). This material increase significantly amplifies the cashflow, financing, and opportunity-cost implications of a lump-sum payment model.

When the timing of large regulatory payments is uncertain, operators are forced to maintain higher cash reserves, reducing capital available for investment. Early payments of months or years ahead of licence commencement, mean operators must carry the debt or cost of capital for that period without receiving any benefit from the renewed licence.

c) Pressure on Corporate Governance and Board Approval Processes

Spectrum renewals require extensive internal governance, involving board approval, risk assessments, financing plans, investment trade-off analysis and shareholder reporting (for listed entities). These processes cannot be performed efficiently unless the operator knows the payment amount, and when payment is due. If Ministerial Policy Statements are released only shortly before the application window opens, and payment may be required immediately after ACMA approval, the governance cycle becomes compressed and rushed, increasing legal, financial, and operational risk.

d) Misalignment of Costs and Benefits

Requiring payment up to 19 months prior to licence commencement forces operators to incur the full cost of renewal long before receiving the legal right to the spectrum, the operational benefit, or the revenue/cost-avoidance value the spectrum provides. This creates a major negative working capital impact, inconsistent with how spectrum value is realised (which occurs gradually throughout the licence term).

e) Distortion of Long-Term Investment Priorities

Large, early payments divert capital from network deployment and upgrades, resilience improvements, rural and regional coverage investments, and technology upgrades (such as 5G to 6G). Uncertain payment timing forces operators to delay or cancel planned network programs to preserve liquidity until a renewal payment date becomes clear.

f) Disproportionate Impact on Smaller Operators

Early payment timing advantages operators with larger balance sheets, deeper capital reserves, or easier access to debt markets. Smaller operators are disproportionately affected by early, uncertain payments, increasing the risk of competitive disadvantage, weakened financial performance, or reduced ability to renew all spectrum bands. This is particularly problematic in a renewal process, where spectrum is already fully integrated into networks and critical for competition.

g) Administrative and Operational Disruption

Operational processes tied to renewal including network planning, vendor contracting, capacity forecasting, and workforce allocation, depend on knowing when renewal will occur and the certainty that the licence can be renewed. Uncertainty in payment timing cascades through to delays in procurement and deployment, misalignment of rollout schedules, and complexity in managing multi-year investment programs. This creates

unnecessary operational inefficiency for both the operator and the broader ecosystem (vendors, contractors, equipment suppliers).

h) Sovereign Risk and Financial Reporting Issues

Uncertain payment timing, particularly when disconnected from licence commencement, creates challenges in financial reporting and provisioning, potential impacts on credit ratings, and increased perceptions of sovereign/regulatory risk among investors and lenders. These factors can directly influence the cost of capital and long-term investment appetite in the Australian telecommunications sector.

We do not support the proposed Spectrum Access Charge (**SAC**) adjustments and consider that a fixed payment date is the most appropriate way forward. The SAC adjustments will introduce unnecessary complexity and have consequences beyond the renewal process, as discussed below.

- a) CPI is an insufficient motivator for an operator to pay early, as it does not represent the cost of capital. Instead of CPI, the relevant metric for timing a payment decision used by operators as well as government, is the weighted average cost of borrowing / capital (**WACC**). The ACMA is currently using the long-term, post-tax nominal WACC recommendation provided by Frontier Economics of 8.49%⁷, which is more than double CPI (3.8% October 2025). As the spectrum renewal charges are large, and the WACC is significantly greater than CPI, this will result in considerable incentives for operators to pay and therefore apply as late as possible in the window.
- b) The SAC adjustment may adversely impact secondary market trading as licensees have paid different amounts based on the timing. This can result in different views on paid prices between different licences which could complicate any secondary market negotiations.

Operators are afforded certainty of renewal via an ACMA renewal offer and subsequent renewal notification, as both are legally binding commitments by the ACMA. These instruments give operators assurance that their licences will be renewed, without requiring payment many months in advance. Optus disagrees with the premise that certainty only arises once payment is made. A legally binding renewal offer by the ACMA provides all necessary certainty to MNOs. Additionally, there is no precedent for the ACMA rescinding such an offer. Doing so would represent a significant sovereign-risk event with likely legal implications.

Conversely, the risk to the ACMA of a licensee defaulting on a renewal payment is extremely low. No Australian mobile operator has ever defaulted on a mobile spectrum auction or spectrum renewal payment. The risk is even lower in renewal scenarios compared with auctions, because the expiring spectrum is already fully deployed in networks and underpinned by billions of dollars in infrastructure investment, meaning operators have strong commercial incentives to complete payment. For these reasons, requiring payment up to 19 months before licence commencement is neither justified nor proportionate, and provides no additional certainty beyond what is already delivered by the ACMA's own legally binding renewal offer and notification.

The ACMA should issue a renewal offer and, upon acceptance of the offer, provide a renewal notification to the licensee with payment due 1 month prior to renewal.

⁷ <https://www.acma.gov.au/sites/default/files/2025-05/Preliminary%20views%20paper%204%20-%20Pricing%20for%20ESLs.pdf> p46

**APPENDIX 1: COLEAGO CONSULTING REPORT ON ESL
STAGE 4 – UPDATED PRELIMINARY VIEWS ON PRICING**

ESL Stage 4 – Updated preliminary views on pricing

prepared for

Optus

26 February 2026



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1. Executive summary

Benchmarking spectrum prices is challenging because they are influenced by a wide range of factors

Careful interpretation is critical – the ACMA’s has been too narrow

This document sets out Coleago’s views on the ACMA’s Stage 4 Consultation¹ on updated ESL preliminary prices and on the Peer Review² of the ESL pricing methodology carried out for the ACMA by DotEcon.

Benchmarking spectrum prices lies at the heart of the ACMA’s approach to ESL pricing and underpins its Stage 4 consultation. In our response to Stage 3, we stated that both renewal and auction prices should be included for benchmarking to be truly representative to ESLs. Since the ACMA has not included renewal prices in its latest approach, we begin by reiterating our view that the ACMA’s prices are likely to be overstated. In any case, benchmarking is inherently challenging due to the wide range of factors that influence spectrum prices, such as auction design, scarcity of supply, market structure, and geography. Careful interpretation of the data is therefore critical. While these are technical issues, it is important to highlight several fundamental points.

The ACMA has erred by adopting a flawed interpretation of the data that is not appropriate given the level of noise in the dataset. In particular, it focuses on the average, or “central estimate,” without considering wider issues such as:

- Is the central estimate (in this case, geometric mean or median) representative?
- What do the range, variability and possible trends in the data imply for its use?
- Should we trust all the data in the set, thus maximising the data available, or are some datapoints too extreme to be included, i.e. they are true outliers?

Wide range and variability of benchmark values

Analysis shows the data vary widely and are clustered at the lower end of the ranges. Using the geometric mean or median is unlikely to be representative of Australia.

Exhibit 1 below shows the number of benchmark spectrum market values (datapoints) used in the analysis and provides a high-level assessment of their range. It is evident that the range is very wide and that there are relatively few datapoints. For example, in the upper 1 - 3 GHz category, the maximum value is 144 times higher than the minimum, based on only 36 datapoints. The fewer the datapoints and the wider the range, the greater the uncertainty that any central estimate can provide a meaningful indication of the value of spectrum in Australia.

Exhibit 1: Number of benchmark values and their range (365day price / MHz / pop AUD 2025)

	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Number of benchmark values	35	23	36	47
Minimum (365 day price)	0.0178	0.0021	0.0009	0.0015
Maximum (365 day price)	0.2996	0.2081	0.1288	0.3764
Maximum as a multiple of minimum	16.8	97.6	144.2	247.7

Source: Coleago based on ACMA Excel files

Simple statistical tests also support this conclusion. The variability of the data can be measured using the “coefficient of variation,” which is equal to the standard deviation

1 Expiring spectrum licences (stage 4) – updated preliminary views on pricing <https://www.acma.gov.au/consultations/2025-12/expiring-spectrum-licences-stage-4-updated-preliminary-views-pricing>
 2 Review of the ACMA expiring spectrum licence pricing, https://www.acma.gov.au/sites/default/files/2025-12/dotecon_review_of_acma_expiring_spectrum_licence_pricing.pdf

divided by the mean. As a rule of thumb used by statistical authorities³, if this ratio exceeds 50%, the average is a poor representation of the data.

The variability across all four band groups is well above 50%. This provides clear evidence that central estimates such as the geometric mean and median proposed by ACMA are neither robust nor representative of the dataset, and it is therefore inappropriate to draw conclusions from them.

Exhibit 2: Coefficient of variation in the benchmark dataset

	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Standard deviation	0.0638	0.0448	0.0274	0.0609
Mean	0.0942	0.0491	0.0270	0.0369
Standard deviation / mean	68%	91%	101%	165%

Source: Coleago based on ACMA Excel files

Given the wide range of observed market values, the ACMA should have considered where within this range the market value of spectrum in Australia is likely to lie, rather than insisting that the geometric mean and median are reasonable and representative. Further analysis shows that the data is clustered at the lower end of the range across all four spectrum categories, with these most typical values (the modal values) lying below the central value proposed by the ACMA.

Risk of ACMA price being too low or too high

The risk is high, 35%-49%, that the proposed ESL prices exceed the value for at least some operators, if the benchmark data is indicative of the probability

Since the benchmarks vary widely, particularly between countries, and are not clustered around the mean, no one value in the dataset is more likely to reflect the value of spectrum in Australia than another, before considering actual market conditions in Australia.

It is therefore essential to consider the probability of whether the value of spectrum in Australia is in fact the geometric mean used by the ACMA, and the probability that the true value is lower (or higher) than this geometric mean: all the more so because the ACMA appears not to have commissioned its own licence valuation exercise to directly measure the value of spectrum to the Australian operators.

A simple indication of this is provided by the proportion of benchmark data points that lie below the geometric mean. Depending on the spectrum band group, the risk that the ACMA's updated preliminary price would exceed the value of spectrum for all or some operators ranges from 35% to 49%.

Setting renewal prices too low

The socioeconomic risks if ESL prices are set too low are limited

If the ACMA sets renewal prices below market value, this would not result in socio-economic harm. The likely consequences are:

- All three operators would renew their spectrum licences.
- With three competing operators each seeking to earn their cost of capital, consumers are likely to be the winners. It is far more likely that operators would either invest more in network build-out, minimise potential price rises or increase service quality, than accrue windfall gains. This is supported by evidence from the ACCC Communications Market Reports, which show that while mobile services retail prices in Australia declined by 79% in real terms between 2014 and 2022, operators' returns on invested capital did not increase. Indeed, Optus' ROIC of 2% is well below its cost of capital. There is no evidence that low spectrum prices increase enterprise value.

3 See UK Office for National Statistics <https://www.ons.gov.uk/methodology/methodologytopicsandstatisticalconcepts/uncertaintyandhowwemeasureit>

The socioeconomic risk if ESL prices are set too high are substantial

The weakest operators may not renew all of their spectrum; investment and competition could decline

Setting renewal prices too high

If the ACMA sets renewal prices above market value, the likely consequences are:

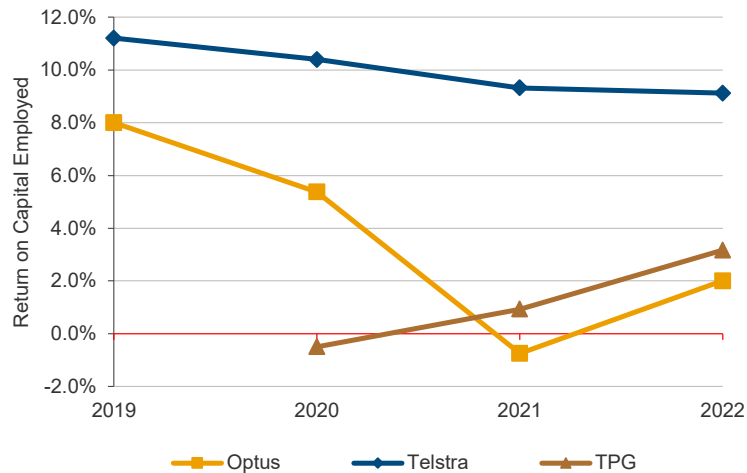
- The operator(s) with the lowest market share, and therefore the least financial flexibility, may choose not to renew all of their spectrum; potentially, two operators could decide not to renew some of their ESL.
- Spectrum would either remain unused for the foreseeable future, as mobile services are generally accepted to be the highest-value use, or the operator with the highest market share could acquire the unused spectrum, potentially further reducing competition.

Since mobile networks are dominated by fixed costs, an operator with a larger market share benefits from significantly stronger economies of scale than an operator with a smaller market share. As spectrum licence fees are themselves a fixed cost, high fees exacerbate this fixed cost problem.

Australia is a relatively small market with a very large land mass, which makes it particularly challenging for operators with lower market share to earn their cost of capital. As a result, competition is especially vulnerable to the fixed-cost nature of the industry. In 2009, following the merger of Vodafone and Hutchison (VHA), their combined market share was 27%. Despite subsequent consolidation to form TPG, TPG’s market share challenge has worsened and now stands at just 15%.

Furthermore, the gap in financial performance between Telstra and its competitors is also significant, as illustrated in the ROCE chart below. Both Optus and TPG are in a difficult position relative to Telstra, with limited prospects for catching up and returns that remain well below the ROCE expected by shareholders and financial markets.

Exhibit 3: Return on capital employed



Source: Operator financial statements, Coleago

Telstra is able to earn a return above its WACC because its dominant market share provides economies of scale that are not available to operators with smaller market shares. High spectrum renewal licence fees would further entrench the disadvantages faced by Optus and TPG. Fundamentally, a business that does not earn its WACC does not represent a sustainable investment opportunity. The inability of either Optus or TPG to earn their WACC illustrates that there is a real threat to investment and competition.

The risks from the ACMA's pricing approach are unacceptable and ESL prices must be set conservatively

We recommend a 20% threshold which also corresponds to how the data is clustered

ESL prices must be set conservatively because of these asymmetric risks

A 35%, or even 49%, risk that TPG or Optus would not renew some or all of their ESLs (based on the analysis above) is not acceptable, given the essential nature of mobile services and the key public interest criteria of efficiency, competition and investment.

In our Stage 3 submission, we strongly recommended that ACMA should set ESL prices conservatively because of such risks and the fact that TPG's and Optus's returns on capital have been substantially below their WACC. The ACMA also stated in its Stage 3 Consultation that its preliminary prices were "relatively conservative". So, the ACMA's updated preliminary prices are a departure from this position. Setting ESL renewal prices at a level where 20% of benchmark prices are lower and 80% are higher may represent an acceptable level of risk. Under this approach, the ACMA could be 80% confident that incumbents would renew all of their spectrum licences and that competition in mobile services would not be weakened.

The 20% threshold is not arbitrary. Exhibit 4 below shows the resulting ESL prices when this risk-based approach is applied. These prices fall within the modal 5th-percentile bucket around which the benchmark values are clustered, indicating a high probability that an appropriate value has been selected based on the dataset. These risk based prices represent Coleago's recommendation for an ESL renewal price level which will deliver all stated policy objectives.

Exhibit 4: Recommended ESL prices based on risk and total Industry bill by band

	Risk based price - AUD / MHz/ pop full licence			Total Industry bill - AUD millions and % change vs. ACMA		
	ACMA	CPI excluded	CPI included	ACMA	CPI excluded	CPI included
700	0.7405	0.3743	0.4465	1,945.9	984 (-49%)	1,173 (-40%)
850	0.7558	0.3820	0.4558	858.9	434 (-49%)	518 (-40%)
1800	0.3030	0.0819	0.0820	1,295.5	350 (-73%)	350 (-73%)
2100	0.2757	0.0745	0.0746	801.5	217 (-73%)	217 (-73%)
2300	0.1596	0.0529	0.0668	322.9	107 (-67%)	135 (-58%)
2600	0.1621	0.0537	0.0679	661.6	219 (-67%)	277 (-58%)
3400	0.2052	0.0669	0.0823	1,502.5	490 (-67%)	603 (-60%)
Total				7,388.8	2,801 (-62%)	3,274 (-56%)

Source: Coleago and ACMA

The total industry bill would fall by 62% compared to the ACMA's updated preliminary prices under our recommended estimate. We removed the ACMA's CPI adjustment from our main estimates (though values with CPI are included for completeness) and we explain below why it is not appropriate to adjust benchmark prices using the CPI.

If risk based pricing is not adopted, the ACMA must address issues in its proposed methodology

If the ACMA does not accept our recommended risk based approach, and decides to continue with its proposed approach of setting ESL prices based on central estimates, it must address several concerns in its methodology as set out in the next section.

Issues to be addressed in the benchmarking if risk based pricing is rejected

We have identified a number of detailed issues in the benchmarking which the ACMA should address

Although ACMA has commissioned well regarded industry experts for the benchmarking, the materially different results of the two ACMA-commissioned benchmark studies underscore the inherent challenges of using benchmarks to set future prices – our key concerns are as follows:

- There are a priori reasons to remove some benchmark outliers from the data set
- Declining trends in spectrum prices must be fully captured in the approach
 - Using CPI on its own is not appropriate

- The ACMA’s Mobile Spectrum Revenue index in Stage 3 better captured the downward trend in spectrum prices and the ACMA considered it a reasonable proxy for profit and hence cash flows relating to spectrum
- DotEcon’s report did not properly assess the impact of future spectrum releases and its impact on spectrum prices
- ESL prices must be consistent with all public interest criteria and the claim that the updated preliminary prices support ACMA’s policy objectives is not substantiated – a public interest discount would be one way to reflect wider public benefits.

Outliers should be excluded from the analysis as is standard practice

It is standard practice to identify and exclude outliers – i.e. data that are not representative – not excluding them overstates ESL prices by an average of 11%

The benchmark analysis by DotEcon for the ACMA did not investigate or remove extreme historical spectrum prices, which disproportionately affect the median/geometric mean leading to a significant upward bias. Robust analysis should identify outliers and assess their impact, if only to detect potential data errors. Indeed, the ACMA notes in Stage 4 that *Stakeholders [including Optus] recognised the cohort analysis as a tool to exclude outliers and improve the robustness of valuation results*”.

DotEcon’s rationale for not attempting to identify and exclude possible outliers from the dataset was that *“Trying to find more refined principles for excluding awards quickly becomes nebulous and difficult to apply on a consistent basis”*. However, this argument is weak, given that DotEcon has previously applied consistent tests for outliers in its historic reports for Ofcom and ComReg (2013-2021) and removed extremes using inter quartile range (IQR) or standard deviation-based tests. Moreover, the ACMA in Stage 3 Paper 4 seemed to approve the removal of outliers commenting that *“... our approach leads to relatively conservative renewal prices, as the valuation methodology controls for outlier prices and assumes declining spectrum values over time”*.

Using the same tests as DotEcon’s previous studies, we found several clear outliers in the dataset which significantly inflate the ACMA’s updated preliminary price by 11% on average. This contradicts the ACMA’s claims that using the geometric mean and median *“... ensures that extreme values do not disproportionately influence the final price”* (Stage 4, p. 24).

Using CPI to adjust auction benchmarks without adjusting for changes in mobile spectrum value is not sufficient

Adjusting benchmarks by the Consumer Price Index is not appropriate because spectrum is a producer cost and values are largely driven by cost avoidance

In a major change from the previous benchmarking analysis the ACMA inflated the benchmark prices to 2025 equivalent values using the Consumer Price Index to *“reflect changes in general price levels”*. It also proposes to project forward its 2025 prices to the commencement date of renewed ESLs using the CPI. However, using the CPI solely to adjust benchmark prices and also future single prices is fundamentally flawed:

- Mobile communications prices fell by 79% in real terms from 2014-2022 (based on ACCC data) whilst the CPI increased by 20% in the same period.
- Between 2008 and 2024, Australia’s CPI increased by 54% whereas Australia’s mobile service revenue increased by a mere 3%. In other words, mobile service revenue is essentially flat whereas consumer prices have increased by 2.58% per year and continue to increase.
- Analysing the benchmark data without the CPI adjustment shows that historically spectrum prices have not increased over time.
- MNO spectrum valuations are largely driven by the relevant avoidable costs of their networks and by their cost of capital, so are even more unlikely to be correlated with general consumer prices.
- The CPI is the “Consumer Price Index”, but ESL spectrum is a cost to the producer, i.e. MNO, and adjusting spectrum values for price changes over time should reflect changes in the relevant prices the MNO faces.

Expert research shows that mobile spectrum prices have been declining and future spectrum release plans imply this will continue in Australia

A mechanism such as the Mobile Spectrum Revenue index discussed in Stage 3 should be applied

Declining spectrum price trends must be fully incorporated into the benchmark analysis

The ACMA must fully incorporate acknowledged declining trends in mobile spectrum prices into the benchmarking both to historical and expected future prices. The Peer Review acknowledged historical evidence of this declining price trend and evidence previously submitted by experts such as NERA confirms the trend. The recent EU Digital Networks Act also recognises this and recommends that in setting fees “revenues per connection, as well as the overall burden ... should also be taken into account, to avoid that very high prices paid in past auctions continue to overburden holders of rights and prevent them from investing in networks”.

DotEcon’s approach of limiting the benchmark data to 2018 onwards, only partially accounts for falling spectrum values and does capture falling price trends post 2018. Moreover, changing the cut-off date changes the results suggesting the 2018 cut-off is not robust. While the previously proposed Mobile Spectrum Revenue (MSR) index (which was rejected in the Peer Review) has some limitations, it may still be better than other alternatives for this purpose. The ACMA should either use the MSR index or develop a better one to make this important adjustment. It is both fair to take into account mobile spectrum price trends and it provides a check on affordability.

Equally as important, the ACMA must also adjust future spectrum prices because there is credible evidence that mobile spectrum prices will continue to decline.

A substantial amount of spectrum of spectrum below 7.1 GHz has been identified for potential release by ACMA. Within the next 10 years, the amount of spectrum below 7.1 GHz used by mobile operators may increase by 96%. With such a large amount of close substitutes to existing mobile spectrum becoming available in this period, it is highly unlikely that mobile spectrum prices will not continue to decline.

Exhibit 5: Likely future mobile spectrum releases in Australia

	Existing	New	Future Total	Increase %
Sub 1-GHz	200	80	280	40%
Lower 1-3 GHz	240	90	330	38%
Upper 1-3 GHz	238	0	238	0%
3.4 GHz	225	0	225	0%
4.4-4.8 GHz	0	200	200	n/a
6585-7100	0	500	500	n/a
Total	903	870	1773	96%

Source: Coleago based on ACMA Spectrum Outlook 2025

Updating the benchmarking periodically with new auction data could undermine efficiency and investment

Finally, the ACMA’s proposal to rerun the benchmarking with new auction prices between now and renewal will not capture the full decline in spectrum prices and will have serious unintended consequences. MNOs will be forced to decide on the earliest ESLs without knowing the price of other ESLs that are substitutes. This undermines MNO choices, risks inefficiency and, in extreme cases, will chill investment.

Consistency of revised prices with public interest criteria

ESL pricing should promote the long-term public interest, but the ACMA has not provided evidence to support this and seems to focus only on one component – economic efficiency

While formally checking against public interest criteria is mentioned in the Consultation, the ACMA simply states that “We have not needed to use this step in forming our updating preliminary views on pricing.” The ACMA does not provide or consider any wider information / analysis on the industry and future development of the market, and only offers a weak argument in support of their assertion.

In fact, the ACMA only seems to focus on one objective that of promoting efficiency and also argues that “higher spectrum prices may be beneficial in facilitating efficiency by reducing incentives to hoard spectrum” although there is no reason to believe this is a significant concern and there has been no evidence of hoarding in the past.

However, the ACMA has not shown how its updated preliminary prices promote: investment and innovation; enhanced competition; service continuity for end users; and connectivity and inclusion in regional and remote areas. In fact, higher prices are doing the exact opposite, as we argued in previous responses. The notion that if more money is taken out of the mobile industry in form of spectrum licence fees, this would leave more cash for investment is not plausible given the financial position of the industry.

Public interest discount

The essential service that mobile provides should be recognised in pricing through applying a public interest discount

Mobile networks provide an essential service to the public and their importance is reflected in the policy considerations relating to ESLs. It is therefore undeniable that there is a public interest in maintaining a competitive mobile market in which operators continue to invest to deliver 5G-Advanced, 5G-Stand-Alone, and future 6G services especially given the difficult financial position of the industry, as mentioned above.

To meet all the appropriate public policy objectives, it is important to apply a public interest discount to MNO ESL. The ACMA did not provide any plausible arguments why the public interest discount applied to MNO ESLs should be zero. A public interest discount would help all operators to invest and reduce the risks to competition.

As previously, we believe that, given the public interest discount of 50% applied in the past to rail and TOB, it is appropriate to apply a similar discount to mobile spectrum.

Impact of addressing the key concerns on ESL prices and the total bill

Fixing our three most important concerns would lead to a total Industry bill of AUD 4.8bn, 35% lower than the updated preliminary prices

We have estimated the impact of addressing the most important methodological issues in the ACMA's benchmarking. Removing the outliers we identify and removing the CPI effect and reflecting price declines through MSR index would give the following prices and a total industry bill of AUD 4.8bn (35% less than the updated preliminary prices). The impact of the other concerns, which would depend on how they were addressed, is also likely to be significant.

Exhibit 6: Prices after adjustment for outliers, CPI and MSR, and total Industry bill

	Prices adjusted for outliers and CPI (AUD, full licence)		Total Industry bill (AUD million)		
	ACMA	Adjusted	ACMA	Adjusted	Ch0061nge
700	0.7405	0.5462	1,945.9	1,435.3	26%
850	0.7558	0.5575	858.9	633.6	26%
1800	0.3030	0.2182	1,295.5	933.1	28%
2100	0.2757	0.1986	801.5	577.3	28%
2300	0.1596	0.0697	322.9	141.0	56%
2600	0.1621	0.0708	661.6	289.0	56%
3400	0.2052	0.1073	1,502.5	785.4	48%
Total			7,388.8	4,794.7	35%

Source: Coleago

Conclusion and recommendations

The ACMA should adopt a risk based pricing approach and not inflate benchmark prices.

However, if the ACMA continues to use central values to set ESL prices, it must address the flaws identified

The ACMA should adopt risk based pricing in view of the complexities identified in the benchmarking, the need for a conservative approach, the asymmetric risk of setting ESL prices too high and the need to promote all the components of the long term public interest. This would reduce prices by 49%-73% compared to the ACMA's updated preliminary prices.

However, if the ACMA maintains its proposed approach based on the geometric mean and median, benchmarking issues must be fixed, it must still set ESL prices conservatively, and the resulting prices must address all public interest issues. In particular, it should:

- Exclude outliers that meet standard tests and are backed up by a priori evidence;
- Adjust benchmarks by trends in mobile spectrum prices and remove the CPI adjustment;
- Apply a public interest discount given mobile is an essential service bring substantial public benefit.

2. Introduction

The guiding principle for setting ESL prices is the long-term public interest

This document sets out Coleago’s views on the ACMA’s Stage 4 Consultation⁴ on updated ESL preliminary prices and the Peer Review⁵ of the ESL pricing methodology carried out for the ACMA by DotEcon.

The framework for both the approach to ESL renewal and ESL pricing was established during the previous three stages of the ESL process. Stage 3⁶ in particular set out the key criteria the ACMA would use to assess renewal and pricing in accordance with the long-term public interest, as specified in Section 77C(5) of the Radiocommunications Act 1992.

The benchmarking is fundamental to the ACMA’s ESL pricing approach, hence our response focuses on this and the impact on the wider public interest

The core of the preliminary ESL price ranges (both preliminary and updated preliminary) proposed by the ACMA is an international benchmarking analysis of historical spectrum auction prices. Following the recommendations of the peer review, the ACMA has made significant changes to both the benchmarking approach and the dataset.

Accordingly, Section 3 of this document begins with an assessment of the most substantive aspects of the benchmarking analysis and how it should be used to set ESL prices.

Subsequent sections are as follows:

- Section 4 sets out the asymmetric impacts of setting ESL prices too high or too low.
- Section 5 discusses the risks to public interest objectives of identifying a single price point based on statistical measures such as the geometric mean or median, rather than a range, given the variability in auction price datasets and their limited representativeness for Australia.
- Section 6 sets out our view that, as a result, the ACMA should adopt a conservative approach to ESL pricing.
- Section 7 discusses spectrum price trends and explains why we consider it inappropriate to adjust spectrum values using the consumer price index.
- Section 8 explains why we believe it is preferable to explicitly adjust for declining spectrum price trends, for both historic and future prices.
- Section 9 discusses the lack of evidence that the ACMA has considered public interest criteria beyond efficiency, including the trade-off between spectrum fees and other aspects of the public interest.
- Section 10 restates our view on the case for public interest discounts.
- Section 11 sets out our detailed analysis of the benchmarking approach and recommendations for how it can be improved.

Finally, although the focus of this paper is ESL pricing, we would like to make one broader comment on the ACMA’s proposal to reissue ESLs to MNOs where they can demonstrate a continuing or future need, rather than re-auctioning them. The European Commission recently adopted the Digital Networks Act⁷. This aims to restore the EU’s industrial competitiveness and innovation in mobile networks. A key element is spectrum, and the Act proposes that rights to MNO spectrum should be “*mainly unlimited licence duration by default, with possibility for review clauses and revocation of rights of use*” (p12). It argues that “*the insufficiently long duration of licences, a lack*

4 Expiring spectrum licences (stage 4) – updated preliminary views on pricing
<https://www.acma.gov.au/consultations/2025-12/expiring-spectrum-licences-stage-4-updated-preliminary-views-pricing>

5 Review of the ACMA expiring spectrum licence pricing,
https://www.acma.gov.au/sites/default/files/2025-12/dotecon_review_of_acma_expiring_spectrum_licence_pricing.pdf

6 <https://www.acma.gov.au/consultations/2025-04/expiring-spectrum-licences-stage-3-preliminary-views>

7 <https://digital-strategy.ec.europa.eu/en/policies/digital-networks-act>

of flexibility and incentives to share spectrum and use it more efficiently, have increased the cost of spectrum which, combined with limited mobile revenues and lack of demand, has negatively affected deployment” (p9). Furthermore, it says “Investment predictability can hence be better achieved by the provision of rights with indefinite duration ... subject to periodic reviews, with credible revocation options” (p46).

This landmark change in approach supports the views we have expressed on renewal in previous submissions and aligns with several of the themes on ESL pricing discussed later in this document.

3. Flawed use of benchmarking to set renewal prices

Correctly analysing and interpreting the benchmark data is critical to the resulting ESL prices given the inherent complexities of spectrum auction benchmarking

The peer review of the ACMA’s pricing methodology, which is based on benchmarking spectrum market prices, lies at the core of the ACMA’s Stage 4 consultation.

We have previously acknowledged that such benchmarking is inherently challenging due to the wide range of factors that influence spectrum auction prices, including auction design, scarcity of supply, market structure, geography, and broader economic conditions. Interpreting the data is therefore critical to the usefulness and validity of the results. Accordingly, this section analyses the key methodological issues involved in interpreting the data.

As the ACMA and their advisors know, when analysing a dataset with the view to draw conclusions there are several aspects to examine:

1. What is the range?
2. Is there a representative central value such as the mean, median or mode?
3. What is the standard deviation?
4. What is the central value?
5. Are there outliers?
6. Is there a trend?
7. Is there a correlation?

The ACMA, following DotEcon’s advice, did not consider, or explicitly excluded, items 1, 2, 3, and 5 from its analysis. Instead, it assumed that it was appropriate to calculate a central value, specifically the median and the geometric mean, and, in Step 6A of its methodology, used these central estimates to determine a single market value for spectrum in Australia.

The use of central values (mean, median) as recommended in the Peer Review is not necessarily representative of a dataset

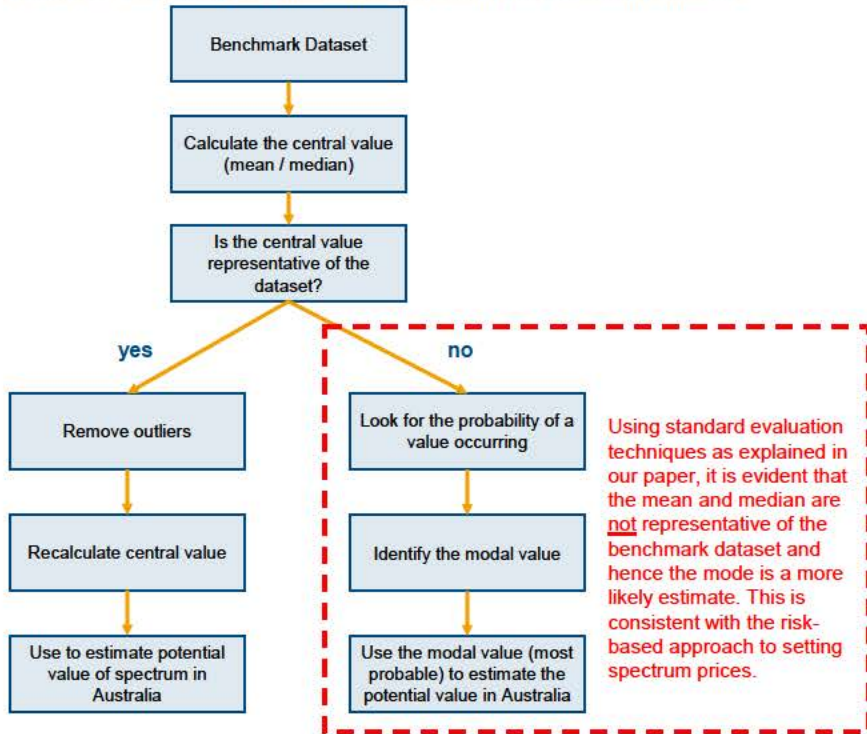
A geometric mean, median, or arithmetic mean can be calculated for any dataset. However, this does not imply that the resulting average or central value is representative of the dataset. To illustrate this point, consider an extreme example. In a dataset with 100 observations, 50 observations have a value of 1 and the remaining 50 have a value of 9. This represents a starkly bimodal distribution, with two distinct peaks.

In this example, the median and mean are both 5, while the geometric mean is 3. However, concluding that a “typical” or representative value is 5 or 3 would be incorrect. Based on the 100 observations, the probability that the next observed value would be 3 or 5 is zero. Examining statistical measures of dispersion for this dataset would provide important context on the extremity of the distribution and the lack of representativeness of the averages.

If benchmark data is used for statistical analysis to estimate the market value of spectrum in Australia, the analysis should be undertaken in an exhaustive manner, taking account of all relevant information contained in the dataset.

Below, Coleago provides a detailed analysis of the benchmark spectrum value datasets, demonstrating that neither the geometric mean nor the median is representative of the data and recommends that the mode is more likely to be an appropriate estimate for spectrum values in Australia.

Exhibit 7: Identifying the representative value in the benchmark dataset



Source: Coleago

In fact, the benchmarking datapoints vary widely and are not clustered around a central value

Wide range of benchmark values

Exhibit 8 below shows the number of benchmark spectrum market values (datapoints), the range of benchmark values across the four band categories, and the maximum value expressed as a multiple of the minimum. It is apparent that the range is very wide and that there are relatively few datapoints. For example, in the upper 1 - 3 GHz category, the maximum value is 144 times higher than the minimum, based on only 36 datapoints (benchmark observations). The fewer the datapoints and the wider the range, the greater the uncertainty that any central estimate provides a meaningful insight into the value of spectrum in Australia.

Exhibit 8: Number of benchmark values and their range (365day price / MHz / pop AUD 2025)

	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Number of benchmark values	35	23	36	47
Minimum	0.0178	0.0021	0.0009	0.0015
Maximum	0.2996	0.2081	0.1288	0.3764
Maximum as a multiple of minimum	16.8	97.6	144.2	247.7

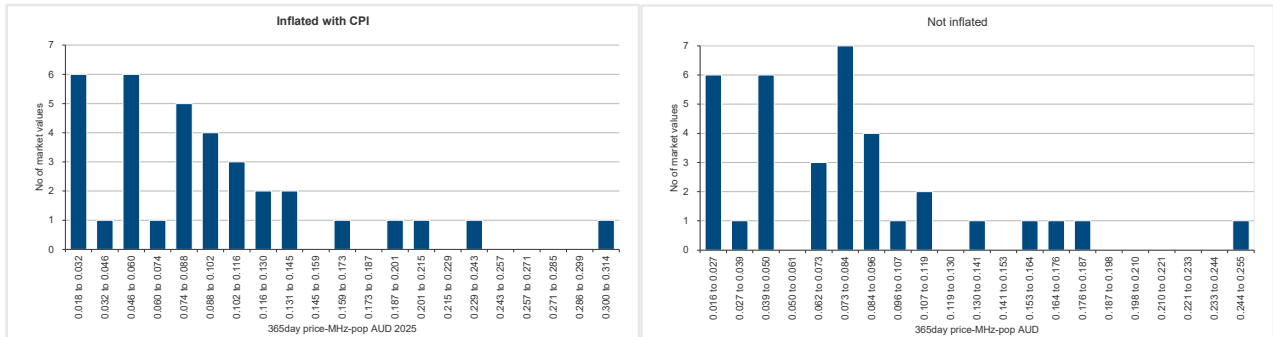
Source: Coleago based on ACMA Excel files

Given the wide range of observed market values, the ACMA should have considered where within this range the market value of spectrum in Australia is likely to lie, rather than simply calculating the geometric mean and median and insisting that these constitute a reasonable and representative central estimate.

Calculated geometric mean and median are not representative of the dataset

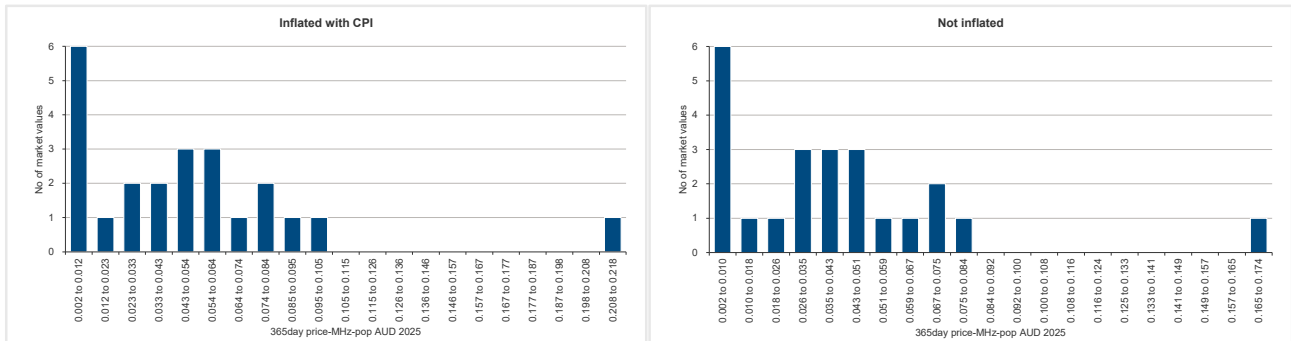
The exhibits below show the benchmark values for the four band categories, grouped into 5 percentile buckets. The charts clearly show that spectrum market values irrespective of whether they inflated by the CPI or not are not clustered around a central value.

Exhibit 9: Number of sub-1 GHz benchmark values in 5 percentile buckets



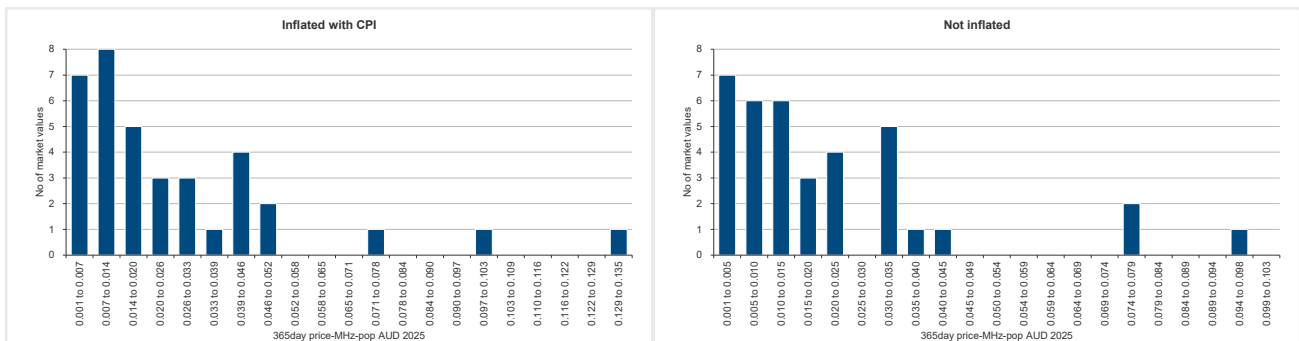
Source: Coleago based on ACMA Excel files

Exhibit 10: Number of lower 1-3 GHz benchmark values in 5 percentile buckets



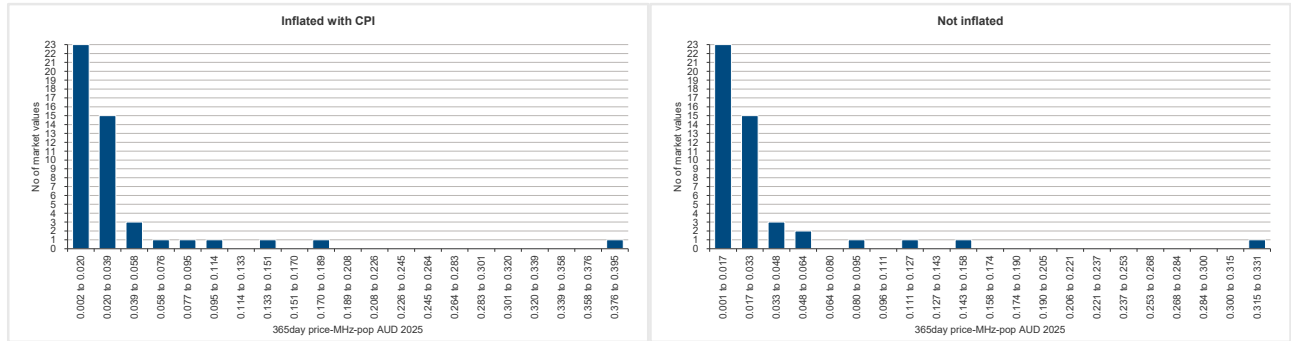
Source: Coleago based on ACMA Excel files

Exhibit 11: Number of upper 1-3 GHz benchmark values in 5 percentile buckets



Source: Coleago based on ACMA Excel files

Exhibit 12: Number of 3.4 GHz benchmark values in 5 percentile buckets

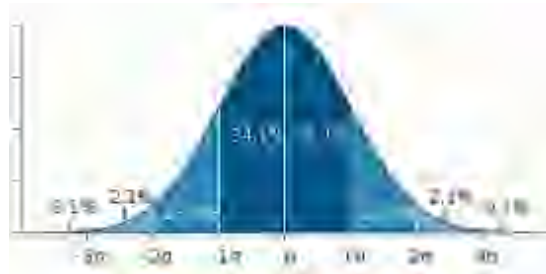


Source: Coleago based on ACMA Excel files

Statistical metrics indicate that the central values used by the ACMA are only weakly representative

For illustrative purposes, Exhibit 13 below shows a standard normal distribution, in which values are clustered around the mean. This implies that, based on the observations in a sample, there is a high probability that an additional observation will fall within a range close to the central value. It is immediately apparent that the observations used for spectrum value benchmarking are not normally distributed; rather, they are widely spread, skewed, and include extreme outliers.

Exhibit 13: Standard normal distribution



Source: Australian Bureau of Statistics

We examined the four benchmark datasets to assess whether calculating an average value in the form of the mean or median provides a price that is representative of the benchmark market prices observed in other countries.

First, we calculated the ratio of the standard deviation to the mean, i.e. the coefficient of variation (CV). When variability is large relative to the mean, this indicates that:

- Individual observations are widely spread.
- Many data points are far from the mean.
- The mean does not describe a “typical” observation very well.

Exhibit 14: Interpretation of coefficient of variation

Coefficient of Variation	Interpretation	Mean representativeness
< 10%	Very low variability	Mean is highly representative
10–20%	Low variability	Mean is representative
20–30%	Moderate variability	Mean is reasonably representative
30–50%	High variability	Mean is weakly representative
> 50%	Very high variability	Mean is poorly representative

Exhibit 15 and Exhibit 16 below show the coefficient of variation (CV) for each of the four spectrum value benchmark datasets. The CV for all four datasets is well above 50%. This provides clear evidence that the mean is poorly representative of the datasets and that it is therefore inappropriate to draw conclusions from it.

Exhibit 15: Coefficient of variation in the CPI inflated benchmark dataset

	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Standard deviation	0.0638	0.0448	0.0274	0.0609
Mean	0.0942	0.0491	0.0270	0.0369
Standard deviation / mean	68%	91%	101%	165%

Source: Coleago based on ACMA Excel files

Exhibit 16: Coefficient of variation in the non-inflated benchmark dataset

	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Standard deviation	0.0510	0.0362	0.0221	0.0509
Mean	0.0791	0.0411	0.0215	0.0310
Standard deviation / mean	64%	88%	103%	164%

Source: Coleago based on ACMA Excel files

As a secondary check on the appropriateness of calculating an average value to estimate the central estimate of spectrum values, we also examined the ratio of the interquartile range (IQR) to the median. This ratio provides a measure of how concentrated the datapoints are around the central value. As a general rule, an IQR-to-median ratio below 25% indicates that the median is highly representative of the dataset; a ratio between 25% and 50% suggests the median is reasonably representative; and a ratio above 50% indicates that the median is weakly representative.

Exhibit 17 and Exhibit 18 below show that, for all four spectrum categories, the IQR-to-median ratio is well above 50%. This indicates that the calculated central datapoint, in this case the median, is not representative of the values in the dataset.

Exhibit 17: Standard deviation to median (CPI inflated data)

	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Inter Quartile Range	0.0650	0.0493	0.0277	0.0244
Median	0.0856	0.0439	0.0173	0.0217
Inter Quartile Range / Median	76%	112%	160%	113%

Source: Coleago calculation based on ACMA benchmark data

Exhibit 18: Standard deviation to median (non-inflated data)

	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Inter Quartile Range	0.0502	0.0393	0.0223	0.0206
Median	0.0741	0.0392	0.0136	0.0175
Inter Quartile Range / Median	68%	100%	164%	118%

Source: Coleago calculation based on ACMA benchmark data

We conclude that, in all 4 spectrum groups, it is questionable that the central value is a reasonable estimate of spectrum value in any one country

The analysis shows that, for all four spectrum categories, the central estimates calculated by the ACMA are not representative of the benchmark value datasets. It is therefore highly questionable to conclude that the central estimate provides a reasonable estimate of the market value of spectrum in Australia (or any one country for that matter).

Skewed distribution and modal value

We also find that the central values are significantly above the “modal value” which indicates where the data is most clustered

Examining the benchmark data in 5 percentiles as shown in the charts above, reveals that the data is clustered at the lower end of the range. For all four spectrum categories, the modal 5-percentile (the most frequently occurring range) lies below the single value proposed by the ACMA.

Exhibit 19: Modal value vs. ACMA updated preliminary price

365day price / MHz / pop AUD 2025	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Modal 5-percentile	0.018 to 0.032 and 0.046 to 0.060 (bimodal)	0.002 to 0.012	0.007 to 0.014	0.002 to 0.020
ACMA proposed single price	0.0755	0.0307	0.0167	0.0217

Source: ACMA and Coleago analysis

The Australian Bureau of Statistics states: “In a set of data, the mode is the most frequently observed value. A set of data can have more than one mode or no modes. In many datasets, the most frequently observed value will occur around the mean and median values, but this is not necessarily the case, particularly where the distribution of the dataset is uneven.”⁸ As we can see from the 5-percentile analysis of the benchmark data, the benchmark values are very uneven and hence it would be appropriate to focus on the modal value.

⁸ 1500.0 - A guide for using statistics for evidence-based policy, 2010

4. Assessing the risk of ACMA price being too low or too high

Because spectrum auction prices can be very specific, to market conditions, rules etc., benchmarking is not straightforward

If we accept that prices paid for spectrum in an auction - i.e. a market-based allocation mechanism - represent the market value of spectrum in the market where the auction was held, it is clear that different markets assign very different values to spectrum. There is no single international market value for spectrum, as each country is a distinct market. A mobile operator cannot purchase spectrum in country X and deploy it in country Y.

In the Stage 4 consultation paper, the ACMA states “*Benchmarking, based on outcomes from domestic and international spectrum awards, allows us to derive prices that reflect the market value of the spectrum in a transparent and evidence-based manner.*” and writes “*We consider the updated preliminary views represent reasonable market valuations for each band group.*”

The essence of the ACMA’s approach to benchmarking spectrum prices is:

- That prices paid at auction are market values.
- That averaging those prices paid in other markets tells us what the market value of spectrum in Australia is likely to be.

As shown in the analysis above, the wide range of values and their skewed distribution indicate that it is inappropriate to draw conclusions based on the median, mean, or geometric mean.

- The high variability in the benchmarks indicates the mean or geometric mean describes the centre but not a typical value.
- The benchmarks are not clustered around the mean or geometric mean which is further evidence that the mean and geometric mean are not representative of the dataset.

For example, let us consider the sub-1 GHz spectrum:

- All 35 benchmarks are market values and are deemed by DotEcon and the ACMA as relevant to estimate what the value of spectrum might be in Australia.
- The benchmarks are widely dispersed and are not clustered around the mean.
- There is a great variation in the benchmark market values and, without knowing the cause of these variations, particularly between countries, there is a reasonable probability that any particular market value in the dataset is the value of spectrum in Australia.

The risk is high, 35%-49%, that the proposed ESL prices exceed the value for at least some operators, if the benchmark data is indicative of the probability

The mean or geometric mean of all values is no more likely to represent the market value of spectrum in Australia than any other of the 35 market values in the benchmark dataset. Hypothetically, for an auction outcome included in the benchmarking dataset with a price below the mean, if the reserve price had been set at the mean value the spectrum would have remained unsold.

It is therefore essential to ask what the probability is that the value of spectrum in Australia is in fact the geometric mean (a single price) used by the ACMA, and what the probability is that the true value is higher or lower than this geometric mean.

If the price is set at the lowest benchmark value, one can be reasonably confident that the value of spectrum to Australian operators is not lower. Setting the price above the lowest value progressively increases the risk that the price exceeds the market value of spectrum in Australia.

Exhibit 20 below shows, for each of the four spectrum categories, the percentage of benchmark spectrum market values that are below the single price proposed by the ACMA. Depending on the category, the risk that the updated preliminary price would exceed the value of spectrum for all, or some, operators ranges from 35% to 49%.

Below, we examine these probabilities in more detail and focus on the implications of the price being set too high, as well as the implications of it being set too low.

Exhibit 20: Benchmark market values below ACMA updated preliminary price

% of benchmark values	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Below ACMA single price	40%	35%	47%	49%

Source: Coleago analysis using ACMA Excel files

4.1 Implications of the single value being lower than the market value in Australia

The socioeconomic risks if ESL prices are set too low are limited

First, we examine the risk of the ACMA proposed single value being lower than the market value in Australia and what would be the consequence.

- All three operators would renew their spectrum licences.
- The question then is whether the difference between the market value and the renewal price accrues to shareholders in the form of a windfall gain, or whether paying less than operators would have been prepared to pay has a positive impact on society. Since there are three competing operators (who are seeking to earn their cost of capital), paying less than spectrum might have been worth to an operator is likely to translate into enabling operators to spend more on network build, reduce prices, or a mixture of both. Either way, the winner is the consumer.

Further, there is little evidence that low spectrum prices lead to inefficient use or hoarding; in fact, the benefits typically flow to consumers

We have previously provided evidence that consumers have benefited significantly from mobile operators' investment in spectrum and networks, while shareholders have not. The value of spectrum accrues to society rather than to investors in mobile operators. In a competitive market, prices fall to a level at which operators earn only their cost of capital. There is no evidence that low spectrum prices increase enterprise value.

Data from the ACCC Communications Market Reports show that, between 2014 and 2022, mobile services retail prices in Australia declined by 79% in real terms. Over the same period, operators' returns on invested capital did not increase. Indeed, Optus' ROIC of 2% is well below its cost of capital. This demonstrates that the value of additional spectrum accrues to consumers rather than to investors.

Setting ESL prices below the value to operators is therefore unlikely to result in a misallocation of spectrum, provided that prices remain above the opportunity cost of alternative uses of the spectrum. This condition should be met, given that renewal decisions are predicated on the ACMA finding continuing and ongoing demand for ESL spectrum from existing licensees, and the absence of credible competing demand from alternative users.

In conclusion, the arguments set out above indicate that, even if the ACMA's focus is limited to the public interest criterion of efficiency, setting renewal prices below operators' value does not result in socio-economic harm.

Furthermore, we reiterate our view that it is not necessary to set ESL prices at market value in order to promote efficiency, given that the secondary market for mobile spectrum is functioning well and already provides strong incentives for efficient spectrum use.

4.2 Risk and implications of the single value being higher than the market value in Australia

The socioeconomic risk if ESL prices are set too high are substantial

The weakest operators may not renew all of their spectrum; investment and competition could decline

There are real risks to competition too if ESL prices are set too high especially given market conditions in Australia

Secondly, we examine the risk of the ACMA updated preliminary price being above the market value in Australia and what the consequence would be.

- The operator(s) with the lowest market share and hence financial leverage may not renew all of their ESL i.e. possibly two operators might not renew all of their ESL.
- Spectrum would either remain unused for the foreseeable future, since mobile is generally accepted to be the highest value use. Alternatively, the operator with highest market share might acquire unused spectrum, thus increasing the concentration of spectrum holdings.

An outcome in which one or two operators do not renew even some of their spectrum would be highly negative when assessed against the policy objectives underpinning the ESL process, notably “enhancing competition” and “promoting competition.”

In Australia, there is a significant risk that the prices proposed by the ACMA will exceed the value of spectrum to Optus, TPG, or both. Australia already faces a highly concentrated mobile market, in which the dominant operator, Telstra, holds a market share of around 50%, giving it economies of scale that are not available to Optus or TPG. Some regional areas are already served only by Telstra, meaning there is no competition at the network level.

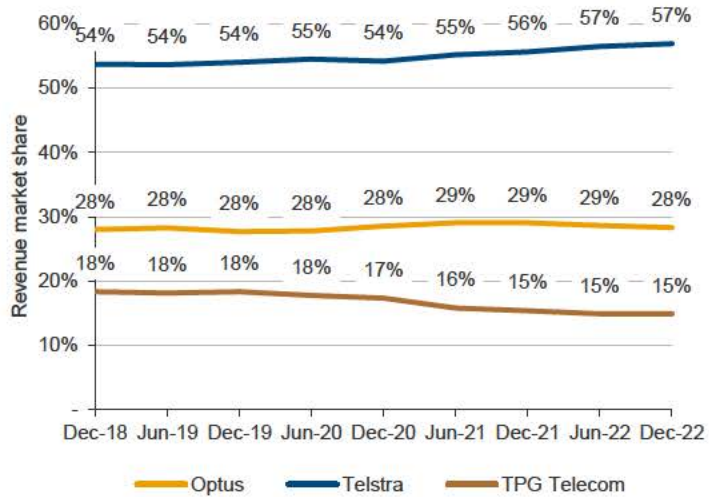
Mobile networks are dominated by fixed costs. For a typical mobile operator, the ratio of fixed to variable costs is approximately 70:30⁹. An operator with a larger market share therefore benefits from substantially greater economies of scale than an operator with a smaller market share. Spectrum licence fees are a fixed cost and therefore exacerbate the fixed cost problem in mobile markets. Australia, with a population of 26.3 million and a very large land mass, is a relatively small and geographically challenging market, making it particularly difficult for operators with lower market shares to earn their cost of capital.

As a result, Australia is especially vulnerable to threats to competition arising from the fixed-cost nature of the industry. In 2009, following the merger of Vodafone and Hutchison (VHA), their combined market share was 27%¹⁰. Subsequent consolidation to form TPG did not resolve the market share and associated economies of scale challenges. Exhibit 21 below shows that TPG’s market share position has continued to deteriorate and now stands at just 15%.

⁹ Coleago Consulting Ltd research. Fixed costs are cost which do not vary with revenue (at least in the short to medium term); variable costs scale in proportion to revenue.

¹⁰ Global Wireless Matrix 1Q14, Bank of America Merrill Lynch, 21 April 2014

Exhibit 21: Mobile network operator market shares by revenue



Source: Optus

To illustrate differences in economies of scale, the table below presents two indicators for the three Australian operators: the number of subscribers per MHz and the number of subscribers per site (shown as an index for ease of comparison). Each metric serves as a proxy for the unit cost of serving customers; higher values for subscribers per MHz or per site typically indicate lower unit costs and greater economies of scale.

The table therefore provides evidence supporting the view that the revised, higher spectrum prices proposed by the ACMA pose significant risks to competition, given that Telstra’s economies of scale are substantially greater than those of Optus and TPG.

Exhibit 22: Economy of scale measures

	TPG	Optus	Telstra
Index: subscribers / MHz	100	117	258
Index: subscribers / site	100	109	142
Spectrum excluding mmWave (metro areas)	225	380	280
Sites	5,207	9,391	11,767
Mobile subscribers	5,514,000	10,861,000	17,710,000

Source: Coleago, Optus, ACCC Mobile infrastructure Report 2025, GSMA

Differences in the financial position of the MNOs further increase the sensitivity of competition to ESL prices

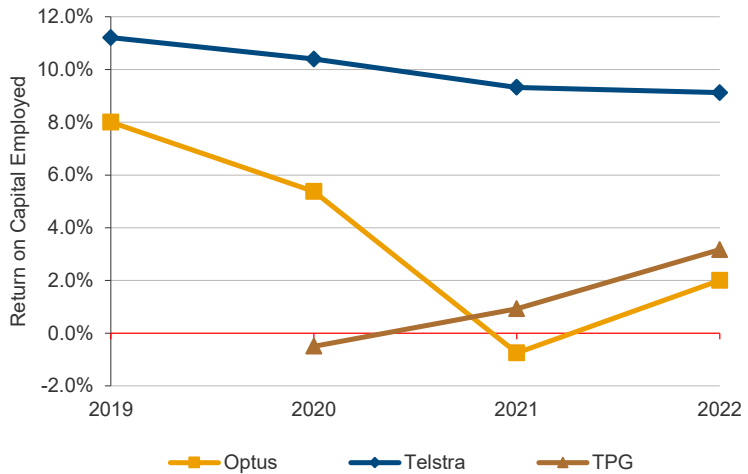
The current returns on capital employed (ROCE) for Optus and TPG are unsustainable. As shown in the ROCE chart below, the gap between the financial performance of Telstra and its competitors is significant. Both Optus and TPG are in a difficult position relative to Telstra, with limited prospects of catching up and returns that are well below the ROCE expected by shareholders and financial markets.

Telstra is able to earn returns above its weighted average cost of capital (WACC) because its dominant market share provides economies of scale that are not available to operators with smaller market shares. High spectrum renewal license fees would further exacerbate the fixed cost disadvantages faced by Optus and TPG.

Fundamentally, a business that does not earn its WACC does not represent a sustainable investment opportunity. Telstra’s competitive advantage, driven by its superior financial position and ability to charge a price premium, is therefore

entrenched. The inability of either Optus or TPG to earn their WACC illustrates a real risk of declining investment and poses a clear threat to the current three-player market structure.

Exhibit 23: Return on capital employed



Source: Operator financial statements, Coleago

Notes: Optus financial year runs to end March, Telstra to end June and TPG to end December. TPG results are given from 2020 as that was the year in which TPG merged with VHA to form the current company.

TPG is the operator with the lowest market share and most challenging financial position of the three. The risk that the prices proposed by the ACMA are above TPG's value is high, as evidenced by TPG's share price performance. Exhibit 24 below shows the share price performance of Telstra and TPG against the ASX 200 index from 2020 to 2023. While Telstra's share price has broadly tracked the market, TPG has performed considerably worse by comparison. TPG's share price underperformance indicates that, at prevailing prices, investors do not expect to earn a return equivalent to alternative investments. In other words, investor sentiment regarding TPG's business case is negative.

To the extent that share prices reflect each company's ability to raise funds for future investment in financial markets, this further highlights the disparity in the financial positions of Telstra and at least one of its rivals. It also supports our argument that, for TPG in particular, the business case for investment is challenging and likely to be sensitive to the level of spectrum renewal fees.

Exhibit 24: Telstra and TPG share prices compared to the ASX 200 index



Source: ASX

Even if Optus and TPG were to renew all their spectrum licences, higher renewal fees would increase Telstra’s dominance due to its greater ability to absorb fixed costs and its deeper financial resources. This would give Telstra greater scope than its competitors to invest, innovate, and expand services, particularly in regional and rural areas, creating a vicious circle from a social welfare perspective by further strengthening Telstra’s financial performance and exacerbating competitive imbalances.

5. Setting prices based on risk

The risks from the ACMA’s pricing approach are unacceptably high and ESL prices must be set conservatively

As explained in Section 4, the impacts of setting ESL prices above market value are much worse than setting them below, and this affects the risks the ACMA faces in ESL pricing. The percentage of benchmark prices that are lower than the single price proposed by the ACMA gives an indication of the risk that spectrum values may be below the ACMA’s proposals and is repeated for ease of reference in the table below.

Exhibit 25: Benchmark market values below ACMA updated preliminary price

% of benchmark values	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Below ACMA single price	40%	35%	47%	49%

Source: Coleago analysis using ACMA Excel files

A 35% or even 49% risk that TPG or Optus would not renew some or all of their ESLs is not acceptable, given the essential nature of mobile services and the policy goal of promoting competition and investment in mobile services. If prices are maintained at the levels proposed by the ACMA, the ACMA would be gambling with the future of a competitive mobile market in Australia. Moreover, the ACMA is incorrect in stating in its Stage 4 consultation that a focus on market-value-based pricing avoids concerns about the risk of overpricing, given the issues inherent in its methodology (p. 26).

We recommend a 20% threshold which also corresponds to how the data is clustered

Coleago has previously argued for the adoption of a conservative approach to setting renewal prices. Setting ESL renewal prices at a level where 20% of benchmark prices are lower and 80% are higher may represent an acceptable level of risk. Based on the benchmark data for spectrum market values, the ACMA could be 80% confident that

incumbents would renew all of their spectrum licences and that competition in mobile services would not be weakened.

The 20% threshold is not arbitrary. Exhibit 26 below shows the ESL prices that result when this risk-based approach is applied. These prices fall within the modal 5th-percentile bucket, indicating a high probability that an appropriate value has been selected based on the benchmark dataset used by DotEcon and the ACMA.

Exhibit 26: Recommended ESL prices based on risk by spectrum group

365day price / MHz / pop AUD	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Modal 5-percentile range	0.073 to 0.084	0.002 to 0.010	0.001 to 0.005	0.001 to 0.017
20% benchmark price limit – non-inflated	0.0381	0.0083	0.0055	0.0071
ACMA updated preliminary price	0.0755	0.0307	0.0167	0.0217

Source: Coleago and ACMA

This translates into the prices per ESL band, for full licence length, shown in Exhibit 27 below. The total industry bill would fall 62% compared to the ACMA's updated preliminary prices – for the main estimate which excludes CPI. For completeness, the table also shows that the total bill would fall by 56% if CPI were included (though we do not consider it appropriate to inflate benchmark prices with the CPI).

Exhibit 27: Recommended ESL prices based on risk and industry bill by Exhibit 4band

	Risk based price - AUD / MHz/ pop full licence			Industry bill - AUD millions and % reduction vs. ACMA		
	ACMA	CPI excluded	CPI included	ACMA	CPI excluded	CPI included
700	0.7405	0.3743	0.4465	1,945.9	984 (-49%)	1,173 (-40%)
850	0.7558	0.3820	0.4558	858.9	434 (-49%)	518 (-40%)
1800	0.3030	0.0819	0.0820	1,295.5	350 (-73%)	350 (-73%)
2100	0.2757	0.0745	0.0746	801.5	217 (-73%)	217 (-73%)
2300	0.1596	0.0529	0.0668	322.9	107 (-67%)	135 (-58%)
2600	0.1621	0.0537	0.0679	661.6	219 (-67%)	277 (-58%)
3400	0.2052	0.0669	0.0823	1,502.5	490 (-67%)	603 (-60%)
Total				7,388.8	2,801 (-62%)	3,274 (-56%)

Source: Coleago and ACMA

For completeness too, we include the table below showing the 365 day price data for the four spectrum groups, based on the CPI inflated benchmarks.

Exhibit 28: CPI inflated ESL prices based on risk by spectrum group

365day price / MHz / pop AUD	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Modal 5-percentile range	0.018 to 0.032 and 0.046 to 0.060 (bimodal)	0.002 to 0.012	0.007 to 0.014	0.002 to 0.020
20% benchmark price limit – CPI-inflated	0.0455	0.0083	0.0070	0.0087
ACMA updated preliminary price	0.0755	0.0307	0.0167	0.0217

Source: Coleago and ACMA

6. ACMA must set prices conservatively given the uncertainty in the benchmark data

ESL prices must be set conservatively, given market conditions, the benchmark data issues and to maximise the long-term public interest

In our Stage 3 submission, we strongly recommended that the ACMA should set ESL prices conservatively.

- One reason for this was the need for ESL prices to remain affordable, given the challenging financial position of the MNOs. As reiterated in Section 4.2 above, TPG and Optus are earning returns on capital substantially below their WACC, while only Telstra is earning above its WACC. Moreover, the investment requirements associated with completing the rollout of advanced 5G networks and the future rollout of 6G are significant. This is not unique to Australia - the EU Digital Networks Act states that high spectrum costs would “*reduce the attractiveness of mobile operators and mobile deployment projects for financial markets and further weaken operators’ capacity to fund high-quality 5G and future 6G deployment*” (p58)
- Secondly, the risks to the industry, investment, competition, service quality, and coverage (i.e. the public interest) are asymmetric depending on whether the ACMA’s ESL price determination is above or below MNOs’ spectrum value.

As discussed in Section 4, the downside risks of setting prices too low are that the government receives less direct revenue from licence fees. Spectrum hoarding is also cited by the ACMA as a potential risk; however, no concerns regarding spectrum hoarding by MNOs have been raised in the past. By contrast, the impact on the mobile market and the wider economy of setting prices too high is potentially far greater and would persist for the entire duration of the licences.

- Thirdly, the benchmarking process itself leaves considerable uncertainty as to how the data should be interpreted and made most relevant to ESL renewal in Australia.
 - Coleago expressed reservations in Stages 2 and 3 of the ESL process regarding the conceptual challenges of using benchmarking to set renewal prices, and the extent to which subjective assumptions were required.
 - While DotEcon’s peer review recommendations reduce the number of assumptions required in some areas, such as by using fewer cohorts, standardising the interquartile range, and seeking to minimise the number of excluded observations, significant uncertainty nevertheless remains.
 - Moreover, the benchmark datapoints are widely dispersed around the chosen averages across all band groups, particularly in the upper 1 - 3 GHz band, with large interquartile ranges. This is not surprising, given that variations in auction design and market dynamics can significantly affect spectrum values, and that it is not possible to correct for all such factors.

Taken together, these issues make a compelling case for a conservative approach to interpreting the benchmark data. In stage 3, the ACMA also supported this principle stating that its preliminary prices were “relatively conservative” though in our view they did not go far enough. Relying on the median or geometric mean could easily overestimate ESL values, with serious consequences for MNOs and spectrum users alike - the high variability of the benchmark data further increases this risk. A conservative approach should therefore apply both to key methodological choices and to the derivation of final prices from the statistical measures of the benchmark data.

This approach should also be applied to the treatment of declining trends in mobile spectrum prices within the benchmarking analysis, as discussed in Section 8, and when considering the case for public interest discounts, as discussed in Section 10.

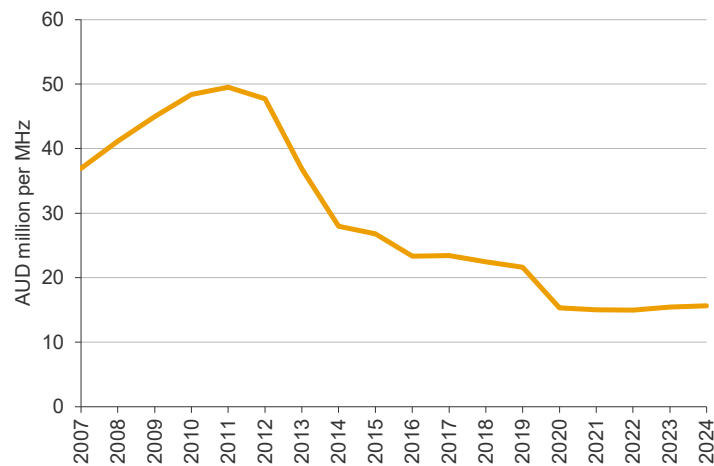
7. Using the CPI on its own to adjust benchmark prices is not appropriate

Adjusting benchmarks solely by the Consumer Price Index is not sufficient to reflect changes in spectrum values over time

The ACMA inflated prices in the benchmarking sample to bring prices forward to a uniform date (2025) using the Consumer Price Index “so that benchmark prices reflect changes in general price levels.” This is a major change from the previous benchmarking analysis.

While it has not been possible to isolate the impact of using CPI on ESL prices using the information released by the ACMA, it is clear that the impact is significant. Simply comparing the 25% change in the CPI from 2018 to 2025 compared to the 28% fall in the MSR index over the same period shows that the combined effect is considerable, as DotEcon recognise in their Peer Review (p5).

Exhibit 29: Mobile service revenue per MHz of spectrum (excl. mmWave)



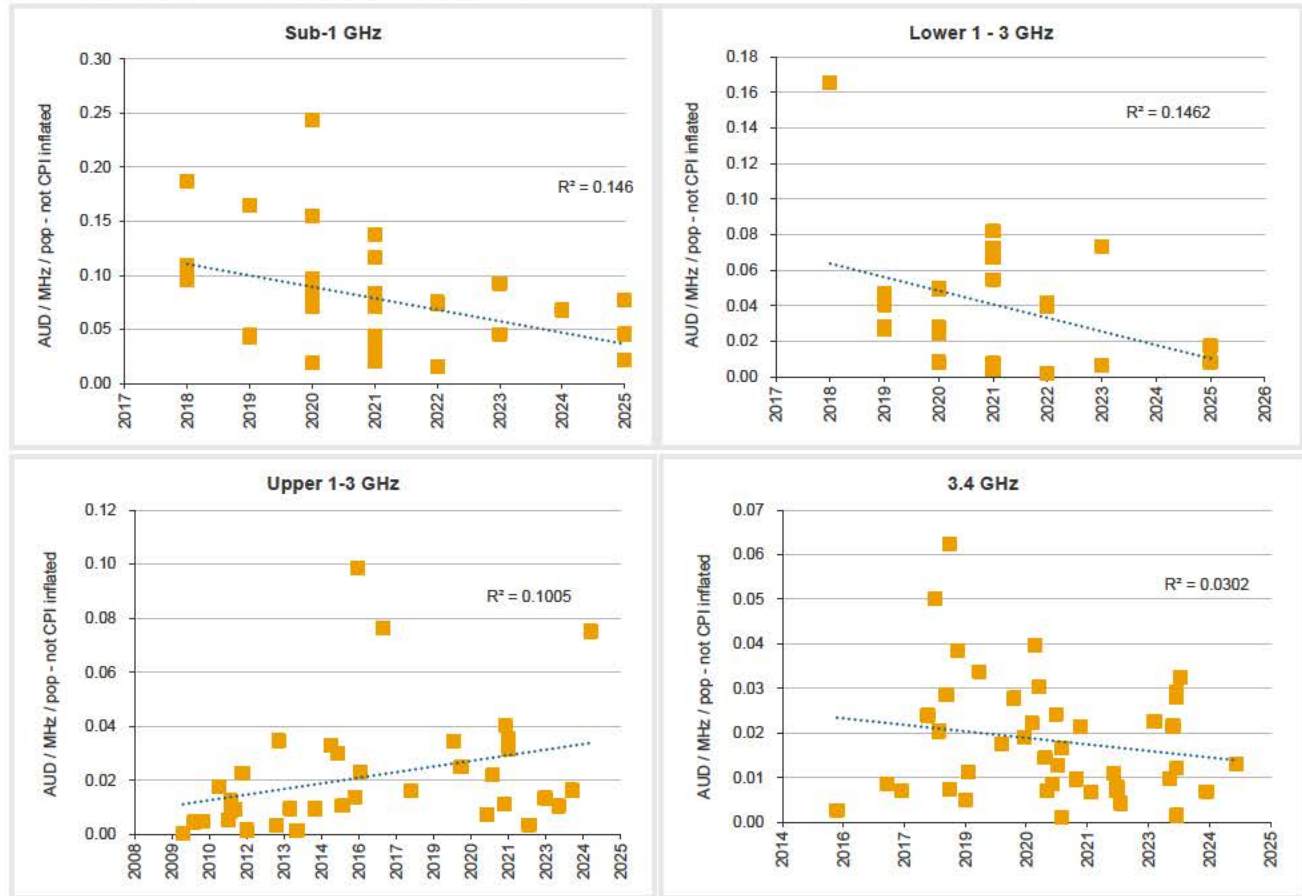
Source: Coleago

Additionally, the ACMA proposes that “The \$/MHz/pop single-year prices derived in the previous step are proposed to be adjusted for inflation (CPI) from 2025 to the relevant commencement date of renewed spectrum licences in each ESL band.”

Below we provide evidence that using the CPI to inflate benchmark prices and to inflate future single prices is fundamentally flawed.

The benchmark data without the CPI adjustment shows that spectrum prices have not increased over time, as shown in Exhibit 30. For three band categories the data shows a slight decline and for one a slight increase. However, the R-squared value is very small, indicating that there is no good correlation between time and prices paid. Another way of looking at this is that despite inflation, prices paid for spectrum have not increased. Therefore, increasing past auction pricing using the CPI is a wilful distortion of benchmark data.

Exhibit 30: Evolution of benchmark prices over time

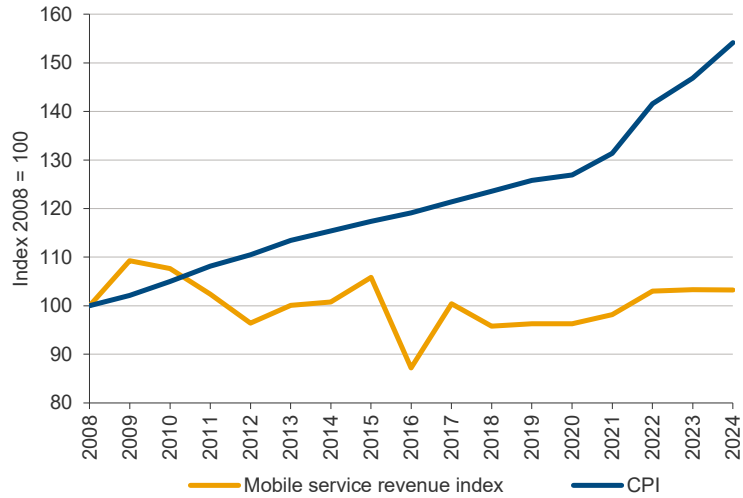


Source: Coleago based on ACMA Excel files

The change in prices for mobile communications is different from general inflation - prices for mobile communications declined over the past decade whereas the CPI shows that prices for other consumer goods have been increasing. When industry sector specific decisions are made, the change in prices in the particular sector should be used to inform decisions. Below we present two pieces of evidence. Firstly, we compare the CPI with the increase in mobile service revenue between 2008 and 2024. Secondly, we show that consumer prices for mobile services have declined sharply whereas the CPI continued to increase.

Between 2008 and 2024, the CPI increased by 54% whereas mobile service revenue increased by a mere 3%, see Exhibit 31. In other words, mobile services revenue is essentially flat whereas the consumer prices have increased by 2.58% per year on average. Essentially mobile service revenue has not increased during past 17 years and there is no indication that mobile service will increase in future. It is not plausible that an input cost, namely the cost of spectrum, shall increase with the CPI whereas mobile service revenue remains flat. Inflating future spectrum prices by inflation ignores this fundamental evidence.

Exhibit 31: CPI vs Mobile Service Revenue Index

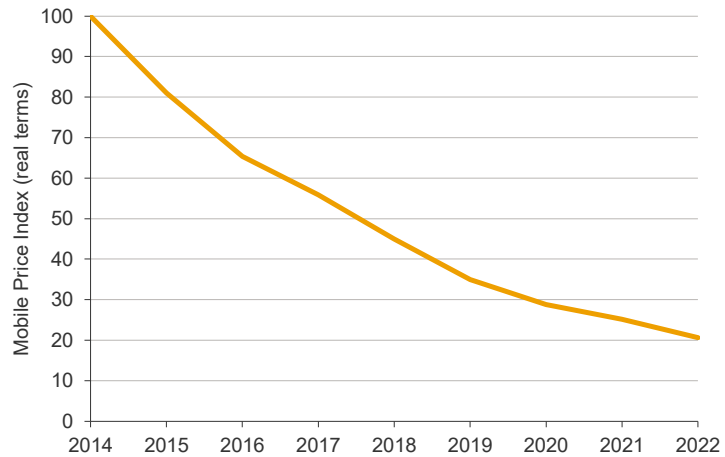


Source: Coleago

Prices for mobile communications declined over the past decade whereas the CPI shows that prices for other consumer goods have been increasing. When industry sector specific decisions are made, the change in prices in the particular sector should be used to inform decisions.

Whereas the CPI increased continuously, prices for mobile communications declined, providing clear evidence the using the CPI to inform ESL pricing amount to a wilful distortion. Exhibit 32 shows the decline in mobile retail prices in Australia between 2014 and 2022. The analysis is based on the price declines¹¹ reported in the ACCC Communications Market reports covering this period. The price declines are reported in nominal terms. The observations cover eight years and hence we have adjusted prices for inflation¹² and calculated an index with 2014 = 100. The data shows that between 2014 and 2022 mobile retail prices declined by 79% in real terms.

Exhibit 32: Mobile retail price decline in Australia



Source: ACCC Communications Market reports and Coleago calculations

¹¹ Feature-adjusted price changes (%) for the hedonic approach

¹² All groups CPI and Trimmed mean, Australia, annual movement (%), Australian Bureau of Statistics

The CPI is the “Consumer Price Index”, whereas spectrum is a cost to a producer. MNO spectrum valuations are largely driven by the relevant avoidable costs of their networks and by their weighted average cost of capital (WACC), hence they are even more unlikely to be correlated with general consumer prices.

In conclusion, we disagree with DotEcon (p. 19) that spectrum prices should, in the long run, necessarily reflect general inflation, and that, absent other changes, spectrum values should remain broadly unchanged relative to consumer prices. As noted above, and as DotEcon itself suggests (p. 18), MNO spectrum values are largely determined on a cost avoidance basis. Over the long term, mobile has experienced considerable technological change which has driven down costs and increased quality. Other factors will also affect mobile network costs, but we do not accept that the underlying trend in spectrum prices should necessarily match general price trends, especially if technological change continues.

Adjusting by CPI alone will lead to ESL prices that are too high, with negative consequences for the public interest, as argued above. Fundamentally, the issue is how to adjust historical (and projected) spectrum values so that they adjust to price movements over time. In our view, it is much more relevant to consider spectrum price trends directly rather than applying the CPI and this is the subject of the next section.

8. Declining spectrum price trends must be fully incorporated in the methodology

Expert research shows that mobile spectrum prices have been declining and future spectrum release plans imply this will continue in Australia

The ACMA’s revised methodology fails to fully incorporate the acknowledged declining trends in mobile spectrum prices. This applies both to historical and expected future price trends.

The case that mobile spectrum values have been falling is supported by both the benchmarking data and other evidence (as discussed below), and a growing consensus view that the beginning of the 5G era towards the end of the last decade¹³ marked a change in spectrum values. In addition, we believe that continuing improvements in spectral efficiency, observed slowdowns in data growth, and stagnation in real mobile ARPUs add theoretical support for the view of declining spectrum value.

The EU has reached a similar conclusion. Although it recognises that fees should promote optimal use, the Digital Networks Act recommends that “*revenues per connection, as well as the overall burden that holders of rights have from all their radio spectrum holdings, should also be taken into account, to avoid that very high prices paid in past auctions continue to overburden holders of rights and prevent them from investing in networks*” (p47). While the EU has not specified a methodology, the substance of their recommendation is very similar to the MSR index approach which the ACMA has now rejected.

¹³ See also the NERA, Aetha submission for Telstra in response to Stage 2

The approach proposed by DotEcon does not capture the full price declines of recent years. A mechanism such as the Mobile Spectrum Revenue index discussed in Stage 3 should be adopted

8.1 Historical trends in spectrum value

DotEcon itself finds evidence of declining market prices in all band groups, except 3.4 GHz, over the period of analysis 2013-2025 (p14-15). Further, Telstra's response to Stage 2 presented analysis by NERA showing a declining trend for low band and lower mid band spectrum from 2016 onwards¹⁴. Evidence from international benchmarking in the UK for annual licence fees also supports this. While Ofcom proposed cuts of 21% for 900 & 1800 MHz, MNOs strongly pushed back and provided evidence that spectrum values were declining even further¹⁵.

The Stage 3 methodology did attempt to correct historic benchmark data for this declining spectrum price trend using the mobile service revenue / MHz / pop or MSR index. While the MSR index has limitations, e.g. it is only indirectly related to spectrum value, it may still be a better proxy than other alternatives¹⁶ as the ACMA recognised in the Stage 3 Consultation "*MSR provides a reasonable proxy for profit and is more accessible*" (Paper 4 p.55). Moreover, some limitations can be reduced. For example, though the MSR index is sensitive to short term changes in spectrum (ACMA p14), this can be mitigated by taking an appropriate moving average to smooth out variations while still capturing the crucial trends in spectrum values.

DotEcon's approach to correcting for historic spectrum price trends does not capture the full impact of declining spectrum values. Limiting most datasets to 2018 onwards, only partially accounts for falling spectrum values. Although the least relevant awards from the pre-5G era are excluded, the continuing price falls between 2018 and the present day are not accounted for. The sample size is also reduced which has an impact on the statistical reliability of the results.

8.2 Expected future trends in spectrum values

The ACMA has identified 500 MHz of spectrum below 7.1 GHz for potential release up to 2032 which is strong evidence mobile spectrum prices will continue to decline

Equally as important, the ACMA does not appear to have considered the evidence presented that current spectrum price declines are likely to continue in the future and hence does not adjust future spectrum prices accordingly.

As Coleago and other respondents stated in response to Stage 3, 500 MHz of spectrum below 7.1 GHz has already been identified for potential release by the ACMA up to 2032, which strongly supports the case that further declines in spectrum value are likely. Crucially, this includes the upper 6 GHz band which is a good substitute for mid band spectrum including 3.4 GHz.

Looking further ahead, in the next 10 years, 870 MHz of spectrum of spectrum below 7.1 GHz may be released for use by mobile operators, a 96% increase. It is inconceivable that mobile service revenue will increase by 96% in real terms during the next 10 years and hence it is certain that the MSR index will continue to decline.

Exhibit 33: Likely future mobile spectrum releases in Australia

	Existing	New	Future Total	Increase %
Sub 1-GHz	200	80	280	40%
Lower 1-3 GHz	240	90	330	38%
Upper 1-3 GHz	238	0	238	0%
3.4 GHz	225	0	225	0%
4.4-4.8 GHz	0	200	200	n/a
6585-7100	0	500	500	n/a
Total	903	870	1773	96%

Source: Coleago based on ACMA Spectrum Outlook 2025

¹⁴ Round-by-Round: Learnings from the First 35 Years of Spectrum Auctions, NERA, 2024, <https://www.nera.com/insights/publications/2024/round-by-round.html?lang=en>

¹⁵ <https://totaltele.com/mobile-operators-quibble-with-ofcom-over-spectrum-fees/>

¹⁶ Additionally, some of DotEcon's criticisms can be mitigated – e.g. short term fluctuations could be limited by taking a moving average.

This invalidates DotEcon’s argument - based on the assumption that additional mobile spectrum release will primarily be mmWave (p15) - that there is insufficient evidence to assume that current price declines will continue.

Regularly updating the benchmarks with new data risks inefficiency. Renewal decisions would be worse informed since the price of other ESLs would not be guaranteed at renewal

8.3 Updating benchmark data prior to renewal windows runs contrary to the stated aims of the ESL process

The ACMA is proposing to add to the benchmark data set future spectrum awards between now and six months prior to the renewal application period for each ESL. This maximises the data available for the benchmark process.

However, the ACMA’s preferred ESL prices would not be fixed but could be revised each year between up to the expiry of each licence type. This potentially creates major uncertainty for ESL holders. It runs directly counter the ACMA’s aims in seeking to minimise uncertainty by establishing the terms and conditions of renewal well in advance of licence expiry through its extensive process of analysis and consultation.

If the ACMA adopts this approach, MNOs will be forced to make decisions on renewing some ESLs (those falling due earliest) without knowing the price of other ESLs that are major substitutes. This uncertainty risks undermining MNO choices, inefficient spectrum use and, in extreme cases, chilling investment.

Another disadvantage is that this approach is unlikely to properly represent the declining trend in spectrum values which we believe will continue, particularly due to new spectrum releases in Australia. Although new awards might confirm a continuing downward trend in mobile spectrum values, their impact given the current benchmarking proposals may be limited. Since ESL prices would still be based on the geometric mean or median of the whole benchmarking sample, an extra few data points would only slightly change the results in a sample of thirty or more observations.

9. Lack of evidence that revised prices are consistent with public interest criteria

ESL pricing should promote the long-term public interest, but the ACMA has not provided evidence to support this and seems to focus only on one component – economic efficiency

9.1 Public interest criteria for the renewal of ESLs

With regard to public interest criteria, ACMA stated the following:

Our public interest criteria for ESLs, which we consulted on in 2023, include the following:

- *Facilitates efficiency (which aligns with the object of the Act)*
- *Promotes investment and innovation*
- *Enhances competition*
- *Balances public benefits and impacts*
- *Supports relevant policy objectives and priorities*

The SoE (Statement of Expectations) and the MPS (Ministerial Policy Statement) for ESL cover similar ground. The MPS for ESL specifies 5 Australian Government communications policy objectives that we must consider in the design and consideration of the ESL process:

- *Supporting service continuity for end users, particularly where no alternative service is available.*

- *Facilitating opportunities for new entrants and use cases, including for low earth orbit satellites.*
- *Connectivity and investment in regional and remote areas to deliver improved services to end users.*
- *Promote competition.*
- *Capacity for sustained investment and innovation.*

While formally checking against public interest criteria (step 6C in the process) is mentioned in the consultation document, the ACMA simply states that “*We have not needed to use this step in forming our updating preliminary views on pricing.*” The ACMA does not provide or consider any wider information / analysis on the industry and future development of the market and only offers a weak argument in support of their assertion.

The only argument stated by the ACMA is that “*higher spectrum prices may be beneficial in facilitating efficiency by reducing incentives to hoard spectrum*”. The spectrum in the ESL process has been deployed, i.e. substantial investments were made, and traffic is flowing through the spectrum. As stated in section 6, there has been no evidence of hoarding in the past, and the hypothesis of future hoarding, i.e. that mobile operators would not use the spectrum in future, is not plausible. As other regulatory authorities have argued, such as the EU in the Digital Networks Act, concerns over hoarding can be addressed by “*obligations to provide wholesale access or enable radio spectrum sharing*” (p46). Competition regulation can also be used to reduce the likelihood of hoarding for anti-competitive purposes.

Taking too much money out of the industry in its current state is almost certain to have a knock-on effect on investment and services

The ACMA has not demonstrated how higher prices would support the stated policy objectives of promoting investment and innovation; enhancing competition; supporting service continuity for end users, particularly where no alternative service is available; enhancing connectivity and investment in regional and remote areas to deliver improved services to end users; or promoting capacity for sustained investment and innovation. In fact, higher prices would have the opposite effect, as we have explained in previous submissions:

- The notion that, if more money is taken out of the mobile industry in the form of spectrum licence fees, this would leave more cash for investment is not plausible given the financial position of the industry.
- The social and economic benefits from digital transformation would be at risk from higher spectrum prices given the major ongoing funding requirements for the advanced networks needed to support them.
- With higher prices there is a risk of one or two operators not renewing some ESLs and this would weaken competition and negatively affect service continuity.

The ACMA has assessed the impact on public interest criteria too narrowly, particularly in light of the considerable risk that the single price proposed by the ACMA may exceed the value of the spectrum for one or two operators.

9.2 If ESL prices are set too high there will be serious consequences for wider public interest objectives

Not only has the ACMA failed to demonstrate how its updated preliminary prices meet public interest objectives, but the level of ESL prices proposed would actively undermine them.

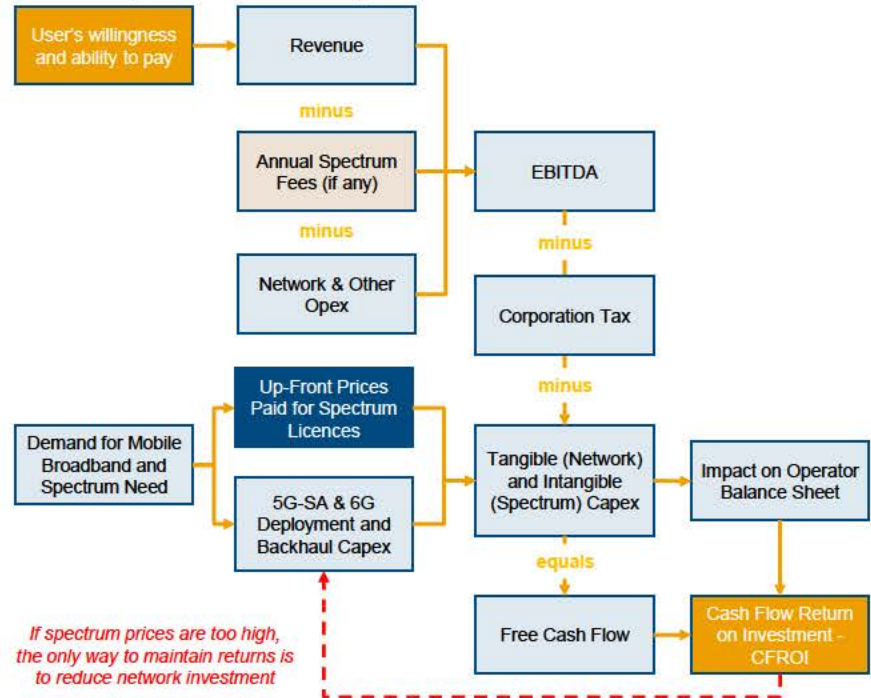
As Coleago has previously stated, imposing substantial fees on MNOs in the form of spectrum prices will inevitably affect investment, service quality, and, indirectly, other objectives such as promoting services in regional and remote areas and supporting broader digital transformation.

Exhibit 34 illustrates the rationale for this. Financial planning in the mobile sector involves carefully balancing cash outflows - operational expenditure and capital

expenditure, including investment in tangible network assets and spectrum licence fees - against cash inflows from revenues. If insufficient cash remains to cover the cost of capital, investments cannot be financed.

Mobile operators must generate sufficient cash to compensate investors in order to finance investment in spectrum and networks. Aside from increasing retail prices - which may have knock-on effects on market share or usage - the only other lever available is to reduce tangible capital expenditure, i.e. invest less in the network, to bring overall capital expenditure to a level that can be financed. In short, high spectrum prices make the business case for mobile network investment less viable.

Exhibit 34: Spectrum licence fee impact on network investment



Source: Coleago

Momentum is building to set spectrum fees according to the wider economic and social good and not just the demands of economic efficiency

Evidence examining investment in mobile networks and the cost of spectrum licence fees is clear. For example, the GSMA's most recent study on the impact of spectrum fees on investment¹⁷ finds that higher spectrum prices are associated with lower network coverage (for both 4G and 5G) and slower download speeds, thereby negatively affecting other policy objectives such as digital inclusion. Specifically, a 10% increase in the ratio of spectrum costs to mobile revenues leads to a 6% reduction in coverage and an 8% decrease in download speeds. The study is based on data from over 250 operators across nearly 100 countries.

Finally, the EU Digital Networks Act represents a sea change in the EU's approach to spectrum licence renewal. Whereas EU countries had historically tended to re-auction expiring spectrum licences, some countries, such as France and Spain, have more recently moved to re-issue licences to existing holders rather than re-auction them. The new Act confirms this shift and recommends that renewal fees not only take into account optimal spectrum use but also the fact that lower fees can spill over into higher investment, quality of services and wider benefits to the economy. In doing so, the Act recognises the importance of appropriate and predictable spectrum prices in promoting wider public policy objectives.

¹⁷ Global Spectrum Pricing, May 2025, <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2025/05/Global-Spectrum-Pricing-Summary-v2.pdf>

The essential service that mobile provides should be recognised in pricing through applying a public interest discount

10. Public interest discount

Mobile networks provide an essential service to the public, and their importance is reflected in the policy considerations relating to ESLs. It is therefore undeniable that there is a public interest in maintaining a competitive mobile market in which operators continue to invest to deliver 5G Advanced, 5G Standalone and future 6G services to Australian businesses and consumers.

Given the existence of a clear public interest, it follows that a public interest discount should be considered. The ACMA has not provided any plausible explanation as to why the public interest discount applied to MNO ESLs should be set at zero. A public interest discount would support all operators in continuing to invest and in delivering outcomes that promote the long-term public interest, especially given the difficult financial position of the industry with two operators struggling to earn their WACC.

Of particular concern are the risks of Optus and TPG falling further behind Telstra and of funds being diverted away from network investment. To meet the relevant public policy objectives, it is therefore important that a public interest discount is applied to MNO ESLs.

With regard to rail and TOB, the lower annual apparatus licence tax rate proposed by the ACMA in its updated preliminary views incorporates the previously applied 50% public interest discount and reflects the public benefits derived from rail communications use. Mobile services are an essential service, like rail, and arguably even more so. Given the effective public interest discount of 50% applied to rail and TOB, it is appropriate to apply a similar discount to mobile spectrum.

11. Comments directly related to the benchmarking

11.1 Introduction

In the preceding paragraphs, we set out an alternative risk-based approach to spectrum renewal pricing that would meet policy objectives while mitigating the risk of prices being set excessively high. In this section, we examine the methodology adopted by DotEcon and identify a number of material shortcomings in their approach. These issues would need to be addressed should ACMA choose to adopt this methodology.

In our June 2025 submission, we raised concerns regarding the use of benchmarking to determine spectrum prices, particularly the reliance on historical outcomes as a basis for setting future prices. *“Regulators should not administratively set prices to historical prices either those observed in other markets, or the market in question. Given the falling price of spectrum over the past decade, they are unlikely to reflect the current reality of the domestic market.”*¹⁸

The materially different results of two ACMA-commissioned benchmark studies underscore the inherent challenges of using benchmarks to set future prices.

While both ACMA benchmark studies were prepared by well-respected industry experts, they arrive at materially different results, underscoring the inherent challenges of benchmarking and using them to set spectrum prices, which we highlighted in our June submission.

The new DotEcon benchmarking study seeks to simplify the approach, which is welcome. However, this simplification comes at a cost, and we consider that the DotEcon study does not adequately reflect:

¹⁸ GSMA – Spectrum prices May 2025

- The cohort analysis, which limited the benchmarks used to set prices, has been largely removed. This increases the importance of examining potential outliers.
- The sustained decline in spectrum prices up to 2025, nor the likelihood of further price declines as additional spectrum is introduced to the market.
- The impact of population density on spectrum prices.
- Use of CPI to inflate spectrum benchmarks is not appropriate.

There are a priori reasons for removing some benchmarks from the data set.

DotEcon states that data should only be removed for *a priori* reasons. While it is appropriate to start with such criteria, robust analysis should also include identification and assessment of outliers, at least as a check for potential data errors. Historically other DotEcon studies for Ofcom and ComReg (2013-2021) have removed extreme outliers as they would not be representative of market values. In this report we provide *a priori* reasons to exclude certain benchmarks.

The MSR approach adopted in Stage 3 better captured the downward trend in spectrum prices.

Using benchmarks from 2018 to 2025 does not adequately reflect the price declines observed over that period, as equal weight is given to outcomes in 2018 as those from more recent auctions. The ACMA's MSR approach adopted in Stage 3 better captured the downward trend in spectrum prices. In our view, this approach should have been refined to address the criticisms raised, rather than being replaced with a less robust alternative.

DotEcon's report did not recognise the impact of future spectrum releases and its impact on spectrum prices.

DotEcon argues that future price declines may not continue on the basis that additional spectrum releases will be largely confined to mmWave bands with limited substitutability. This is incorrect; ACMA's Draft 2025 FYSO work program identifies substantial new allocations in the 600 MHz, 1.5 GHz and 6 GHz bands over the next five years, all of which are highly substitutable with the bands under consideration. These releases would increase mobile spectrum supply by approximately 96%, placing continued downward pressure on spectrum prices.

The only mechanism proposed to reflect future spectrum prices is the inclusion of additional benchmarks as they become available. However, no detail is provided on how these future benchmarks would be incorporated or how price declines would be treated, for example whether the 2018 cut-off would continue to apply. This newly introduced uncertainty around future pricing undermines the ability of licensees to make rational decisions about which of their spectrum holdings are optimal to be renewed.

The failure to account for the downward trend in spectrum prices is further compounded by the use of CPI to inflate historical values to derive a 2025 equivalent. As set out in the preceding paragraphs, we provide evidence that CPI is an inappropriate metric for determining spectrum prices.

The DotEcon study does not adequately account for population density.

Simplification has also come at the expense of adequately accounting for population density. In the DotEcon study, outcomes from the most densely populated countries, namely Singapore, Hong Kong and South Korea, have a disproportionate influence on the prices derived for Australia, which has the lowest population density in the sample. There is a clear *a priori* basis for excluding Hong Kong, Singapore and South Korea from the benchmarking dataset. These countries have population densities that are orders of magnitude higher than Australia's and are therefore structurally unrepresentative of Australian market conditions. Given the fundamental role population density plays in determining spectrum value, their inclusion as extreme high-population-density outliers disproportionately distorts the prices derived for Australia.

Evidence has not been provided to substantiate the claim that the updated preliminary prices support ACMA's policy objectives.

The study asserts that the proposed updated preliminary prices are consistent with the ACMA's policy objectives; however, no supporting analysis or evidence is provided to substantiate this claim. In particular, no affordability assessment has been undertaken to demonstrate that the updated preliminary price increases are sustainable for Optus and TPG, or that, at these levels both operators would be able to acquire their proportionate share of future spectrum. This leaves it unclear as to how the updated

preliminary prices have been assessed for consistency with the ACMA’s competition objectives in an already highly concentrated market.

Removing the impact of outliers and CPI would reduce the prices between 18%-40% and projected total value of \$5.5bn.

There are several instances in the DotEcon study where transparency is limited.

11.2 Lack of transparency and supporting documentation undermines the benchmarking study

Below we highlight several instances where transparency in the DotEcon study is limited:

- The study asserts that the updated preliminary prices support the ACMA’s policy objectives; however, no supporting analysis or evidence is provided to substantiate this claim.
- The study claims that the number of mobile network operators does not influence spectrum prices, but this assertion is not supported by empirical evidence or analytical justification.
- The study does not flag the existence of outliers in the box plot analysis, nor do they assess their impact on the results.
- The spectrum price spreadsheets do not include calculation links, which further restricts transparency and independent verification and reconciliation against our own spectrum database, and the calculations have not been provided for the conversion of the single annual price to the preliminary prices.
- No detail is provided on how future benchmarks would be incorporated, or how observed price declines would be treated in the future, for example whether the 2018 cut-off would continue to apply. This lack of transparency creates uncertainty around future pricing outcomes, which in turn complicates licensees’ ability to assess the relative value of different spectrum holdings and to undertake robust planning for renewal decisions.

In the Ofcom and ComReg studies DotEcon removed extreme outliers as they would not be representative of market values.

11.3 DotEcon has not considered the impact of outliers or their treatment in the benchmark study

The benchmark analysis by DotEcon for the ACMA did not investigate or remove extreme historical spectrum prices, which distorts the median/geometric mean and risks inflating future spectrum price forecasts. Robust statistical analysis should include the identification of outliers and an assessment of their impact, if only to detect potential data errors. Further, the ACMA in Stage 3 Paper 4 seemed to approve of removing outliers commenting that “... *our approach leads to relatively conservative renewal prices, as the valuation methodology controls for outlier prices and assumes declining spectrum values over time*”.

Although DotEcon may have conducted such analysis, it has not been presented, indicating a lack of transparency. In all DotEcon’s previous benchmark studies for Ofcom and ComReg (2013-2021), it has removed extremes using inter quartile range (IQR) or standard deviation-based tests. “Outliers are then removed before producing the summary statistics for the sample”.¹⁹

Their previous studies have “*adopted a transparent and objective rule to exclude outliers and applied this consistently, rather than dropping data points in an ad hoc manner in the course of the analysis. In particular, we excluded observations that:*

- *Lie more than three standard deviations away from the sample mean, or*
- *Lie more than three times the interquartile range above the 75th percentile.*²⁰

¹⁹ DotEcon benchmarking ComReg (2021)

²⁰ DotEcon benchmarking ComReg (2015)

The outlier tests traditionally applied by DotEcon are consistent with Tukey’s²¹ definition of extreme outliers. Under Tukey’s framework, observations lying more than 1.5 times the IQR above the 75th percentile (or below the 25th percentile) are classified as outliers, while those exceeding three times the IQR are classified as extreme outliers. DotEcon’s use of a 3×IQR threshold in the Ofcom and ComReg studies, therefore, corresponds to the identification and exclusion of extreme outliers rather than ordinary outliers.

In the Ofcom and ComReg studies DotEcon removed extreme outliers as they would not be representative of market values.

In previous benchmark studies, DotEcon has removed extreme outliers as they “would not be representative of market value of spectrum, and including them in data analysis may skew results and conclusions”²²

Applying the above DotEcon extreme outlier tests to the Australian dataset would result in the benchmarks highlighted in the exhibit below being removed from the dataset.

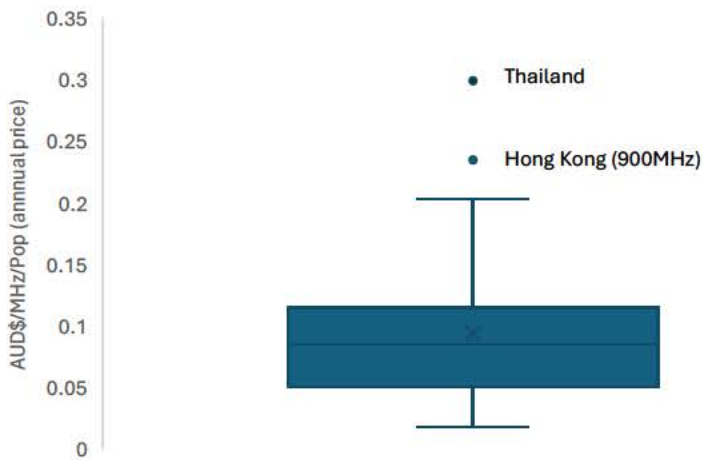
Exhibit 35: Extreme outliers identified by applying DotEcon’s criteria

Su- 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Thailand (2020)	Hong Kong (2018)	Singapore (2017)	Canada (2021)
		South Korea (2016)	Portugal (2021)
			US (2021)
			US (2021)
			Italy

Source: Coleago

Using box plot analysis with a 1.5× IQR threshold, all outliers in the dataset can be identified as either extreme outliers (3× IQR) or non-extreme outliers. Each of these warrants review, as outliers can disproportionately influence benchmark results, distort spectrum price estimates, and may reflect conditions not relevant to the Australian market. Assessing them helps ensure pricing conclusions are robust, representative, and aligned with the ACMA’s policy objectives.

Exhibit 36: Sub-1 GHz box plot analysis

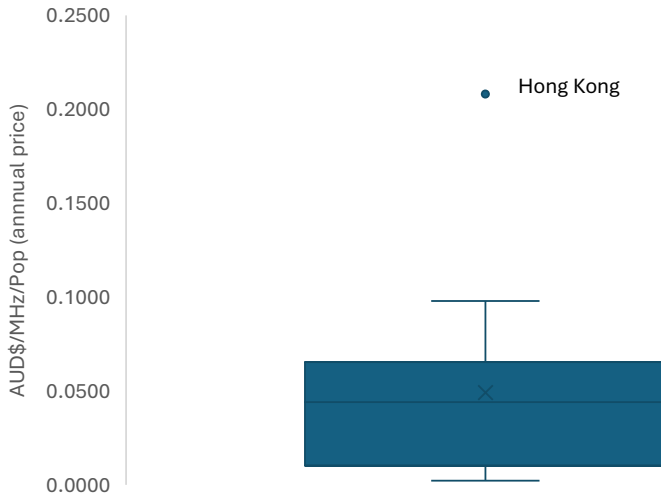


Source: Coleago

21 Tukey, J.W. (1977). Exploratory Data Analysis.
 22 DotEcon International benchmarking of 900MHz and 1800MHz spectrum (2013)

The box plot analysis for the sub-1 GHz band identifies Hong Kong as an outlier, in addition to Thailand, which was already flagged using DotEcon’s criteria for extreme outliers.

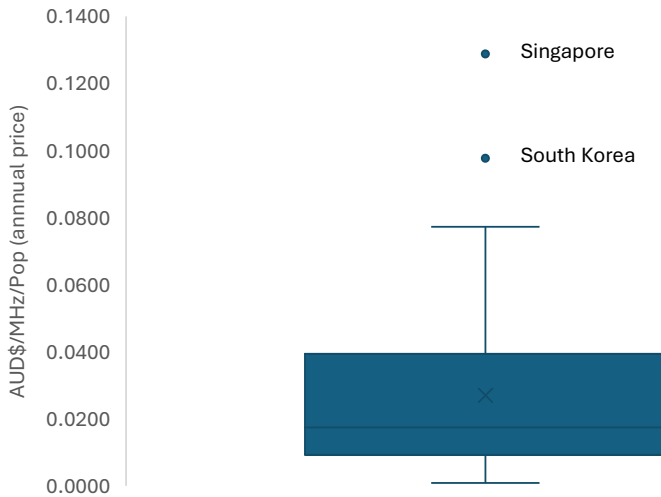
Exhibit 37: Lower 1-3 GHz box analysis



Source: Coleago

Box plot analysis of lower 1 - 3 GHz spectrum identifies no further outliers from those identified using the DotEcon’s criteria for extreme outliers.

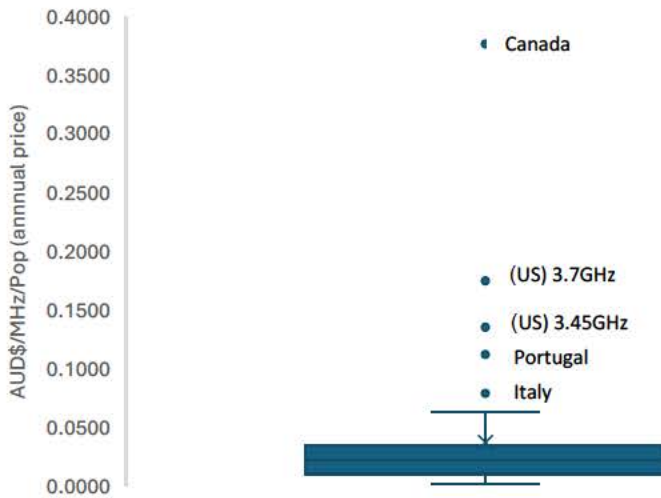
Exhibit 38: Upper 1-3 GHz box analysis



Source: Coleago

Box plot analysis of upper 1 – 3 GHz spectrum identifies no further outliers from those identified using the DotEcon’s criteria for extreme outliers.

Exhibit 39: 3.4GHz box analysis



Source: Coleago

Extreme outliers are having a disproportionate impact on the geometric mean and median

In addition to the extreme outliers using DotEcon’s criteria (Canada, US, Portugal), Italy is identified as an outlier.

These benchmarks have a disproportionate impact on the geometric mean and median, as shown in the table below. In the lower 1 - 3 GHz band, removing the single benchmark Hong Kong out of a sample of 23 reduces the geometric mean by 8%. The material impact that a single datapoint is having on geometric mean, and hence prices, suggests that the statistical methods used by DotEcon are not robust to outliers or appropriate in the Australian context. If these outliers are included in the benchmark dataset, there is a risk that spectrum prices will be set too high, which would undermine ACMA’s spectrum policy objectives.

Exhibit 40: % decrease in geometric mean by removing outliers

	Sub 1GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Extreme outliers	-4%	-8%	-11%	-22%
All outliers (including extreme)	-7%	-8%	-11%	-22%

Source: Coleago

There are clear a priori reasons for excluding the outliers identified.

In the ACMA report, DotEcon has adopted a different approach to the treatment of outliers compared with their benchmarking studies prepared for Ofcom and ComReg, stating that, “No competitive auctions should be excluded from a benchmarking exercise without good reasons, which are restricted to obvious errors or unavailability of data, or very strong a priori reasons to believe an award is irrelevant.”²³

DotEcon’s rationale for not attempting to identify and exclude possible outliers from the dataset is that “Trying to find more refined principles for excluding awards quickly becomes nebulous and difficult to apply on a consistent basis.”²⁴

23 DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

24 DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

This argument is weak, given that DotEcon has previously applied consistent interquartile range and standard deviation tests in its historic reports for Ofcom and ComReg (2013–2021). Beyond their disproportionate impact, there are clear *a priori* reasons that should have been considered when determining which outliers should be excluded from the dataset:

- Thailand is not appropriate for inclusion in mobile spectrum benchmarks because the market was originally structured under a concession model. The transition to a spectrum licensing regime meant that spectrum valuations reflected not only network cost-avoidance considerations, but also the additional value associated with avoiding concession fees.
- In some of 3.4 GHz spectrum bands artificial scarcity was created.
 - In Italy (2018): only 200 MHz of the available 400 MHz has been issued with no certainty even seven years after the first auction as to when or if the remaining spectrum will be released as it is currently occupied by FWA players.
 - Canada (2021): this was the first of two auctions. At the time of the auction, there was no certainty regarding the timing of the second auction, what caps might apply, or how much spectrum would be allocated to the “set-aside” for weaker market players. This created short-term scarcity and uncertainty, resulting in prices in the first auction being around 12x higher than in the second auction. The Canadian auction does, however, provide some insight into spectrum valuations/prices for weaker market players through the “set-aside” spectrum outcomes.
 - Using the prices for “set aside” may be more reflective of the market position of Optus and TPG both of whom are struggling in the market. This benchmark could be used as an alternative benchmark for both of the Canadian auctions.
 - Or alternatively a weighted average price across the two auctions would be more appropriate.
- Hong Kong, Singapore and South Korea have population densities that are orders of magnitude higher than Australia’s and are therefore structurally unrepresentative of the Australian market.
- At the time of the US 3.4 GHz auctions, the 2.1 GHz, 2.3 GHz, and 2.6 GHz bands were largely unavailable in the United States, creating artificial scarcity in mid band spectrum - this distorted auction outcomes.
- Valuations for Canada and the US include a terminal value, as licences are offered on an infinite basis. In a developed country, the terminal value typically accounts for approximately one third of the total value. DotEcon recognises the existence of infinite-duration licences but argues that it is preferable not to adjust for the initial licence period, provided the methodology is robust to outliers. The analysis above clearly demonstrates that the methodology currently used is not robust to outliers. Accordingly, these outliers should either be removed, or the licence length should be adjusted to reflect the infinite nature of the licences.

For the *a priori* reasons set out above, we believe that the benchmarks listed in the table below should be removed from the dataset. There are *a priori* grounds for removing all benchmarks identified in our analysis as extreme outliers under the DotEcon criteria, as well as those identified as outliers under the Tukey criteria, with the exception of the Portuguese 3.4 GHz auction (2021).

Exhibit 41: a priori reason for removal of benchmarks from the data set

A priori reason for exclusion	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Extreme population density	Singapore, Hong Kong, South Korea (all benchmarks)			
Additional sources of spectrum value – concession model	Thailand (all benchmarks)			
Spectrum scarcity at time of auction				US (all) Canada (2021) Italy (2018)

Source: Coleago

The Australian Bureau of Statistics (ABS) recognises the need to identify outliers and treat them in a different way.

The Australian Bureau of Statistics (ABS), in its statistical analysis, seeks to identify possible outliers and handle them in a different manner. *“The presence of outliers in the sample, may result in grossly inadequate estimates, unless they are treated in a special way.”*²⁵ The approach adopted for handling outliers has been the use of winsorization techniques. Winsorization is a statistical method that limits the influence of extreme values by replacing them with the nearest values within a defined threshold. This approach reduces distortion from outliers while retaining all observations in the dataset.

11.4 Simplification fails to capture key factors influencing spectrum pricing

DotEcon’s simplified approach does not capture the impact of population density on spectrum prices.

The previous ACMA benchmark study recognised the impact of factors such as the number of MNOs, population density, and GDP on spectrum prices through its weighting methodology. While this did not capture all possible influences, it did acknowledge some of the key drivers of spectrum prices.

Simplification is welcome where it continues to capture the key factors that may influence spectrum prices. However, DotEcon’s simplified approach does not reflect all the impacts recognised in the earlier benchmark analysis.

DotEcon’s benchmark analysis:

- Discounts the impact of MNOs on prices with no evidence provided for this conclusion.
- Recognises the impact of GDP using PPP exchange rates.
- Acknowledges that population density does have an impact on spectrum. However, the Step 6 approach of using population cohorts fails to adequately reflect this as the sample sizes are too small to be statistically valid.

11.5 The updated preliminary prices are unduly influenced by the three highest-density countries

DotEcon recognises that spectrum prices are influenced by population density: *“Deploying networks over large sparsely populated areas is more costly on a per user basis. The value of spectrum might therefore be expected to be lower in countries with a low population density. Australia has the lowest population density of the countries in the award data.”*²⁶

It argues that population density may not be a good measure, as it will understate the density of areas relevant to the spectrum licence because there are no coverage obligations and the networks do not cover the entire country. Whilst this is true, the

²⁵ Australian Bureau of Statistics - Labour Statistics: Concepts, Sources and Methods, 2013

²⁶ DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

The disproportionate influence of the three most densely populated countries on Australia's outcomes indicates the approach is not robust to population density effects.

impacts will be small and population density remains an appropriate and comparable metric for cross country spectrum analysis, even where networks are not deployed to 100% of the population. In Australia, around 99.7% of the population is already served. Sparse, unserved areas account for a negligible share of demand and do not materially distort international comparisons.

The Step 6 approach does not account for the impact of population density on spectrum values or prices. Applying the DotEcon outlier tests (as used for Ofcom and ComReg) described earlier identifies the three most densely populated countries in the sample - Singapore, Hong Kong and South Korea - as extreme outliers. These countries exert a disproportionate influence on the price determination for Australia, which is the least densely populated country in the sample. This suggests that the proposed approach to determining spectrum prices is not robust to outliers and is not appropriate in the Australian context.

Exhibit 42: Population density versus Australia

	2023 Population density (Pop/Sq. Km)	Population density multiple versus Australia
Singapore	8,242	2,747X
Hong Kong	7,177	2,392X
South Korea	530	176X
Australia	3	

Source: World Bank

A simple rule could be applied to exclude from the sample any country with a population density more than 150 times that of Australia. Such countries are highly unrepresentative of Australia and should therefore be excluded as data points across all spectrum bands.

DotEcon has expressed concern about removing data without an *a priori* justification. The extreme disproportionality in these countries' population densities provides a clear *a priori* basis for their exclusion from the dataset.

11.6 The approach to deriving a single price point could be simplified

The approach to setting a single price could be simplified.

The approach in Step 6 of the methodology is unnecessarily convoluted and does not adequately account for the impact of population density on final spectrum prices.

The filters used by DotEcon are either redundant or fail to reflect the impact on spectrum prices:

- The GDP filter is redundant, given that the revised benchmarking methodology already uses PPP-adjusted rates.
- The population density filter does not adequately reflect the impact of population density on spectrum prices.

A simpler Step 6 approach would be to base the single price on the geometric mean of the full sample, while explicitly accounting for population density by removing countries with extreme population densities from the sample.

11.7 Differing metrics used to derive single price for each of the bands

Depending on criteria outlined in Step 6, different statistical metrics are being used to determine a single price for each of the bands.

Exhibit 43: Price determiner for each of the bands

	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Price determined	Geometric mean of total sample	Upper cohort of population density	Geometric mean of total sample	Median of total sample

Source: DotEcon

As highlighted above, Step 6 of the methodology could be simplified by using a single sample with outliers removed (i.e. eliminating the GDP and population cohorts) to determine a single price. This would then allow the geometric mean to be applied consistently across all spectrum bands using one common sample.

In its previous benchmarking studies, DotEcon has recognised the substantial variation in spectrum prices across markets and concluded that the geometric mean provides a more appropriate measure of central tendency than the arithmetic mean or the median.

Exhibit 44: Spectrum price variation measured by the ratio of the highest to lowest observed values

	Sub-1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Highest/Lowest price multiple	16.8X	97.6X	144.2X	247.7X

Source: Coleago

11.8 The MSR approach better reflects the decline in spectrum prices than the new post 2018 approach

It is widely accepted that spectrum prices have been declining over time and DotEcon recognise this with the exception of 3.4GHz spectrum. To reflect price declines DotEcon take a simplified approach to focus only on benchmarks since 2018 for the Sub 1GHz and the Lower 1-3GHz band. “By excluding older observations, we avoid using valuations based on conditions that no longer apply.”²⁷ The only rationale for using 2018 cut off is that it leaves approximately half the data set.

The basic approach of using 2018 benchmarks is applied only to the sub-1GHz and lower 1–3GHz bands, as DotEcon’s statistical test does not consider the observed price declines to be material. This is despite the upper 1–3GHz spectrum showing a higher annual rate of decline than sub-1GHz and an overall real-terms price reduction of 53% since 2013.

Exhibit 45: Price declines since 2013

	Sub 1GHz	Lower 1-3GHz	Upper 1-3GHz	3.4GHz
Annual price declines	-6.6%	-11.1%	-7.6%	-1.5%
Real price decline from 2013-2025	-48%	-67%	-53%	-12%

Source: DotEcon

²⁷ DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

Significant reductions in the geometric mean with changes in the cut-off date indicates limited robustness in the DotEcon approach to reflect 2018–2025 price declines.

This approach does not reflect differential price declines that have been observed after 2018 for Sub 1GHz and Lower 1-3GHz and gives an equal weight to a benchmark in 2018 as to a more recent one in 2025. The use of 2018 cutoff is arbitrary, changing this date to 2019 or 2020 results in significant reductions in the geometric mean suggesting that this approach is not robust to statistical analysis.

For Upper 1-3GHz where benchmarks from 2013 are used, the study gives no consideration of the observed price declines.

Exhibit 46: Impact of changing the cutoff from 2018 to 2020 for Lower 1-3GHz

	2018 (Absolute geometric mean)	2019 (% change geometric mean)	2020 (% change in geometric mean)
Geometric mean	0.0310	-8%	-16%
Sample size	23	22	18

Source: Coleago

The MSR approach advocated in the previous ACMA benchmark study was more robust for accounting for declines in spectrum prices.

The MSR approach adopted in the Stage 3 benchmark study better captured the downward trend in spectrum prices. In our view, this approach should have been refined to address the criticisms raised, rather than being replaced with a less robust alternative.

Removing the impact of outliers and reinstating MSR would reduce the prices between 14%-44% and projected total value of AUD 5.6 bn (23% reduction compared to the ACMA updated preliminary estimate of AUD 7.4 bn).

Exhibit 47: Impact of adjusting for outliers and using MSR to reflect price declines

	Prices adjusted for outliers and MSR (AUD, full licence)		Total Industry bill (AUD million)		
	ACMA	Adjusted	ACMA	Adjusted	Change
700	0.7405	0.6395	1,945.9	1,680.6	14%
850	0.7558	0.6527	858.9	741.8	14%
1800	0.3030	0.2546	1,295.5	1,088.6	16%
2100	0.2757	0.2317	801.5	673.6	16%
2300	0.1596	0.0899	322.9	181.8	44%
2600	0.1621	0.0913	661.6	372.5	44%
3400	0.2052	0.1261	1,502.5	923.2	39%
Total			7,388.8	5,662.0	23%

Source: Coleago

DotEcon themselves recognise there may be better approaches than using a 2018 cutoff “At least in principle, it may be possible to capture trends over longer periods through a systematic econometric model. However, we have not attempted this as it would require significant investigation of the appropriateness of the fit of such a model to the data. Simply taking more recent benchmarks provides a simpler approach”.²⁸

In summary, the simplistic approach of using 2018 as a cutoff for two of the bands fails to reflect the observed price declines after 2018. Where no cutoff is applied, the absence of any adjustment for price declines similarly leads to a material overstatement of spectrum prices. The band most affected is Upper 1–3 GHz, where all benchmarks date back to 2013, despite evidence of a real price decline of 53% over that period. Given the risks associated with setting prices too high, a more robust approach to accounting for observed price declines needs to be adopted.

28 DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

“Regulators should not anchor administratively set prices to historical prices either those observed in other markets, or the market in question. Given the falling price of spectrum over the past decade, they are unlikely to reflect the current reality of the domestic market.”²⁹

11.9 Use of CPI is inappropriate without a robust approach for addressing spectrum price declines

The failure to account for the downward trend in spectrum prices is further compounded by the use of CPI to inflate historical values to derive a 2025 equivalent. As set out in the preceding paragraphs, we provide evidence that CPI is an inappropriate metric for determining spectrum prices.

Removing the impact of outliers and CPI and reflecting price declines by using MSR index would reduce the prices between 26%-56% and projected total value of AUD 4.8bn (35% reduction compared to the ACMA updated preliminary estimate of AUD 7.4 bn).

Exhibit 48: Prices after adjustment for outliers, CPI and MSR, and total Industry bill

	Prices adjusted for outliers, CPI and MSR (AUD, full licence)		Total Industry bill (AUD million)		
	ACMA	Adjusted	ACMA	Adjusted	Change
700	0.7405	0.5462	1,945.9	1,435.3	26%
850	0.7558	0.5575	858.9	633.6	26%
1800	0.3030	0.2182	1,295.5	933.1	28%
2100	0.2757	0.1986	801.5	577.3	28%
2300	0.1596	0.0697	322.9	141.0	56%
2600	0.1621	0.0708	661.6	289.0	56%
3400	0.2052	0.1073	1,502.5	785.4	48%
Total			7,388.8	4,794.7	35%

Source: Coleago

11.10 Future spectrum prices will likely fall with the release of new spectrum

The DotEcon study did not account for future releases of substitutable spectrum.

DotEcon argues that price declines have resulted mainly from increased spectrum being made available and believe that this effect may not continue, as additional spectrum releases are likely to be largely limited to mmWave bands, which have limited substitutability for the mobile spectrum bands considered in this analysis. *“Whilst there is evidence of trends over the sample period, we cannot assume that a similar downward trend will continue. During the sample period there was both re-award of previous allocated bands (1800 MHz, 2.6 GHz) on a newly liberalised basis and introduction of entirely new bands (e.g. 2.3 GHz, 3.4 GHz) adding substantial additional bandwidth. Looking forward now, additional spectrum release for cellular networks above 1 GHz is primarily expected in the mmWave bands. These bands may be significantly less substitutable for spectrum below 3 GHz both because of limited propagation and heavy power demands on mobile terminals.”*³⁰

This statement is untrue. The Draft 2025 FYSO Work Plan identifies several new allocations under consideration over the next five years, to 2029, in the 600 MHz, 1.5 GHz and 6 GHz bands. All of this spectrum is highly substitutable with the bands under consideration and will increase the supply of spectrum by 96%, which is likely to result in further price declines. This should have been reflected in the proposed spectrum prices.

²⁹ GSMA – Spectrum prices May 2025

³⁰ DotEcon - Review of the ACMA expiring spectrum licence pricing (2025)

To date, operators’ 3.4 GHz business plans have not reflected the potential impact of 6 GHz spectrum, largely due to uncertainty regarding auction timing and the amount of spectrum to be released. Based on our experience developing 3.4 GHz valuations globally, 6 GHz has, at best, been treated only as a sensitivity. As 6 GHz becomes more firmly incorporated into operators’ plans, it can be expected to exert downward pressure on 3.4 GHz prices.

Exhibit 49: Impact of possible new spectrum releases in Australia

	Current market spectrum	Likely new releases by 2029	Future total	% increase
Sub 1-GHz	200	80	280	40%
Lower 1-3 GHz	240	90	330	38%
Upper 1-3 GHz	238	0	238	0%
3.4 GHz	225	0	225	0%
4.4-4.8 GHz	0	200	200	n/a
6585-7100	0	500	500	n/a
Total	903	870	1773	96%

Source: Coleago

The uncertainty introduced by deferring price setting to account for future spectrum benchmarks undermine licensees’ ability to ascertain which of their spectrum to renew.

11.11 The inclusion of future benchmarking creates uncertainty for licensees

The only mechanism proposed to reflect future spectrum prices is the inclusion of additional benchmarks as they become available. However, no detail is provided on how these future benchmarks would be incorporated, or how observed price declines would be treated for example, whether the 2018 cut-off would continue to apply.

This lack of transparency creates uncertainty around future pricing outcomes, which in turn complicates licensees’ ability to assess the relative value of different spectrum holdings and to undertake robust planning for renewal decisions. This newly introduced uncertainty around future pricing undermines the ability of licensees to make rational decisions about which of their spectrum holdings are optimal to be renewed.

11.12 Public interest discount

To meet public policy objectives, a public interest discount should be applied to MNO ESLs. No affordability analysis has been provided to demonstrate that Optus and TPG can afford the updated preliminary prices, nor does the benchmark analysis incorporate a public interest discount.

12. Conclusion and recommendations

The ACMA should adopt risk based pricing in view of the complexities identified in the benchmarking

We recommend that the ACMA adopts a risk based pricing approach in view of the complexities we have highlighted in the benchmarking data set and assumptions.

- This dictates the need for a conservative approach in interpreting the benchmark data
- It is prudent given the asymmetrically higher risk if ESL fees are set too high (rather than too low).
- It will also ensure that ESL prices promote all the components of the long term public interest and reflect the public benefits that use of the spectrum will bring.

Exhibit 50 below compares the ACMA’s updated preliminary prices to our risk based prices for each of the 4 band groups, both with and without adjusting the benchmark data by the CPI.

Exhibit 50: Recommended ESL prices based on risk

365-day price / MHz / pop AUD 2025	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
20% benchmark price limit (real values)	0.0455	0.0083	0.0070	0.0087
20% benchmark price limit (nominal values)	0.0381	0.0083	0.0055	0.0071
ACMA updated preliminary price	0.0755	0.0307	0.0167	0.0217
% reduction (real values)	40%	73%	58%	60%
% reduction (nominal values)	49%	73%	67%	67%

	Risk based price - AUD / MHz/ pop full licence			Industry bill - AUD millions and % change vs. ACMA		
	ACMA	CPI excluded	CPI included	ACMA	CPI excluded	CPI included
700	0.7405	0.3743	0.4465	1,945.9	984 (-49%)	1,173 (-40%)
850	0.7558	0.3820	0.4558	858.9	434 (-49%)	518 (-40%)
1800	0.3030	0.0819	0.0820	1,295.5	350 (-73%)	350 (-73%)
2100	0.2757	0.0745	0.0746	801.5	217 (-73%)	217 (-73%)
2300	0.1596	0.0529	0.0668	322.9	107 (-67%)	135 (-58%)
2600	0.1621	0.0537	0.0679	661.6	219 (-67%)	277 (-58%)
3400	0.2052	0.0669	0.0823	1,502.5	490 (-67%)	603 (-60%)
Total				7,388.8	2,801 (-62%)	3,274 (-56%)

Source: Coleago and ACMA

If the ACMA maintains its proposed approach, benchmarking issues must be fixed and the resulting prices must address all public interest issues

However, if the ACMA decides to maintain its proposed approach of setting ESL prices according to the central estimates – geometric mean and median – it must:

- address the methodological issues we have identified; and
- still take a conservative approach and demonstrate that ESL prices promote all public interest objectives.

Our key recommendations if the ACMA takes this route are as follows:

- Exclude outliers that meet standard tests for identification and are backed up by clear a priori evidence – we estimate this would reduce the total value of spectrum by 11%.
- Adjust benchmarks by trends in mobile spectrum prices and remove the CPI adjustment. We estimate that removing the CPI adjustment would reduce the total value of spectrum by a further 16%. Adjusting the benchmarks for the falling trends in mobile spectrum prices would reduce ESL prices significantly further. We recommend the ACMA proposes a way to apply this factor and the MSR index used in Stage 3 could be a starting point.
- Adjusting for outliers and CPI reduces the total value of spectrum \$5.5bn.
- Finally, the ACMA should apply a public interest discount in view of the fact that mobile is an essential service and the public benefits it brings. As in Stage 3, we recommend that a similar discount to NBN and Rail is applied, i.e. 50%.

Exhibit 51 below shows the impact of adjusting for outliers and removing CPI compared to the ACMA's updated preliminary prices.

Exhibit 51: ESL prices based on benchmarking with Coleago amendments

365-day price / MHz / pop AUD 2025	Sub 1 GHz	Lower 1-3 GHz	Upper 1-3 GHz	3.4 GHz
Geometric mean excluding outliers	0.0725	0.0285	0.0149	0.0154
Geometric mean excl. outliers, no CPI adjustment	0.0619	0.0244	0.0116	0.0131
Geometric mean excl. outliers, no CPI & MSR adjustment	0.0557	0.0221	0.0073	0.0113
ACMA updated preliminary price	0.0755	0.0307	0.0167	0.0217
% reduction (exclude outliers)	4%	7%	11%	29%
% reduction (no outliers, no CPI adjustment)	18%	20%	31%	40%
% reduction (no outliers, no CPI & MSR adjustment)	26%	28%	56%	48%

	Prices adjusted for outliers, CPI and MSR (AUD, full licence)		Total Industry bill (AUD million)		
	ACMA	Adjusted	ACMA	Adjusted	Change
700	0.7405	0.5462	1,945.9	1,435.3	26%
850	0.7558	0.5575	858.9	633.6	26%
1800	0.3030	0.2182	1,295.5	933.1	28%
2100	0.2757	0.1986	801.5	577.3	28%
2300	0.1596	0.0697	322.9	141.0	56%
2600	0.1621	0.0708	661.6	289.0	56%
3400	0.2052	0.1073	1,502.5	785.4	48%
Total			7,388.8	4,794.7	35%

Source: Coleago and ACMA

The logo for Optus, consisting of the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
Departmental consultation

***Draft
Radiocommunications
(Ministerial Policy
Statement – Expiring
Spectrum Licences)
Instrument 2024***

PUBLIC VERSION

April 2024

EXECUTIVE SUMMARY

1. Optus welcomes the opportunity to provide feedback to the Department's consultation on the draft *Radiocommunications (Ministerial Policy Statement – Expiring Spectrum Licences) Instrument 2024* (the draft MPS).
2. The use of spectrum, subject to the MPS, for mobile services delivers billions of dollars of economic activity and many thousands of jobs each year. Multiple reports demonstrate that the annual Australian economic uplift due to 5G mobile services amounts to between \$30-60 billion in 2030.¹ Globally, the GSMA predicts the continued use of low band spectrum for 5G mobile networks will contribute \$130b in economic growth in 2030.² In America, BCG predicts that by 2030, 5G will have contributed from US\$1.4 trillion to US\$1.7 trillion in US economic growth.³
3. The single largest risk to the delivery of the predicted economic and jobs growth is a lack of certainty around ongoing spectrum availability. Ensuring the expiring spectrum licences process supports the ongoing economic and social benefits of mobile services must be the priority of the MPS.
4. Optus generally supports the draft MPS. In particular, Optus welcomes the recognition of the importance of continuity of service and a sustainable investment environment. Support for these policy objectives will ensure continued economic and jobs growth, and in turn help realise wider Government policy priorities relating to regional connectivity and Closing the Gap.⁴ The MPS should explicitly state that continuity of services and the promotion of sustainable investment are the priority objectives for the ESL process.
5. However, the MPS should provide further guidance as to the policy intention behind the competition related objectives, in particular “facilitating opportunity for new entrants and use cases, including for low earth orbit satellites”. Optus cautions against any changes to existing arrangements designed to simply support entry for the sake of it. Actual or potential fragmentation of spectrum can have disproportionately adverse customer consequences for existing mobile network performance and coverage.
6. The ESL process and the ACMA's decision-making framework provide a real opportunity to deliver for Australia's digital future. In an uncertain industry and investment climate, the Government should seek to provide the certainty required, through the MPS or otherwise, to promote investment and innovation in the sustainable supply of critical communications networks and services for the long-term benefit of Australians.
7. Optus submission sets out some high-level policy considerations that should be reflected in the decision-making framework for ESLs. We then provide specific feedback on the policy objectives set out in the draft MPS. Optus would welcome the opportunity to discuss our feedback with the Department to help ensure that the ESL process delivers for the long-term public interest of Australia.

¹ AMTA, 2021, 5G Unleashed; Optus, 2021, 5G Impact; PwC, 2020 Global Impact of 5G; CSIRO, 2018; BCAR, 2018, Impacts of 5G on productivity and economic growth.

² GSMA, 2023, Socio-Economic Benefits of 5G. The importance of low-band spectrum.

³ <https://www.bcg.com/publications/2023/accelerating-the-5g-economy-in-the-us>

⁴ as reflected under “connectivity and investment in regional areas to deliver improved services to end users”

EXISTING SPECTRUM ARRANGEMENTS ARE FIT FOR PURPOSE

8. Spectrum licences are afforded a high degree of exclusivity and certainty under the *Radiocommunications Act 1992* (“the Act”).⁵ This has made the licence type suited to the long-term investment required for multiple generations of mobile network deployment. As a result, the Australian mobile market is one of world’s leading in terms of penetration and speeds. Australia is served by multiple advanced 4G and 5G mobile networks, supplying data throughputs that rank amongst the best in the world.
9. Mobile services, supplied using long term spectrum licences, enable greater productivity growth and result in more jobs throughout the whole economy. Numerous economic studies support this conclusion, including:
 - (a) Deloitte Economics forecasts that adoption of 5G technology in Australia could increase the size of the economy by \$70 billion in 2030 in 2022 dollars.⁶
 - (b) Optus, using PwC modelling, expects the widespread rollout and adoption of 5G in Australia could increase the economy’s GVA by approximately \$36.7 billion, equivalent to 1.2% of economic value by 2030.⁷
 - (c) The Federal Government’s Bureau of Communications and Arts Research estimated that 5G will result in a \$1,400-\$2,000 increase in GDP per capita by 2030. This equates to a total contribution of \$42-60 billion.⁸
10. Global studies produce similar estimates. The GSMA predict that 5G is expected to yield more than \$960 billion in additional GDP value-add to the global economy, or approximately 0.70% of global GDP in 2030⁹ – of which 87% comes from spectrum ranges that are subject to ESLs.
11. Optus submit that the MPS should recognise that changes to existing spectrum arrangements risks these public benefits and risks future investment and innovation in critical infrastructure and the ongoing supply of essential services.

Early certainty of ESL renewal is important to Australia’s digital future

12. Digital connectivity is essential to Australia’s economy and society. National mobile networks and services are a central component of Australia’s digital infrastructure, connecting Government, businesses and consumers, enabling new vertical industries and supporting the realisation of key Government policy objectives for an inclusive, secure and prosperous Australia.¹⁰
13. The billions of dollars of investment made by mobile operators to deploy national mobile network infrastructure and deliver essential services across Australia has been premised

⁵ For example, sections 60B, 105 and 138 of the Act support the relative exclusivity of spectrum licences by limiting the ACMA’s power to issue class and apparatus licences (respectively) that overlap with spectrum licences while certainty of access is implied in the long-term duration of spectrum licences under s.65 of the Act and the protections afforded to licensees regarding variation or resumption of spectrum licences by the ACMA (chap 3).

⁶ AMTA, ‘5G Unleashed: Realising the potential of the next generation of mobile technology’ *Australian Mobile Telecommunications Association* (2022)

⁷ Optus, ‘Submission in response to ACCC Consultation Paper Allocation limits advice for 850 MHz expansion band and 900 MHz band spectrum allocation’ *ACCC* (December 2020)

⁸ Bureau of Communications and Arts Research, ‘Impacts of 5G on productivity and economic growth’ *Australian Government Department of Communications and the Arts* (Aprile 2018). Assumes population of 30 million.

⁹ GSMA, ‘The Socio-Economic Benefits of Mid-Band 5G Services’ (February 2022), p.11

¹⁰ The broader socio-economic benefits of mobile networks and services are well documented. GSMA research “Mobile technology: two decades driving economic growth”, 2020, shows that the baseline economic impact of mobile services increases when upgrading from one generation of mobile technology to the next (15% from 2G to 3G and 25% from 2G to 4G).

on access to spectrum via long term licences. However, the mobile sector is at an inflection point with the demand of digital infrastructure investment coupled with long-term decline in returns on invested capital (ROIC) raising the prospect of a digital investment gap.¹¹ Ongoing certainty of access to spectrum is needed to support Australia's digital future.

14. Compared to the previous renewal process, this ESL process is inherently more uncertain for incumbent licensees. This is largely a result of the revised legislative framework and the significant discretion and independence afforded to the ACMA in making decisions about future use of ESL spectrum. An overly broad discretion, while providing flexibility for the ACMA, can create unnecessary uncertainty among stakeholders, acting as a disincentive to long term network planning and investment.
15. ESLs expire between 2028-2032 and the new legislative framework means that the ACMA can only provide a final view in response to a renewal application. Optus compares this to the regulatory framework for renewals in Finland, Canada and the UK where the expectation of renewal of spectrum licences is near automatic or very strong.¹² The Government's Statement of Expectations provides that the ACMA should be "risk based, and data driven" with a view to "manage risks proportionately". A lack of certainty that ESLs will be renewed raises risks to Australia's digital future that outweigh any perceived benefits of retaining discretion to re-allocate or auction spectrum for new uses.
16. Optus welcomes the ACMA's view that "continued support for wireless broadband (WBB) use of ESL spectrum bands is "likely conducive to promoting the long-term public interest".¹³ However, to minimise the risks of delayed or slowed investment the Minister should indicate in the MPS that certainty of renewal of ESL, at least in specified circumstances, is to be considered in the public interest.
17. Optus submits that the MPS further requests the ACMA to identify in what circumstances, incumbent licensees can be provided with sufficient detail of what spectrum holdings will be renewable and which spectrum might not be renewed well before the application window open. At a minimum, Optus submit that where no viable alternative demand or use case for ESL spectrum is established via the ACMA's Stage 2 consultation, the need to promote certainty of investment should weigh heavily in favour of the ACMA forming a "preferred view" that "renewal of ESLs to incumbent licensees is in the long-term public interest".

Renewal of ESLs at a nominal price is in the long term public interest

18. Mobile services are increasingly recognised as an essential service both as an input to the supply of other critical services and in its own right. However, the industry does not receive any of the regulatory benefits of designation as an essential service. For example, unlike electricity and water, the mobile sector has no regulated guaranteed return on the assets for the lifetime of the asset required to supply the service. In addition, water and electricity entitlements are in perpetuity with complete certainty and no risk to the past, existing or future investment.
19. Given the centrality of spectrum to a mobile operator's business model, the ESL process raises the risk of higher prices for spectrum access through potential auction processes or Government revenue raising via administrative renewal. Higher spectrum access

¹¹ Optus May 2023 submission to the ACMA's Stage 1 consultation paper citing Venture Insights report

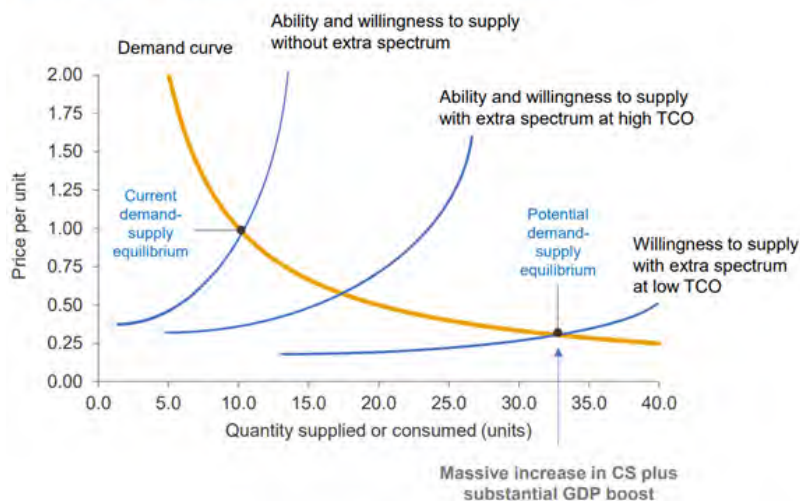
¹² Unless there has not been "productive use" of the spectrum or there are exceptional circumstances such as an overriding policy need

¹³ ACMA Expiring spectrum licences: stage 2 Information gathering, and views on uses of frequency bands and alternative licence conditions; March 2024; p.2

charges can have downstream effects, as consumers and business potentially bear the cost of operators having to recoup their investment through higher retail prices. Less capital for investment may also result in lower quality mobile services.

20. This diagram illustrates the potential broader public benefits of low spectrum pricing:¹⁴

Impact of large spectrum allocation at low prices (illustrative)



21. A sustainable telecommunications sector is in the public interest – industry sustainability must be an overarching consideration in the ESL process. The risk of a digital investment gap can be eased by low prices for ESL renewal.¹⁵ The ACMA proposes to issue spectrum access charges determinations at Stage 4 for each ESL spectrum band. Optus submits the MPS explicitly state that spectrum access charges payable by licensees should be set at a nominal level to support long term industry sustainability and network investment.¹⁶

ESL process should not be used to implement too broad a policy agenda

22. The Government has set out an ambitious industry policy agenda, including a list of critical technologies in the national interest such as Artificial Intelligence (AI), advanced manufacturing and information and communication technologies among others.¹⁷ The success of this agenda will rely in part on the availability of reliable, high quality and potentially high bandwidth connectivity services.
23. Therefore, it will be important to ensure that the regulatory framework is sufficiently supportive of the investment required to densify networks and deliver sufficient bandwidth at a competitive price point. National mobile operators benefit from economies of scale and scope that mean they are best placed to support these industry policy objectives and boost productivity, as long as they have sufficient spectrum to do so. For example, the ESL process can assist the Government’s regional connectivity objectives, which requires cost effective network deployment in regional areas depends on access to suitable low band spectrum.

¹⁴ Coleago, Mobile Spectrum and Network Evolution to 2025, p.33

¹⁵ ACMA states that where public interest tests are required (such as where a licence includes a public interest test or the licence is to be renewed for 10 years or longer) the ACMA will have regard to whether an “incumbent would be significantly compromised if the licence were not renewed and potential flow on effects” when assessing the public interest of renewing a licence; Our approach to radiocommunications licensing and allocation, pp.25-26

¹⁶ Section 294(2) of the Act

¹⁷ [List of Critical Technologies in the National Interest | Department of Industry Science and Resources](#)

24. However, certain policy objectives, including in the communications portfolio, cannot be delivered via spectrum management policy and should not be a policy priority of the ESL process. Optus submit that given the potential unintended consequences, the extent to which other policy objectives may be achieved through means other than changes to spectrum licence arrangements should be a guiding consideration in implementation of the ESL process. For example, linking improvements in network resilience and disaster responsiveness to the ESL process may, in our view, undermine the purpose of both processes and lead to duplication of outcomes.

Avoiding unintended impacts to quality of existing services in policy implementation

25. Optus consider that the application of the decision-making criteria for ESLs may have unintended adverse technical implications for mobile network coverage and performance. The main source of concern relates to spectrum fragmentation that may result from decisions to re-allocate ESL spectrum, particularly low band spectrum, to prospective spectrum holders, with no proven business case or flowing from access granted to spectrum by way of the operation of proposed new licence conditions, such as “Use-it-or-lose-it” (UIOLI) or “Use-it-or-share-it” (UIOSI). It is important that such impacts are factored into the broader framework.
26. These impacts may also be avoided by the ACMA consideration of whether non-ESL licensing, such as recent or ongoing AWL allocation processes in the 3.8 GHz band, have or will meet demand for alternative use cases.¹⁸

Low band spectrum utility is particularly susceptible to fragmentation

27. Changing the geographic scope of a spectrum licence increases (co-channel) interference risk due to the presence of licence boundaries. Interference can result in coverage loss beyond the carved-out area. This “out-sized” impact of a change to geographic area is particularly relevant to low-band spectrum, such as the 700 MHz band, currently heavily utilised by all mobile operators.¹⁹
28. The introduction of new boundaries, especially for low band spectrum, will result in “dead zones” with no mobile service between different licensees. Given the importance of low band to regional and remote coverage, this effect is more likely to disproportionately impact people living in regional and remote areas. Fragmenting existing low band holdings for the sake of enabling localised entry in regional Australia will only serve to undermine coverage and performance of existing mobile services. As the ACMA noted:
- “there are constraints on increasing the number of operators using low-band spectrum: Any approach to increase the number of operators using this spectrum is challenging as the ‘wide area’ benefits of the band can be lost by disaggregation into smaller frequency blocks of spectrum. ... Therefore, minimising the number of boundaries and avoiding boundaries through or near population centres is important to maximising the overall utility of the spectrum.”²⁰
29. The MPS should make clear that low band spectrum should be allocated nationally to ensure it is deployed without inefficient dead zones caused by licence boundaries.

¹⁸ As per the draft MPS under “scope and policy context for MPS” at section 5 of the draft MPS

¹⁹ Low-band spectrum propagates over long distances, making it highly suitable in supporting national wide-area networks. However, this also makes it extremely difficult to coordinate across co-channel spectrum boundaries and the distances required between radio sites to prevent harmful interference for licensees on either side would need to be extremely large, resulting in wasted spectrum.

²⁰ “Connecting the country: Mission critical”; Inquiry into co-investment in multi-carrier regional mobile infrastructure; House of Representatives Standing Committee on Communications and the Arts; para 2.24; p.17

Existing mechanisms enable spectrum access

30. Mandating use or sharing of spectrum via licence conditions runs the high risk of regulatory failure, by incentivising inefficient use and/or non-commercial investment. To the contrary, use of existing legislative mechanisms allows for coordinated access to spectrum that enables new use cases or operators while maintaining the operating integrity of the existing mobile networks. Through secondary trading and/or third-party access, mobile operators can develop coordination approaches that avoid the problems of geographic boundaries outlined above.

SPECIFIC COMMENTS ON THE DRAFT MPS

31. Optus provides the following comments on the specific policy objectives outlined in the draft MPS for the Department's consideration in finalising the MPS instrument.

Scope and policy context for the MPS

32. Optus understands that the matters set out under the MPS fall under the ACMA's fifth decision-making criteria of "support relevant policy objectives". In this way, the MPS instrument seeks to provide clarity on the policy objectives that the Minister considers the ACMA must have regard to in its ESL decision-making.²¹
33. As noted above, Optus considers that the ACMA's discretion in relation to ESL decision-making risks being unduly broad, creating uncertainty about the prospects of renewal and potentially undermining long term investment planning. Optus is concerned that the draft MPS may compound this by not confining the matters to which the ACMA must have regard to the MPS itself.
34. For example, the draft MPS states that "the ACMA will need to consider the broader communications environment within which these licences exist. This could include consideration of existing spectrum holdings which are otherwise outside the scope of the expiring spectrum licences process."²² While the example provides welcome clarification, Optus considers that the statement "will need to consider the broader communications environment" remains too open-ended.
35. In this context, it is unclear to Optus whether the broader communications environment would involve consideration of "the Government's broader communications policy agenda, which includes, but is not limited to" the policy matters listed in the MPS.²³ Optus submit that such an interpretation would create an inappropriately broad range of potentially irrelevant policy issues for the ACMA to have regard to in its ESL decisions.

Supporting service continuity for end users, particularly where no alternative service is available

36. Optus welcomes this policy objective and consider that the need to support continuity of service should weigh heavily in favour of renewing all ESLs in full.
37. The ESL process presents a risk to service continuity in a number of ways. For example, if an operator were to lose access to part of its spectrum holdings, this is likely to impact network coverage or service quality causing noticeable disruption to customers. Further, the announcement of an auction to re-allocate ESL spectrum would precipitate a period of uncertainty for an incumbent about how/whether to maintain services on that band or migrate them to other bands. The potential impact on end-users, including loss of service, could be very serious and must be afforded priority consideration in all ESL decisions.
38. Optus submit that prioritising continuity of service will promote the "public interest" whereas a change in licensees would "put at risk delivery of services to a significant

²¹ Section 28B; the Act

²² Draft MPS; p.5

²³ Which states that the MPS is "made within the context of the Government's broader communications policy agenda, which includes, but is not limited to, Telecommunications Universal Service Obligation Reform, initiatives to improve digital connectivity for First Nations Australians and communities, the 2024 Regional Telecommunications Review, and activities to support the resilience of telecommunications networks and temporary disaster responses."

number of people”.²⁴ Given ESL spectrum is used to supply essential services across Australia, we consider that continuity of service should be the primary consideration, particularly where no, or limited, alternative communications services are available. Optus welcomes changes to the MPS to make this clearer.

Facilitating opportunities for new entrants and use cases, including for LEO Sats

39. Optus agrees with the general sentiment that competition remains crucial to drive investment and innovation in mobile markets. However, such competition needs to be efficient. Optus is concerned that the MPS appears to be focused towards the potential for new entry or use cases.
40. Optus is concerned about the apparent rationale for the inclusion of this draft policy objective, namely to “explore future arrangements that reduce barriers to new entry” as recommended by the ACCC. Optus notes that incumbent licensees have, through open auctions, paid billions of dollars for access to spectrum to enable the deployment of mobile networks and further billions to deploy networks providing connectivity to over 30 million customers nationally.
41. While Optus readily concedes that the mobile sector is characterised by high barriers to entry due to the high cost of spectrum and high cost to deploy, we note that the ACCC’s recommendation is not based on a formal analysis of the current state of competition in the national mobile market. More specifically, there does not appear to be any assessment of whether existing legislative mechanisms are in fact unfit for the purpose of enabling the desired spectrum access. Establishing clear evidence of market failure should be a pre-requisite to regulatory intervention.
42. If lowering barriers to entry means supporting low-cost access to ESL spectrum for prospective licensees, then Optus considers such a step to constitute a significant departure from established regulatory practice – and is a step that will not promote the public interest. In such a scenario, it is incumbent on the ACMA to explain its approach to pricing and valuation transparently and through public consultation processes.
43. A further question remains as to the nature of the entry that might be supported – for example, any intervention to support entry into the national mobile market should be treated with a high degree of caution. Recent history would suggest that any new entry at a national level is highly unlikely. Optus notes that there have been numerous open auctions in recent years for mid and low band spectrum. None of which has demonstrated any real demand by new entrants. Any policy decision that aims to promote inefficient entry is likely to reduce the public benefit of spectrum use.
44. The MPS should make clear that licenced spectrum is not the only spectrum available for new entry. For example, the need to further support localised entry must be considered in the context of the ACMA’s recent administrative allocations in the 3.8 GHz band across metro, regional and remote areas. There are existing legislative mechanisms that support trading and third-party authorisation of spectrum. Calls for the re-allocation of ESL spectrum to new local area use cases or operators should be substantiated by clear evidence that market mechanisms for access to spectrum have and/or are failing.
45. We observe that the ‘demand’ for ESL spectrum appears to be theoretical and not supported by any market evidence. Optus notes that it has not been approached by any prospective local area WBB operators to access any of its ESL spectrum in recent years. Optus welcomes such approaches. In this context, Optus supports the reference to “the importance of ESLs to continuity of existing service coverage” under this draft policy

²⁴ ExMemo to Modernisation Act, p.34

objective as a relevant consideration to temper the introduction of new entry mechanisms simply for the sake of entry.

LEO satellite services provide an opportunity to connect the country and Close the Gap

46. Optus support entry of new use cases that help maximise the use of ESL spectrum holdings. Our collaboration with SpaceX is evidence that existing market mechanisms can be used to promote spectrum utilisation in regional and remote areas where there has been limited or no previous mobile coverage. Spectrum policy arrangements can help usher in the benefits of technological advancements that will see end-users seamlessly communicate across terrestrial and non-terrestrial (satellite) networks.
47. Our arrangement with SpaceX authorises the use of Optus ESL spectrum to deliver direct to mobile services to underserved geographic areas of Australia, thereby promoting the efficient use of this spectrum and helping to deliver on regional connectivity goals. The “IMT” satellite “DTM” use case was enabled by the flexibility afforded to licensees under the existing spectrum licence regime. An important benefit of maintaining the spectrum with the (terrestrial) spectrum licence holder is that the spectrum licensee remains ultimately responsible for interference management, lessening the burden on the ACMA and any affected adjacent licensees.
48. Optus observes that this policy guidance supports the reallocation of ESL spectrum to existing licence holders.

Connectivity and investment in regional areas to deliver improved services to end users

49. Optus supports this draft policy objective and notes that it reflects key elements from the Government’s broader policy agenda, including on Closing the Gap.
50. That said, Optus questions the extent to which spectrum policy and in particular, changes to arrangements governing ESL spectrum, will be able to deliver the desired outcomes. To the contrary, ensuring ongoing access to ESL spectrum at low cost for incumbents will enable and support investment to deliver improved services in regional Australia.

Promoting competition

51. Competition can drive investment and innovation and ultimately the supply of higher quality and more affordable services to consumers. Competition in the mobile sector has delivered enormous consumer benefit over the last 30 years in the form of high-quality affordable mobile communication services. Mobile competition includes infrastructure and service-based competition.²⁵
52. Optus generally supports the ACMA’s consideration of competition issues as part of its public interest assessment. However, we note that the reference in the draft MPS is one of three competition related considerations that may inform the ACMA’s decision-making.²⁶ Any confusion or inconsistencies between these three references should be clarified in any final MPS instrument.

²⁵ Infrastructure based competition describes competition on coverage, capacity, and capability of services, which depend upon the underlying network infrastructure. Service competition, on the other hand, occurs within the confines of available network infrastructure: MNOs compete on, for example, price and inclusions (including data and content). The promotion of competition will help deliver the productive, allocative and dynamic efficiency benefits.

²⁶ The others being “facilitating opportunities for new entry and use cases” and Criterion 3 “enhances competition” under the ACMA’s final framework.

53. Optus notes that in high fixed cost network industries which supply essential services to the public, competition should not simply be promoted at all costs – failed entry can have significant negative consequences for businesses, consumers, competition and the industry as a whole. Failed entry has also resulted in stranding spectrum, leaving spectrum fallow for years, which is anathema to the objectives of the Act. Australia has seen this happen many times, more than most jurisdictions, as the market has continually consolidated over the last few decades as it strived for sustainability and profitability (e.g One, Tel, Qualcomm, AAPT, Hutchison, Vodafone/TPG, Dense Air).
54. It will be important to balance competition objectives with other objectives to ensure that competition is efficient, sustainable and not simply enabling bad or improperly resourced actors, or even speculators, e.g. Dense Air. It follows that new entrants must demonstrate a viable and sustainable business case that is superior to the incumbents.

Capacity for sustained investment and innovation

55. Optus welcomes the inclusion in the MPS of the need for the ACMA to consider the “capacity for sustained investment and innovation” in its ESL decision-making. Optus submits that delivering this policy objective should largely favour renewal of ESLs, simply because of the significant investments that have been made by industry to date based on the existing spectrum licence arrangements.
56. Mobile is a high fixed cost industry. Mobile networks require significant large upfront capital investment to deploy physical infrastructure and network equipment followed by less expensive marginal investments to extend those networks and add new users. Mobile markets are also characterised by cycles of technological improvement and investment (4G to 5G, to 6G etc). The eventual obsolescence of older technology means that consumers will lose existing coverage, capacity, and capability if a mobile operator does not continually invest in the requisite infrastructure upgrades.
57. Optus has been a significant infrastructure investor since it entered the market over 30 years ago, having invested \$43.7 billion since 1992. Optus typically invests over \$1.5 billion in capital expenditure annually in its mobile network and services. This investment has been possible through the security and certainty from spectrum licences.
58. Investment and innovation play a crucial role in promoting the public benefits of efficient spectrum utilisation, through the introduction of new technologies and improved services.²⁷ The potential for a digital investment gap is compounded by the rising costs of capital. The ACMA should seek to maximise certainty to encourage investment and innovation where possible.
59. Spectrum policy settings must continue to support investment in networks and services to ensure Australia’s communications networks continue to evolve with technological developments and support our ongoing global competitiveness and productivity. Changing the core conditions of a spectrum licence or introducing new licence conditions will change the investment environment, potentially in a manner that is not conducive to the long-term investment horizons required for mobile network deployment.
60. In this context, Optus welcomes the statement in the draft MPS to the effect that “The ACMA should consider past, existing and potential future investment by licensees, as well as known market demand for spectrum and the capacity for other prospective licence holders to make the investment required to deploy and maintain an effective service with the spectrum.” Consideration of the viability of new entry should help reduce the likelihood of opportunistic potentially speculative claim for access being rewarded.

²⁷ ACMA, Consultation Paper. p.19

The logo for Optus, featuring the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA consultation

**Our approach to
radiocommunications
licensing and allocation
2024**

**Revised Draft Information
Paper**

Public Version

September 2024

EXECUTIVE SUMMARY

1. Optus welcomes the opportunity to provide feedback on the Australian Communications and Media Authority's (ACMA) consultation on its revised Information Paper "*Our approach to radiocommunications licensing and allocation 2024*" (the Information Paper).
2. The technological flexibility of Australia's spectrum licensing framework has enabled mobile network operators (MNOs) to rapidly deploy multiple generations of mobile technology. The certainty and exclusivity of spectrum access afforded to spectrum licensees has facilitated the billions of dollars of private sector investment needed to do so. This investment has delivered competitive national critical infrastructure networks enabling the supply of essential communications services to Australians. The public benefit derived from mobile spectrum is unrivalled.
3. The ACMA's management of spectrum must always be informed by the overarching legislative objectives of the Radiocommunications Act 1992 (the Act) namely, to promote the long-term public interest derived from use of spectrum.¹ The reforms of the Modernisation Act have provided the ACMA with broader discretion to adjust spectrum arrangements in response to market changes and ultimately to promote the long-term public interest. However, this increased flexibility creates uncertainty for licensees and has the potential to undermine network investment over the long term.
4. The Information Paper can serve a valuable function of clarifying the ACMA's general approach to licensing and allocation decisions, with a view to limiting the degree of uncertainty inherent to a more flexible legislative regime. While Optus welcomes the intent of the Information Paper to provide ex-ante transparency, we consider that it falls short of this and in fact introduces an unnecessary degree of uncertainty into the mobile network investment environment. This is not in the long-term public interest.
5. In Optus' view, the revised Information Paper does not clarify the general circumstances and factors relevant to the ACMA's discretion to intervene in spectrum arrangements. Rather than provide clarity upfront, the Information Paper indicates that the ACMA will rely on the incremental transparency of a case-by-case approach. The result is that the Information Paper provides little certainty or predictability about the ACMA's decision-making and appears inconsistent with a "long-term" approach to the public interest. To address this, Optus submits that the revised Information Paper should be amended to
 - (a) Strike a more investment friendly balance between transparency and certainty (or predictability) for licensees and the flexibility the ACMA needs to effectively manage spectrum – for example, by providing more fulsome descriptions of the factors that the ACMA may have regard to;
 - (b) More clearly articulate how the ACMA will employ a "balanced application of market and regulatory mechanisms" – in Optus' view, the revised Information Paper should make clear that the ACMA will, other than in exceptional circumstances, only intervene where it is established that the market is not facilitating and cannot facilitate public interest outcomes;
 - (c) Avoid any unnecessary "dilution" of spectrum licence rights that may undermine the terms of spectrum access that have supported billions in network investment over the last 30 years;

¹ Section 3, the Act

- (d) Provide greater assurance that a spectrum licence that has been used to supply essential services to the public and will almost certainly continue to be used to supply those services to the public will be renewed. In this way, the Information Paper should afford greater weight to the long-term public benefits derived from use of spectrum for public mobile networks and services.
- 6. Optus considers that the degree of uncertainty the Information Paper creates is not justifiable in the context of its potentially adverse impact on the deployment of national critical infrastructure and essential communications services. It also appears counter to the Government's communications policy objectives to improve regional and remote connectivity.
- 7. Optus urges the ACMA to reflect on whether it is in the public interest to introduce further uncertainty into the investment climate of an industry critical to Australia's future and experiencing long-term declines in returns on invested capital (ROIC). Rather than preserve an unnecessarily broad discretion to adjust spectrum access under spectrum licences, Optus urges the ACMA to adopt a default assumption that the use of spectrum licences for mobile services promotes the long-term public interest.
- 8. Optus considers that, if the Information Paper is published without further amendment to address the above concerns, it will constitute a missed opportunity to provide critical ex-ante transparency to stakeholders to help promote network investment. Optus provides further explanation for its concerns below and also refers the ACMA to the submission from the Australian Mobile Telecommunications Association (AMTA).

CLEAR AND TRANSPARENT DECISION-MAKING CRITERIA

9. Optus recognises that the reforms to the Act provide the ACMA with greater flexibility and independence in its spectrum management functions. The reforms were introduced in part to address perceived “inflexibilities” in the previous legislative framework.² The Spectrum Review also recommended legislative amendments require “the ACMA to improve and maintain the range, availability and quality of information available to the market, supported by appropriate powers to collect information from industry”³
10. It is well understood that uncertainty creates risk, which in turn can chill investment. Uncertainty in access to a critical input such as spectrum, including that created by regulation that is too broad or unclear, will undermine investment in radio networks and services. Any dilution of the spectrum licence rights that have supported mobile network investment to date changes the investment equation, with potentially adverse effects on the quality and reliability of downstream services.
11. To limit the uncertainty arising from the new legislative framework and the ACMA’s new powers, the ACMA should provide clear, concise and transparent information over the matters it will consider in its licensing and allocation decision-making. Transparency assists stakeholders and the ACMA to understand the boundaries of the regulatory framework and limits the risk of regulatory failure and/or disputation by delivering greater understanding and acceptance of decision-making.
12. Many licensing and allocation related decisions made by the ACMA under the Act are decisions that, upon application, may be subject to reconsideration by the ACMA or subsequently for review by the Administrative Appeals Tribunal (AAT, soon to be the Administrative Review Tribunal or ART).⁴ It is therefore important that the regulatory framework is comprehensive and transparent so that affected stakeholders can predict the ACMA’s approach to an issue with sufficient certainty to manage risk and plan accordingly.
13. In Optus’ view, the revised Information Paper preserves a broad and relatively unqualified discretion for the ACMA, and this is compounded by reference to other regulatory materials that may inform the ACMA’s decision-making.⁵ While the Act grants the ACMA broad discretion, this does not mean that the criteria to be applied cannot be clearly articulated and the ACMA’s discretion appropriately qualified. In fact, a broad discretion requires greater qualification to avoid a perception of arbitrariness and promote consistency in decision-making.
14. In Optus’ view this requires that the Information Paper provide sufficient detail as to how the ACMA will apply its licensing and allocation powers in the general case. In other words, what are the general considerations that will inform these decisions. Rather than listing the legislative provisions that provide the ACMA with its licensing and allocation powers, Optus suggest that the Information Paper should describe the considerations that will inform its decision-making in detail sufficient to enable an affected stakeholder to understand the process and the nature and scope of the matters to which the ACMA will have regard when performing its licensing and allocation functions.

² The licensing system – supporting material for the Exposure Draft of the Radiocommunications Bill 2017; May 2017; p.2 citing the findings of the Spectrum Review

³ [Spectrum-Review-report-FINAL - for publishing.pdf \(infrastructure.gov.au\)](#); p.7

⁴ See sections 285 and 287 of the Act

⁵ including the FYSO, Govt communications policy, Ministerial Policy Statements (MPS), the Government’s Statement of Expectations, and the ACMA’s Statement of Intent as well as the ACMA’s broader spectrum planning and decision-making processes and consultation obligations

15. By way of example, the ACCC has issued “A guideline to the declaration provisions for telecommunications services under Part XIC of the *Competition and Consumer Act 2010*” (the CCA).⁶ The stated purpose of the guideline is to “provide clear guidance about both the processes associated with declaration and the issues which the ACCC will generally consider in declaration decisions. It is also intended to assist those making submissions to the ACCC in the context of public inquiries considering declaration”.⁷ To this end, the guidelines explore how the ACCC examines whether the long-term interest of end-users (LTIE) will be promoted by declaration and the three objectives that the ACCC must have regard to in establishing whether the LTIE will be promoted.

The long-term public interest – further exploration of the concepts

16. The Explanatory Memorandum to the Modernisation Act provides that the public interest is at the discretion of the ACMA though needs to be “consistent with considerations that the ACMA currently applies to its spectrum licensing and management decisions”.⁸ In Optus view, it follows that the ACMA’s approach to spectrum licensing and management decision-making must be clear and transparent to provide affected stakeholders with a sufficient understanding of the processes and issues the ACMA will generally consider in assessing the public interest in order to make informed submissions to consultations about licensing and allocation decisions that may affect their business interests.
17. We acknowledge the list of factors in the Information Paper that the ACMA has indicated it will consider in assessing the impact that a regulatory (licensing or allocation) proposal will have on the public interest.⁹ However, this list, which captures a broad range of “interests” is not accompanied by any explanatory information or examples as to how these interests may be considered in specified circumstances. While we accept that the ACMA may not apply “measurements” or weightings to its public interest criteria, it can provide a general qualitative description of these criteria to help guide the reader.
18. We also note the statement in the Information Paper that the broad approach to the public interest the ACMA has outlined aligns with the Australian Government’s Policy Impact Analysis Framework.¹⁰ While it is not immediately clear how the ACMA’s approach to assessing the impact of a regulatory proposal aligns with the Framework, we agree that the Framework itself sets out a number of useful questions to be answered as a pre-requisite to any Government intervention.
19. In particular, we support the need for establishing a clear evidence base for intervention as well as consideration of its impacts and any viable alternatives.¹¹ We also strongly support the general statement in the Framework document that “Impact Analysis is required for all policy proposals of government that would be expected to drive a change in behaviour such as changes to rights, powers, obligations or responsibilities where those changes would have major impacts on our community”.¹²
20. However, we note that this Framework is principally intended to “inform Australian Public Service policy making” for the purpose of providing advice to government, rather than regulation. We consider that a clearer explanation of how these policy-oriented

⁶ ACCC; August 2016; available here: <https://www.accc.gov.au/about-us/publications/guideline-for-part-xic-declaration-provisions-for-telecommunication-services>

⁷ ACCC Part XIC Guidelines; p.4

⁸ Explanatory Memorandum to the Modernisation Act, p.38

⁹ Information Paper, p.4

¹⁰ [Australian Government Guide to Policy Impact Analysis \(pmc.gov.au\)](https://www.pmc.gov.au)

¹¹ E.g questions 1 (what is the policy problem you are trying to solve and what data is available?), 2 (what are the objectives, why is government intervention needed to achieve them, and how will success be measured? and 4 (what is the likely net benefit of each option?)

¹² [Australian Government Guide to Policy Impact Analysis \(pmc.gov.au\)](https://www.pmc.gov.au);p.5

questions may be applied to spectrum management decision-making is warranted. For example, an explanation of the triggers for any intervention into existing licensing arrangements would help stakeholders better understand how the ACMA promotes “the object of the Act and relevant government policy through a balanced application of market and regulatory mechanisms”.¹³

21. In this context, we note that the previous 2021 draft of the Information Paper stated that “there is significant alignment between the long-term interests of end-users, which guides the ACCC’s decision-making under the Competition and Consumer Act 2010, and the object of the Act”.¹⁴ We agree with this statement and are disappointed that the ACMA has removed it from the revised Information Paper. We refer back to the ACCC’s Part XIC guidelines, which highlight the importance of the impact on investment as a factor in the ACCC’s approach to the applying the LTIE, explaining that:

“To evaluate the consequences of declaration on the interests of end-users, the ACCC will be concerned with the effect on access seekers in terms of rivalrous behaviour and investment decisions. This should enable the ACCC to form a view about the economic benefits likely to flow to end-users in terms of price, quality and diversity of services as a result of declaration...

in determining whether declaration will promote the LTIE the ACCC must have regard to the extent to which declaration is likely to result in the achievement of the following three objectives: promoting competition; achieving any-to-any connectivity; and encouraging the economically efficient use of, and investment in, infrastructure. In practice, the ACCC must balance each of these objectives when deciding whether a particular course of action would promote the LTIE.”¹⁵

22. The Guidelines also highlight the importance of clarifying what is meant by a “long-term” approach to the public interest.¹⁶ Optus encourages the ACMA to consider whether there are aspects of the approach taken by the ACCC in its Part XIC Guidelines or the guidance materials of other spectrum regulators in finalising the Information Paper.

SUFFICIENT CERTAINTY AND EXCLUSIVITY OF SPECTRUM ACCESS FOR MOBILE SERVICES IS IN THE PUBLIC INTEREST

23. Telecommunications is recognised as an essential service and telecommunications infrastructure as critical infrastructure.¹⁷ Mobile networks supply essential communications services to Australians across the country, providing access to emergency, education, banking, health, social, commercial and government services. Mobile services keep us connected with work, family and friends, providing convenience and improving productivity.
24. Mobile networks are a critical component of Australia’s digital infrastructure, connecting government, businesses and consumers, enabling new vertical industries and supporting the realisation of key Government policy objectives for an inclusive, secure

¹³ Information Paper, p.4

¹⁴ 2021 draft of the ACMA Information Paper, p.33

¹⁵ ACCC Part XIC Guidelines, p.29

¹⁶ noting that it interprets this expression from an economic perspective as “the time within which suppliers can vary all factors of production (e.g in response to an increase in consumer demand)”.

¹⁷ See for example the “National principles to support streamlined telecommunications planning arrangements”; 4 July 2024; p.17

and prosperous Australia.¹⁸ Australia is a leader in 5G and the ever-increasing demand for mobile services is set to continue with the increasing take-up of 5G services.

Use of spectrum for mobile services is a “high-value” use of spectrum

25. The wider public benefits of mobile services are well documented, including by Optus in our submission to the ACMA’s Stage 2 Expiring Spectrum Licences (ESL) process. As has been demonstrated in that context, there is little or no alternative use or users for ESL spectrum currently held by MNOs that will deliver a higher value use to the public.
26. The ACMA has adjusted its description of spectrum licences from being “broadly used to authorise the use of *high-value* spectrum” to “*high-demand*” spectrum.¹⁹ Optus is concerned that the use of “high-demand” remains unclear and is not necessarily determinative of the “public interest” to be derived from the spectrum. This is compared to a “high-value” use of the spectrum which Optus submits can be more readily linked to the degree to which that use case is “valued” by the public over the long term.²⁰
27. While related to apparatus licensing arrangements, we note in the ACMA’s 1800MHz and 2GHz band Options Paper, that the ACMA proposes to define “high-demand areas” as “any level 3 HCIS cell with more than 10 PTS base stations” at “a point in time”.²¹ As is set out in our submission to that consultation process, the assumption underpinning the ACMA’s approach is that current registrations represent the total demand in the apparatus licenced areas and that a prescriptive approach to allocation in the 1800MHz band guarantees access for Optus. However, this demand analysis does not reflect the reality that we have been unable to deploy in many locations due to failing coordination.
28. The ACMA should provide further clarification as to how the notion of “high demand” relates to its decision-making for spectrum licensing. In Optus’ view, whether spectrum is in “high demand” should reflect the extent to which a particular use case has or will deliver public benefit. Optus submits that spectrum that is used by or identified for public mobile services will be in “high demand” meaning that the ACMA can, by default, “have a high degree of confidence that the use of the spectrum [for mobile services] will promote the long-term public interest throughout the licences duration”.²²

Long-term capital-intensive network investment requires certainty of spectrum access

29. Mobile is a high fixed cost industry. Mobile networks require significant large upfront capital investment to deploy physical infrastructure and network equipment followed by low variable costs to extend those networks and add new users. Mobile markets are also characterised by cycles of technological improvement and investment (4G to 5G, to 6G etc). The eventual obsolescence of older technology means that consumers will lose existing coverage, capacity, and capability if a mobile operator does not continually invest in the requisite infrastructure upgrades. Optus has invested over \$45 billion into its networks over the last 30 years of market competition in Australia.
30. The role of spectrum in a network is to connect user devices and network equipment to network equipment and enable data transmission. Therefore, spectrum is essential to

¹⁸ The broader socio-economic benefits of mobile networks and services are well documented. GSMA research “Mobile technology: two decades driving economic growth”, 2020, shows that the baseline economic impact of mobile services increases when upgrading from one generation of mobile technology to the next (15% from 2G to 3G and 25% from 2G to 4G)

¹⁹ See page 6 of 2021 version of the Information Paper and p.8 of the revised draft Information Paper

²⁰ For example, by reference to the price paid for the spectrum and the downstream public benefit delivered.

²¹ 1800 MHz and 2 GHz bands – Review of planning arrangements outside of spectrum licensed areas – Options Paper – June 2024; p.3

²² Information paper, p.9

the function of a mobile network and the supply of essential mobile services to end-users. GSMA has observed “approaches which undermine mobile operators’ certainty of access to spectrum...risk jeopardising planned long-term, wide area 5G network investment” and in this context “mobile operators need certainty of access to significant amounts of licensed spectrum for a sufficient duration (e.g 20-year licences)”.²³

31. Optus also submits that how spectrum is used in a particular use case, including how it is relevant to network deployment decisions, should be a factor in the ACMA’s approach to licensing and allocation decision making.²⁴ For example, MNOs deploy their spectrum assets in line with their customers’ needs and their network deployment strategy to provide capacity and coverage to their customers. “Unused” spectrum is important to the cost-effective deployment of mobile network infrastructure – the availability of spectrum enables the spectrum licensees to respond effectively to a change in demand in a particular area by upgrading or building out their network. An absence of current use (whether by geography or bandwidth) cannot be taken as an absence of need to access spectrum in the future.
32. Therefore, assessing the efficiency of spectrum use at a specified point in time does not necessarily reflect how spectrum is utilised in mobile network deployment decision-making. Adequately capturing plans for use will be critical in determining spectrum utilisation and the licence type that may be suited to the use case – Optus submits that the ACMA should consider how to reflect this in its Information Paper. To this end, Optus strongly endorses the ACMA’s comment in the context of its ESL Process, that:

“holding unused spectrum can also potentially provide licensees utility by providing greater flexibility to deploy or adjust services on a needs basis in the future, particularly in bands where significant new releases of spectrum are not expected over the term of a licence. In such cases, the length of time that the spectrum has not been used, or underused, would need to be considered in connection with technology and investment cycles, and anticipated future use of the spectrum”²⁵

A dilution of spectrum access under spectrum licences is not in the long term public interest

33. Optus could not have invested the billions of dollars in our network or in acquiring spectrum without the technological flexibility and certainty of access to spectrum that the Act affords to spectrum licence holders. Indeed, a statement to this effect was included in the 2021 draft of the Information Paper where it said that

“Spectrum licences have broadly been used to authorise the use of high value spectrum over large geographic areas to support services such as wireless broadband. This stems from the Act providing spectrum licensees with a high degree of exclusivity and certainty, making the licence type suited to supporting scenarios where licensees have long-term investment requirements.”²⁶

34. Optus is disappointed to observe that the above reference to the “Act providing spectrum licensees with a high degree of exclusivity and certainty” has been removed from the revised Information Paper.²⁷ We also note the subtle change in tone in the description of the “conditions of use” for spectrum licences under Appendix A of the Information Paper,

²³ 5G Spectrum; GSMA Public Policy Position; June 2022; p.8 available at [5G-Spectrum-Positions.pdf \(gsma.com\)](https://www.gsma.com/5G-Spectrum-Positions.pdf)

²⁴ Optus June 2024 submission to ACMA’s Stage 2 ESL consultation paper; p.87-88

²⁵ ACMA ESL Stage 1 Consultation paper, p.20

²⁶ Our approach to radiocommunications licensing and allocation Implementing the *Radiocommunications Legislation Amendment (Reform and Modernisation) Act 2020*; March 2021, p.6

²⁷ Information Paper, p.8

which suggests to Optus that spectrum licensees cannot expect the same degree of exclusivity or protection from interference that they may have in the past.²⁸

35. A key objective of the Spectrum Review was to maximise the public benefit derived from spectrum “so that new and existing users of spectrum benefit from more certain and efficient allocation and re-allocation of spectrum and have greater opportunities for technological and services innovation.”²⁹ The reforms were also guided by the principles of “certainty – providing confidence about regulatory arrangements and spectrum access terms and conditions and promote international harmonisation in Australia’s interests”.³⁰
36. Optus considers that the revised draft Information Paper indicates that the ACMA intends to further expand its discretion to intervene in spectrum licensed spectrum. The result is a “dilution” of the exclusivity and certainty of spectrum access that has underpinned billions in mobile network investment to date. This is not in the long-term public interest. It is also contrary to the stated purpose of spectrum licences to “support long term investment certainty to licensees”.³¹ Any dilution of spectrum licence rights is particularly concerning in an industry climate of long-term declines in returns on invested capital (ROIC).³²
37. We acknowledge that a stated intention of the amendments to the Act was to provide the ACMA with flexibility in re-allocation processes to prevent “spectrum becoming “locked” into spectrum licensing” and enable new spectrum use cases and licensing approaches to be adopted as they emerge.³³ However, we do not consider that such flexibility should be left open ended, given the public interest to be served in supporting efficient network investment and deployment of critical infrastructure and essential connectivity services.
38. In the context of high-cost investments and low and uncertain incremental revenue, the ACMA must ensure that spectrum licensees continue to be afforded sufficient protections to support ongoing investment in network deployment and upgrades to deliver the high quality, high-capacity services the market demands. In order to better reflect these circumstances, the ACMA should amend the Information Paper to state that:
 - (a) Spectrum licences will continue to be afforded a high degree of certainty and exclusivity of access to spectrum;
 - (b) The impact on licensees and downstream services is a key consideration in the ACMA’s decisions concerning any changes to existing licence arrangements, including the introduction of any overlapping licences or co-existence arrangements – and we note is consistent with the content of the 2021 version of the Information Paper;

²⁸ For example, page 36 of the 2021 draft of the Information Paper states spectrum licences enjoy “Exclusive use within defined area and frequency range, however class and apparatus licences may be authorised to co-exist under specified circumstances. Interference protection in accordance with ACMA policies” while page 35 of the 2024 Information Paper states “Generally, exclusive use within defined area and frequency range, however class and apparatus licences may be authorised to co-exist under specified circumstances. Interference management in accordance with legislative instruments and ACMA policies”.

²⁹ [Spectrum-Review-report-FINAL - for publishing.pdf \(infrastructure.gov.au\)](#); p.10

³⁰ [Spectrum-Review-report-FINAL - for publishing.pdf \(infrastructure.gov.au\)](#); p.13

³¹ Information Paper, p.8

³² Venture Insights; State of the Telecommunications Industry; June 2023

³³ Explanatory Memorandum to the Modernisation Act 2020, p.26

- (c) The ACMA will consider the nature of technology deployment and the relevance of spectrum to deployment decision-making when considering whether competing use cases better promote the long term public interest;
 - (d) Analysing demand based on a specific point in time is only reasonable to the extent that new access or licensing arrangements are supported by evidence of a viable business case. In other words, it must be clearly established that demand is not being met, including via existing market-based mechanisms of spectrum access and that prospective licensees have a viable business case.
39. Optus also notes that the reforms sought ensure that “the rights of existing licence holders are not diminished in the transition to the new framework.”³⁴ Optus considers it reasonable to expect that existing spectrum licences remain unaffected unless agreed between the ACMA and spectrum licensees.

MARKET DRIVEN SPECTRUM OUTCOMES ARE MOST EFFICIENT

40. In Optus’ view, Information Paper indicates an intention on the part of the ACMA to adopt a more interventionist approach to spectrum management. Optus cautions against the ACMA using the increased regulatory flexibility afforded to it under the Act to adopt a “command-and-control” style approach to decision-making. There is broad consensus among economists that, “where they operate effectively, no human institution is better able to deliver economic welfare in the long run than well-regulated competitive markets”.³⁵ It is notable that the Spectrum Review identified that an objective of reform was to “provide for greater market-based activity” highlighting that;
- “given the inherent costs and inefficiencies in both governments and markets trying to jointly coordinate economic activity, the reforms provide a greater opportunity for Government to establish and promote the necessary conditions for market-based activity up-front with a view to limiting the extent to which further direct interventions are necessary. Noting that the Government would retain the right to intervene in specific spectrum management matters to achieve policy priorities”.³⁶
41. Market mechanisms remain the most efficient means of promoting the efficient use of spectrum. Regulatory intervention should only be contemplated where it is clearly established that the market is failing to deliver the desired policy outcomes. Even then, regulatory intervention should be approached cautiously so as not to undermine nascent innovation or chill investment in new technologies and solutions. While the ACMA must have the power to intervene to prevent underutilisation of spectrum, we consider that it should be made abundantly clear that such intervention will be the (rare) exception rather than the rule, and then only based on clear evidence that existing mechanisms of spectrum access have failed.
42. The revised Information Paper states that the ACMA intends “to promote the objective of the Act and relevant Government policy through a balanced application of market and regulatory mechanisms”.³⁷ Optus strongly urge the ACMA to confirm that market-based mechanisms remain the most effective means of promoting efficient spectrum use and

³⁴ Explanatory Memorandum to the Modernisation Act 2020

³⁵ Biggar, Dr Darryl; Public policy for regulators: Is “market failure” passe? Network; Issue 85 December 2022; p.1 accessible here: [Network \(acc.gov.au\)](https://www.accc.gov.au/publications/network/issue-85-december-2022)

³⁶ [*Spectrum-Review-report-FINAL - for publishing.pdf \(infrastructure.gov.au\)](#); p.14

³⁷ Information Paper, p.4

that ACMA intervention will be limited to situations where market competition are not operating effectively to deliver identified public policy outcomes.

Establishing market failure before intervening to promote the public interest

43. A spectrum regulator's spectrum management decisions inevitably impact the economics of mobile networks – and flow through to the affordability of essential mobile communications services for consumers and the broader economy. Increased regulation means an increase in regulatory costs – more resilient and secure networks will require increased investment. Delivering essential mobile services across Australia in a cost-effective and sustainable manner means avoiding inefficient costs on industry.
44. Optus suggests that the Information Paper include express confirmation that the ACMA will test whether market-based solutions are in fact failing to deliver the desired public policy outcomes before considering regulatory intervention. Such analysis would involve interrogating claims from prospective entrants that existing market mechanisms of spectrum access, such as trading and third-party authorisations, have not and will not deliver desired outcomes.
45. In Optus' view, the availability of a secondary market for spectrum access means that incentives to maintain and improve efficient spectrum use already exist.³⁸ Market driven spectrum arrangements, including for spectrum sharing such as via our MOCN agreement with TPG, also better facilitate fit for purpose interference management due to the better information available to commercial operators about the performance characteristics and objectives of their networks. We also note that the relative flexibility afforded to spectrum licensees within the spectrum space is central to enabling innovation such as satellite direct to mobile services. In other words, the long-term public interest to be derived from the use of spectrum can be delivered via market mechanisms rather than regulatory intervention.³⁹
46. Rather than presenting the ACMA's powers to intervene as an unqualified power to change arrangements to better promote the public interest, itself a very broad concept, Optus submits that the decision to intervene in spectrum licence arrangements should be clearly contingent on very sound and considered evidence that
 - (a) there is a problem to be addressed;
 - (b) existing market mechanisms are not fit for purpose and;
 - (c) any benefit of facilitating entry or co-existence outweighs any public detriment.
47. Optus also submits that the notion of dedicated "spectrum licence bands" is not necessarily problematic as long as the use of that spectrum continues to deliver for the long-term public interest.⁴⁰ As Optus has highlighted in numerous submissions, MNOs use of spectrum to supply public mobile services and deploy public mobile networks promotes the long-term public interest derived from that spectrum.
48. There are of course circumstances in which Optus considers that ACMA involvement is crucial – such as where the market is unable to effectively deliver defragmentation of spectrum holdings. For example, the 3.4 GHz band is highly fragmented, and not

³⁸ Cambridge Economic Policy Associates (CEPA), Renewing expiring spectrum licences: By Dr. Chris Doyle for SingTel Optus Pty Limited, 24 May 2024

³⁹ Under section 86 and 68A of the Act respectively

⁴⁰ As highlighted at page 25 of the 2021 version of the Information Paper, which states that "public interest test is designed to ensure that spectrum is used efficiently, by preventing it from being locked up in uses that no longer offer the highest value or the maximum public benefit"

conducive to efficient trading. An ACMA led defragmentation of the band will be the most expeditious means of overcoming fragmentation and the promotion of more efficient use of this spectrum. The ACMA could indicate the factors that might trigger intervention to assist the market to address the spectrum inefficiencies arising from fragmentation.

OPTIMISING SPECTRUM BANDS FOR SPECIFIC USE CASES

49. The GSMA has observed that “the core objective of spectrum management is...to enable spectrum to be used in a manner that will bring the greatest benefits to society”.⁴¹ GSMA also highlights that keeping Australia’s spectrum allocation aligned with international standards will be important for harmonisation with global networks.⁴²
50. The International Telecommunications Union (ITU) provides guidance on the use of spectrum for IMT and publishes recommendations on how it expects future technology, such as 6G, to develop and what spectrum is appropriate to support the delivery of new mobile services.⁴³ Given the influence that these and international standard-making bodies such as 3GPP have on the device ecosystem and supply chain, there are clear benefits to aligning Australia’s approach to spectrum with international frameworks.
51. The ACMA’s new powers to intervene enable it to change spectrum arrangements that might not otherwise be promoting the Australian public interest. However, overlapping licence arrangements or new co-existence frameworks must reflect careful consideration of the interference risks and consequent loss of spectrum efficiency that this can entail.
52. Optus wish to highlight concerns about the inefficiencies that may arise from allocation and licensing decisions that seek to accommodate too wide an array of use cases in a spectrum band as well as decisions to facilitate co-existence in spectrum licence space. Given the potential impact on existing and future use of spectrum licences, we consider that these matters should be better examined in the revised Information Paper.

Catering to too wide an array of use cases can undermine the public interest

53. Optus generally supports the factors that that the ACMA has set out as informing how it will “identify appropriate licensing arrangements.”⁴⁴ However, the Information Paper also states “In some bands, it may be appropriate to use a mixture of spectrum, apparatus and class licensing to support multiple uses by a range of different users and optimise the use of the spectrum access the band and in different geographical regions”.⁴⁵
54. Optus notes that the use of too wide an array of licensing arrangements, which entail various levels of interference protection and differing degrees of accountability and experience in interference management, raises the risk of sub-optimal spectrum outcomes for a band. The clear example is the ACMA’s approach to allocation of the “C-band” and in particular, band n78, or the 500MHz between 3300 and 3800MHz, which has been recognised as a pioneer band for 5G.
55. 3GPP standards recommend minimum contiguous bandwidths of 100MHz to deliver the spectral efficiency enhancements of 5G cost effectively. The wider the band in which 5G

⁴¹ Maximising the socio-economic value of spectrum – a best practice guide for the cost-benefit analysis of 5G spectrum assignments; January 2022; p.4

⁴² GSMA, 2022 accessible at [5G-Spectrum-Positions.pdf \(gsma.com\)](https://www.gsma.com/5G-Spectrum-Positions.pdf)

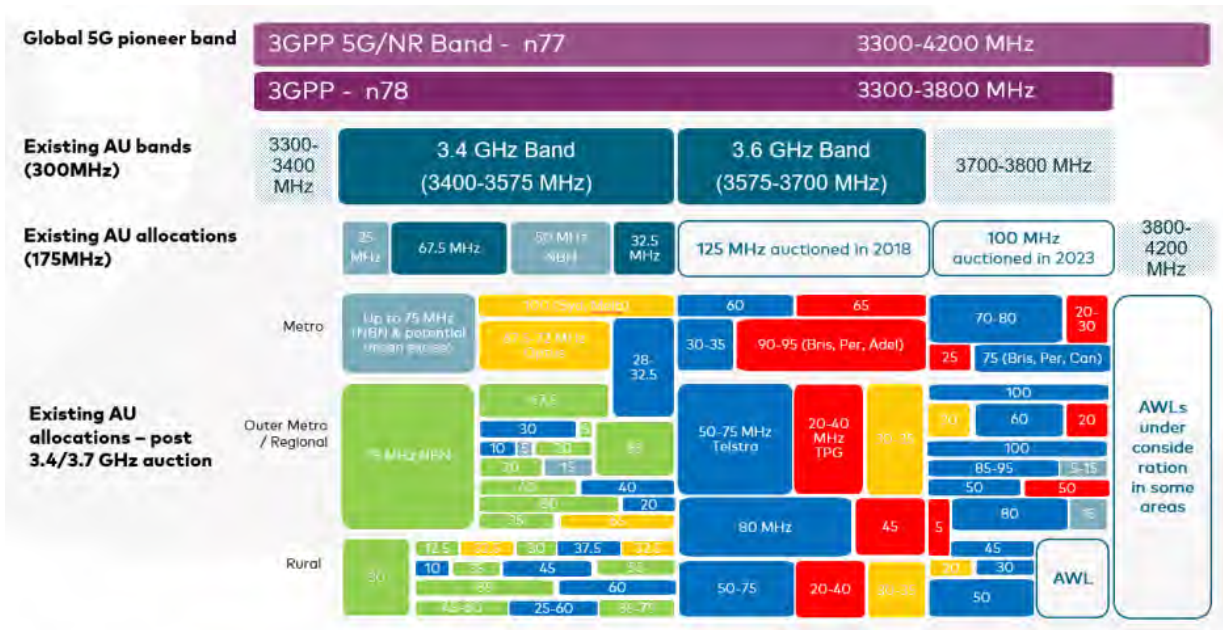
⁴³ ITU-R Recommendation M.2083 for 5G and ITU-R Recommendation M.2160 for 6G (IMT-2030)

⁴⁴ Information Paper, p.7

⁴⁵ Information Paper, p.8

is deployed, the higher the spectral efficiency.⁴⁶ Optus has long advocated for harmonisation across the 3.4-4.0GHz band and more specifically, for allocation of at least 100MHz of contiguous mid-band spectrum for MNOs and NBN Co, as per 3GPP.⁴⁷

56. However, the ACMA has implemented multiple different allocation processes and issued diverse licence types and conditions to cater to a wide range of different WBB use cases and scenarios.⁴⁸ In Optus view, the result of the ACMA’s approach to 3.4GHz to 4.0GHz spectrum has been to create a complex and highly fragmented spectrum landscape that ultimately undermines the potential utility and efficiency of the band.
57. In particular, the channel sizes for 5G mid-band deployment are generally limited to between 30 and 60MHz and the geographic areas covered by 3.4GHz and 3.6GHz and 3.7GHz licences do not align (depicted below). There is no restriction in the band that causes this; rather it is a result of allocation decisions by the ACMA.⁴⁹



Source: Optus

58. As a result of a range of allocation decisions by the ACMA, this band is not optimised for 5G. The resultant fragmentation will be hard to resolve via market mechanisms alone due to the fragmented and disparate geographical boundaries, licence technical conditions and inconsistent frequency allocations across the band. Optus consider that a key insight from this experience is to avoid designing multiple allocation processes to support too wide a range of use cases and to minimise the number of licence

⁴⁶ Deploying 5G in a 100MHz wide channel in upper mid-band spectrum delivers a 7% higher spectral efficiency compared to deploying it in only a 20MHz channel bandwidth. Spectrum utilisation is less than 100% for all 5G NR channel bandwidth options because the resource blocks do not fully occupy the channel bandwidth. However, the utilisation decreases with the channel bandwidth for 30kHz sub-carrier spacing as per ECC Report 287, Guidance on defragmentation of the frequency band 3400-3800 MHz, October 2018, page 41

⁴⁷ Optus submission to ACMA consultation on proposed spectrum re-allocation declaration for the 3.4GHz and 3.7GHz bands; May 2022

⁴⁸ ACMA has identified “3 broad categories of WBB use-cases” including “wide-area subscriber networks”, “more limited market subscriber networks over smaller, localised areas” and “mobile private networks”; see ACMA Draft FYSO 2024-29, p.18

⁴⁹ See Optus submission to ACMA’s ESL Stage 2 consultation paper for further information

boundaries, so the spectrum can be fully harmonised and optimised for the highest value and most efficient use.

Greater clarity about the ACMA's approach to co-existence in spectrum licence space

59. As Australia's only dual mobile and satellite network operator, Optus is well placed to understand the importance of well-designed co-existence arrangements to deliver Australia's communications needs. No licensee is entitled to operate in a completely interference free environment. Carefully designed technical frameworks along with traditional and modern interference resolution techniques are all necessary to support co-existence, minimise interference potential and ensure efficient spectrum utilisation.
60. However, increased spectrum use means heightened risks of interference which imposes costs and resourcing constraints on operators. Increased interference also undermines investment certainty and ultimately the value of spectrum licences. While operators can often be relied on to cooperate to resolve interference, disputes can arise, particularly between operators in different sectors. Co-existence is only as effective as the availability of recourse to the regulator in the event of an unresolved dispute.
61. Optus notes that the public benefits of co-existence arrangements must be carefully and transparently weighed against the potential negative impact on investment in well-established and proven business cases. As has been outlined above and highlighted in Optus as well as industry submissions to the ACMA,⁵⁰ MNOs are concerned about a "dilution" of spectrum licence rights. Some of this concern arises from the reference in the 2021 Information Paper, which remains in the revised Information Paper, that "class and apparatus licences may be authorised to co-exist under specified circumstances".⁵¹
62. Given the potential impact of co-existence on a spectrum licensee's use of spectrum, Optus is disappointed that the ACMA has not taken the opportunity to more clearly define the specified circumstances in which the ACMA may seek to authorise co-existence. In Optus' view, the Act clearly limits the instances in which the ACMA may re-allocate or issue overlapping licences in spectrum licence space.
63. However, while there are references to the relevant sections of the Act included in the footnotes to the Information Paper,⁵² there is insufficient discussion of the policy issues or market factors that may give rise to the ACMA seeking to accommodate new apparatus or class licensed services within, or adjacent to, spectrum licensed bands. Optus encourages the ACMA to address this in a revised Information Paper.

Licence duration

64. The ACMA has identified licence duration as "a key tool" in its "ability to balance the provision of investment and service predictability to licensees, with our ability to efficiently manage the spectrum through replanning, allocation and re-allocation to promote the long-term public interest". Optus agrees with this view and also supports the ACMA's view that licence terms may be adjusted (shortened) to support planning objectives, such as aligning expiry dates or to support defragmentation.⁵³

⁵⁰ For example, AMTA's submission; 700 MHz Technical Liaison Group (TLG) dated 11 August 2023, p.9

⁵¹ Information Paper, p.35

⁵² Footnote 5 of page 8 of the Information Paper

⁵³ Information Paper, p.14-15 where the ACMA state that "However, we may issue licences with shorter terms when shorter durations provide planning and policy utility by aligning expiry dates of multiple licences across a band or adjacent bands, or otherwise facilitating processes such as re-allocation or restacking."

65. It follows that adjusting licence terms should therefore be done only where suits the broader policy context. For example, Optus considers that the 7-year re-allocation period for incumbent WISPs in the 3.6 GHz band was excessive and has resulted in delays to Optus deployment in some regional towns and ultimately the underutilisation of important mid-band spectrum.
66. Optus also strongly support the need for public consultation on any proposal to renew apparatus licences with a long licence duration and suggest that any proposal to do so in spectrum bands that are also subject to spectrum licensing should not undermine the potential for the wider spectrum licensing in the future.

THE ACMA MUST CONSIDER INDUSTRY SUSTAINABILITY AND THE IMPACT ON INCUMBENT NETWORKS AND SERVICES

67. The Australian mobile industry is at an inflection point with declining revenue and the increasing levels of investment required to meet demand creating a digital investment gap. The capacity for operators to invest is further limited by the rising costs of capital. This investment gap threatens the ability of industry to invest sustainability in the networks and services that are critical to Australia's long-term prosperity.
68. Venture Insights warns that "these issues must be addressed to create the investment environment that will attract the capital Australia needs. In a global economy where capital is mobile, private capital investment cannot be sustained unless returns meet industry benchmarks."⁵⁴ Discussions around the essential nature of mobile service should also include discussions on how revenue can grow to support their sustainable provision over the long term.
69. The Information Paper represents an opportunity for the ACMA to alleviate some of the uncertainty faced by industry and to promote long term network investment in a difficult investment environment. For example, the Information Paper could highlight that a factor to be considered in the ACMA's licensing and allocation decision-making will be the degree to which existing uses of the spectrum continue to promote the public interest and what impact a change in spectrum arrangements would have on incumbent services. We also consider that the ACMA can provide greater investment certainty in relation to its proposed approach to "renewal statements" and "payment arrangements".

Renewal statements

70. Optus considers that long public interest to be derived from the use of spectrum will be better served by the ACMA providing greater certainty of renewal for licenses used by MNOs to supply public mobile services. A key issue is that the renewal arrangements set out under the Act create a significant degree of uncertainty about future access to spectrum that is crucial to the supply of essential services. For example, what are the matters to which the ACMA "may have regard" and "must consider" when deciding to renew a spectrum licence and more importantly what do they mean?⁵⁵
71. Optus does not consider that the revised Information Paper provides sufficient certainty of renewal for licences used to provide public mobile services. For example, in regard to a "specified circumstances" renewal statement, we are concerned that achieving the "specified circumstances" is merely a trigger for the ACMA to then exercise its discretion

⁵⁴ Venture Insights Report, p.5

⁵⁵ Section 77C of the Act

as to whether or not to renew the licence.⁵⁶ This approach does not enable a licensee to “assess the likelihood of future renewal” as suggested by the ACMA.⁵⁷ It also seems unsatisfactory, and unnecessarily uncertain, that the satisfaction of the “specified circumstances” should not in itself be the reason for renewal (assuming compliance with other licence conditions).⁵⁸ In Optus view, satisfaction of specified circumstances should at least weigh heavily in favour of renewal.

72. Without further explanation or context, it is also concerning that the ACMA may unilaterally vary the circumstances in which a spectrum licence may be renewed or omit or replace a renewal statement (i.e without the licensee’s consent). To promote certainty, it should be made abundantly clear that such an approach will be reserved for highly exceptional circumstances and will also be applied to remove a “specified circumstances” renewal statement where that specified circumstance has been met or are no longer applicable.
73. As Optus has highlighted in our submission to the ACMA’s Stage 2 ESL consultation paper, the increased levels of certainty and predictability created by a strong expectation of renewal will, among other public interest benefits, promote network investment, innovation and deliver service continuity for end-users that will outweigh any potential short-term gains from regularly re-allocating/auctioning the spectrum.
74. The GSMA has identified certainty and long licence tenure as critical to long term network investment decision-making.⁵⁹ In the UK, after an initial term of typically 20 years, licences become effectively perpetual, with the licence renewed annually on application. There are provisions for clawing back spectrum for spectrum management reasons with a five-year notice period. This is perceived as a sufficient period in the unlikely event intervention is required. Spectrum management reasons include major replanning due to changing use cases, international frequency harmonisation and coordination and interference management.⁶⁰
75. In the interests of certainty, Optus suggests that the Information Paper also provide that the ACMA will insert a renewal statement into new and renewed mobile spectrum licences to the effect that; “provided spectrum has been in continuous use and absent overriding policy needs, existing holders should have a strong expectation of renewal upon the expiry of the licence.”
76. Optus is particularly concerned that the ACMA has removed the list of “matters we might consider when assessing the public interest” in the context of having to assess the public interest due to a public interest statement or where licences are to be renewed for 10 years or longer.⁶¹ While we acknowledge that the Explanatory Memorandum to the Modernisation Act provides useful instruction on the scope of the ACMA’s discretion in this regard, we consider that for transparency purposes it would be helpful to reinsert these and any other relevant matters within the Information Paper.⁶²

⁵⁶ Information Paper, p.24

⁵⁷ Information Paper, p.24

⁵⁸ If for example a renewal statement in a spectrum licence provides that “Optus must realise X by Y” and Optus has met X then there is reasonable expectation that licence renewal should be guaranteed.

⁵⁹ GSMA; 5G Spectrum 2022; p.7

⁶⁰ [Review of Ofcom’s market-based approach to mobile spectrum management](#); we also refer to the regulatory approaches of leading jurisdictions such as Japan and Finland which in effect, provide unlimited licences

⁶¹ 2021 version of the Information Paper

⁶² Explanatory Memorandum to the Modernisation Act; p.34 states that the public interest is “a tool for ACMA to analyse the potential benefits that renewal of a spectrum licence may offer to the long-term public interest, consistent with the object of the Act. As such, some of the matters that ACMA may consider in making a decision

Payment arrangements

77. The revised Information Paper states that the ACMA have a “strong preference for upfront payment of spectrum access charges for spectrum licences”.⁶³ Optus submits that a rigid approach to payment for spectrum access charges for spectrum licences does not sufficiently take into account industry sustainability and the adverse impact of a potentially significant financial burden of upfront payment on MNO finances.
78. Optus seeks further information from the ACMA about why there is a preference for upfront payments apart from historical practice, to enable Optus and other spectrum holders an opportunity to address any concerns the ACMA may have regarding instalment payments. We note the unsold 700 spectrum licences were successfully paid in 3 instalments and this was completed in 2019, the last 26GHz instalment payment is in 2025 and apparatus licences are usually paid annually, all without event or non-payment.
79. Optus submits that the Information Paper clarify that while the ACMA has such a preference, spectrum licensees will be given the option to pay by instalments. The ACMA should also confirm that it may determine, by legislative instrument, whether a spectrum licensee may pay by instalments to support equalisation of payment arrangements (and thereby diminish the distortionary effects of ‘aligned maximum durations’).⁶⁴

regarding the public interest of renewing a spectrum licence include: *if the licence is used to supply essential public services and there is the potential that a change in licensees may put at risk delivery of services to a significant number of people, whether the incumbent can demonstrate substantial investment and past long-term use of the licensed spectrum, and considerations of the highest value use of the spectrum*”

⁶³ Information Paper, p.18

⁶⁴ Information Paper, p.18

The logo for Optus, featuring the word "OPTUS" in a bold, teal, sans-serif font.

Submission in response to
ACMA Consultation

**Expiring spectrum
licences – Stage 2
'Reply to comment'**

PUBLIC VERSION

June 2024

EXECUTIVE SUMMARY

1. Optus welcomes the opportunity to provide a submission to the Australian Communication and Media Authority's (ACMA) 'reply to comment' period for Stage 2 of the Expiring Spectrum Licences (ESL) process.
2. There were 25 submissions made to Stage 2 raising a range of perspectives on the future use of ESL spectrum. Optus does not reply to each submission individually, other than Telstra's which we consider warrants specific mention due to the adverse impact we believe its approach to Use-it-or-lose-it (UIOLI) and preference for re-allocation of "unused" spectrum via auction would have on sustainable market competition. For other submissions, Optus has identified common themes and messages that we consider need to be clarified to ensure that the ACMA's ESL decision-making will promote the long-term public interest to be derived from use of ESL spectrum.¹
3. Apart from submissions from the current ESL spectrum licensees, all submissions advocating re-allocation, or the imposition of alternative licence conditions, favour bespoke private networks. In Optus' view, such use cases for ESL spectrum offer inherently less public benefit compared to the use of ESL spectrum for national public mobile networks, undermining any case for changing existing arrangements to facilitate bespoke entry. We repeat that there are other spectrum bands and licensing types specifically designed to support bespoke private networks. The use of these arrangements will deliver the benefit of private networks without the very significant detrimental impact on national mobile networks.
4. In summary, many submissions demonstrate a short-term and narrowly focused view, with limited regard to how spectrum is used in the supply of public mobile services and national network deployment. If implemented, many of the proposals represent a threat to the long-term sustainability of effective competition in Australia's national mobile market. Optus notes that any consideration of the public interest in determining future arrangements for use of ESL spectrum must carefully weigh the real costs to national operators against any perceived benefits of prospective entry.
5. In this context, we note that some submissions express support for the alleged consumer benefits of alternative licence conditions and regulatory intervention, without any regard to the costs of implementation and the very real threat to the sustainability of a competitive national mobile sector.² Others make claims about the behaviour of MNOs (spectrum squatting or hoarding) without evidence.³ Further submissions also draw inaccurate comparisons with other jurisdictions (e.g., the US) or industries (electricity) that could create the false impression of market failure in Australia's mobile markets.⁴
6. As Optus' submission makes clear – there is no market failure that requires a change to the existing arrangements that govern the use of ESL spectrum. Previous auctions and renewal processes, combined with the existence of a secondary market for spectrum access, mean that the existing ESL spectrum allocation is efficient. Spectrum is not the only barrier to entry and holding it without the means to deploy competitive network risks that spectrum lying fallow. While we recognise that the secondary market for spectrum

¹ As per section 3 of the Radiocommunications Act 1992

² For example, ACCAN submission, p.1, 4 and 5

³ NSW and Victorian Government submissions, p.4 and p.14 and 15 respectively

⁴ Omnitouch and Consunet submissions respectively

trading may be thin, this does not mean that it is inefficient. Further, trades to facilitate defragmentation inherently facilitate efficient spectrum use.

7. Given the disproportionately negative impact that carving up existing spectrum holdings would have on national public mobile networks and services, Optus does not believe there is a case for changing ESL arrangements. Renewal of ESLs on the existing terms of access will continue to promote the long-term public interest. Optus sets out its “reply to comment” in more detail below.

CHANGING EXISTING ESL ARRANGEMENTS IS A DISPROPORTIONATE RESPONSE TO POLICY CONCERNS

8. Optus’ submission explains how the ESL Process can help support a number of Government policy objectives. Renewal of Optus’ ESL spectrum will enable Optus to continue to provide essential services across metro and regional Australia; to innovate and deploy new networks and services and continue to compete in the national mobile market. Meanwhile, existing mechanisms of spectrum access will enable parties to negotiate terms of access that limit the harmful effects of arbitrarily carving up national spectrum.
9. Optus supports the policy sentiment expressed in certain submissions, particularly in reconsidering approaches to bridge the Digital Divide and Close the Gap. However, we disagree that access to spectrum is the only or even the main barrier to addressing these long-term policy issues. It is well established that spectrum is one of many barriers to entry in mobile markets.⁵ However, characterising it as the “most critical barrier”⁶ misrepresents the effects of high network deployment costs, the difficulties of locating and accessing sites and the limited demand for services in remote areas.
10. It is these same factors that mean that carving up ESL spectrum for new local area private networks risks the continuity of essential services, particularly in regional areas, and undermines sustainable competition and investment in national public networks. National mobile network operators benefit from economies of scale, which enables cost-effective deployment of expensive radio networks and equipment over time. Competition between MNOs drives investment in networks and services, delivering long term benefits to Australians in the form of high quality and affordable mobile services. Re-allocating spectrum to prospective licensees will undermine the broader benefits of scale.
11. As a general principle, regulatory intervention should only be contemplated to correct market failures, which should be substantiated with evidence. Optus strongly cautions against accepting characterisations from certain submissions, particularly without clear supporting evidence, to the effect that licence holders are preventing secondary access

⁵ ACCC, Regional Mobile Infrastructure Inquiry – Final Report June 2023 discusses, among other factors, land access issues, the effectiveness of tower access arrangements and Telstra’s enduring competitive advantages; also para 335 of the Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No.2) [2023] identifies other barriers to entry to the national mobile services market as (i) large-up front sunk capital investment required (ii) economies of scale, (iii) brand perception and (iv) phase in technology cycle (first mover advantage)

⁶ ACCC submission to the Department’s consultation on draft ESL – Ministerial Policy Statement (MPS) 2024; p.1

to spectrum.⁷ We note that existing ACMA rules support trading of “one or more whole standard trading units” of a spectrum licence, which geographically corresponds to an area of 9km x 9km – i.e., sufficiently small areas to support local area use cases, individually or in aggregate.⁸

12. The long-term public interest of ensuring ongoing investment in national critical infrastructure and the supply of high-quality mobile services on a national basis outweighs the far narrower benefits that may arise from changes to ESL arrangements for local area uses. National mobile networks will deliver up to \$94 billion uplift to Australia’s GDP by 2030 and are relied upon to deliver critical services like emergency calling services. They are key to the social and economic well-being of our communities.
13. Regulatory intervention to enable greater local area access to low band spectrum for at best, speculative use cases, risks stranding valuable spectrum and the creation of new boundaries that will cause disproportionate harm and costs to national mobile networks. Intervention risks the very socio-economic benefits that existing ESL arrangements have enabled MNOs to deliver to Australia to date.
14. Optus considers that none of the submissions make a sufficient case for intervention to support new local area entry that would outweigh the resultant adverse effects on the network performance, service quality for end users or the business case for national mobile networks. Where the ACMA may be contemplating changes to existing arrangements to support the realisation of broader policy objectives, including to promote regional connectivity or Close the Gap, Optus recommends that the ACMA compartmentalise these objectives and consider how they can be better dealt with via other policy responses or via non-spectrum licensed spectrum.
15. The lack of certainty as to whether MNOs will be offered the opportunity to renew their ESL spectrum remains the main risk to the delivery of the public benefits to be derived from national mobile networks and services. Ensuring the ESL process supports the ongoing economic and social benefits of mobile services should be the ACMA’s priority in developing its preliminary view. Having considered all the submissions, Optus reiterates our view that ESLs should be offered for renewal on the same terms at a nominal price.
16. Optus also makes the following general comments regarding the ACMA’s consideration of submissions:
 - (a) In light of the ACMA’s stated preference for transparency, and the ultimate purpose of this reply to comment process, “commercial-in-confidence” (CIC) material should be given less weight in the ACMA’s formulation of its preliminary view;

⁷ For example, Vocus’ and Pivotal’s submission to the Departments consultation on the draft MPS 2024 and Pivotal’s (Stage 2) submission.

⁸ See section 9 and section 5 of the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2023; which defines standard trading unit as the “combination of (a) a geographic area corresponding to Level 1 cell; and (b) a part of the spectrum, where the lower and upper limits of the part are integers when described in Hertz”. ACMA permission is only required where a trade would result a spectrum licence that specifies less than the Minimum Contiguous Bandwidth (MCB) for that band, which is 5MHz for all spectrum licensed bands except 3.4-3.8GHz (10MHz) and mmWave (50MHz)

- (b) Where no robust business case for alternative use has been presented, then the ACMA should assume that the claim is less valid and should not form a preliminary view that such a claimed use promotes the public interest more than existing or planned use by an incumbent;
- (c) Where there is no alternative use for the spectrum which provides demonstrably greater public benefit, then the ACMA should form the preliminary view that ESLs should be offered for renewal;
- (d) Telstra's dominance and the potential for it to increase its dominance by acquiring more ESL spectrum is the real competition concern in the ESL Process, not the reduction of barriers to entry for prospective licensees; and
- (e) Economic value does not exclude "community benefit" – "commercial" public mobile services deliver social benefits and connections far beyond bespoke private exclusive use cases that truly "lock up" spectrum from secondary access.

TELSTRA'S APPROACH WILL EMBED ITS MARKET POWER IN REGIONAL AUSTRALIA FOR THE LONG TERM

17. Telstra's submission reflects its approach to competition more generally, which is that of a dominant operator. Telstra has been, and continues to be, highly dismissive of the state of competition in the national mobile market, underplaying the importance of national mobile market competition to delivering downstream benefits to consumers and society.
18. Optus has invested over \$45 billion into network infrastructure since it entered the market in 1993. It is Optus' network investment that has driven some of the fastest mobile network deployments in the world and across such a vast geographic area. The ACCC and the Competition Tribunal have recognised that Optus' network investment has driven Telstra's network investment.⁹ This is what effective competition does. The resultant infrastructure-based competition has delivered significant public benefit to Australians.
19. Telstra's characterisation of our MOCN agreement with TPG as "at the cost of reduced competition in regional Australia"¹⁰ highlights Telstra's lack of understanding of market competition and the distortionary effects of its market power. While the MOCN agreement will enable cost efficiencies in network deployment, these efficiencies will only serve to promote competition by enabling the accelerated deployment of a second 5G network in regional Australia by 2030. This network will be used by both Optus and TPG to better compete with Telstra and to compete with each other, delivering enhanced 5G competition for the long-term benefit of Australians. TPG's incentives to monetise its spectrum outside of the MOCN also remain unaffected.

⁹ E.g ACCC, Regional Mobile Inquiry, Final Report – finding at p.86-87 "Telstra and Optus have made significant investments in regional, rural and remote areas, despite the challenges, to differentiate themselves on geographic coverage" and Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No.2) [2023]; paras 224 and 672

¹⁰ Telstra's submission, p.51

20. Telstra’s advocacy of re-allocation of ESL spectrum via auction where there are no demonstrable plans to use the spectrum or to impose UIOLI across all renewed spectrum licences is self-serving and anti-competitive. Its approach will permanently foreclose terrestrial infrastructure-based competition outside of Optus’ existing network footprint and jeopardise nascent competition in satellite direct to mobile (DTM) services.

Telstra’s characterisation of its role in the market should be treated with scepticism

21. Once again, Telstra seeks to argue that its anti-competitive conduct is justified on the basis that it occupies a unique role in meeting the connectivity needs of Australians. The following claims demonstrate Telstra’s attempt to rewrite the history of network deployment in Australia and should be treated with healthy scepticism:
- (a) Telstra’s suggestion that its “support” for MVNO retail competition is in its economic interest, reflects the view of a dominant incumbent.¹¹ Telstra fails to mention its long-standing position on only offering MVNOs access to part of their network – a position only recently changed.
 - (b) Telstra’s statement that its spectrum assets have also allowed it to “be an active participant in various Government-supported co-investment programs”¹² is a misrepresentation of the distortionary effect of Telstra’s superior spectrum holdings on the award of funding under the MBSP and RCP – which have seen Telstra granted the vast majority of public funding support.
 - (c) Similarly, Telstra’s statements that “its history of investment and innovation”¹³ has delivered Australia’s largest mobile network with around 1 million km² more than any other operator underplays the competitive advantages afforded by its legacy, publicly funded network infrastructure – and the competitive detriment Telstra’s dominance has through the wider mobile market.
22. Telstra’s market position is the result of legacy network advantages, including with regard to spectrum. Telstra now seeks to use the ESL process to obtain any “unused” spectrum, via auction, either following expiry or as a result of the operation of “Use-it-or-Lose it” (UIOLI) conditions. If implemented, Telstra’s approach will only serve to further entrench Telstra’s market power for the long term, harming competition and providing no real long-term benefit to the delivery of communications policy objectives.
23. It will also have the effect of introducing new geographic boundaries at the edge of Optus’ network that would have a disproportionate effect on our network performance, quality of service and incentives to invest. The ACMA should remain cognisant of the observations of the Competition Tribunal that Telstra only invests where required to by the competitive pressure of Optus and TPG.¹⁴ Without the threat of investment by competitors it is unlikely that Telstra will invest to improve services and will be more able to maintain high prices and margins than might otherwise be the case.

¹¹ Telstra’s submission, p.21

¹² Telstra’s submission, p.25

¹³ Telstra’s submission, p.25

¹⁴ Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No.2) [2023]; paras 224 and 672

Any auction of “unused” spectrum will benefit Telstra and undermine the ESL Process

- 24. Telstra’s submission advocates an approach to ESL that will result in Telstra acquiring significantly more spectrum in regional Australia, thereby embedding an anti-competitive market structure, to the long-term detriment of regional Australians.
- 25. Telstra’s network footprint is geographically more extensive than Optus’, its nearest rival. Figures 1 and 2 provide a high-level depiction of the current extent of Telstra and Optus site deployments (per HCISL2 Block) as reflected in the RFNSA database. These two diagrams are overlaid in Figure 3, to more clearly compare “Telstra-only” and “Optus only” site locations.

Figure 1: Telstra Site Locations per HCISL2 Block and Adjacent HCIS L2 Blocks (RFNSA Existing June 2024)

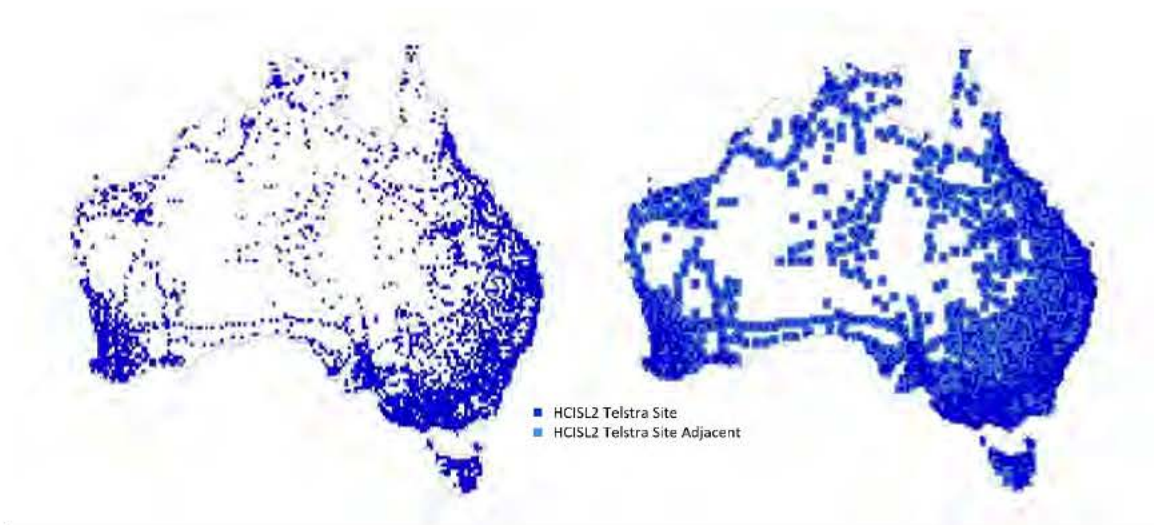
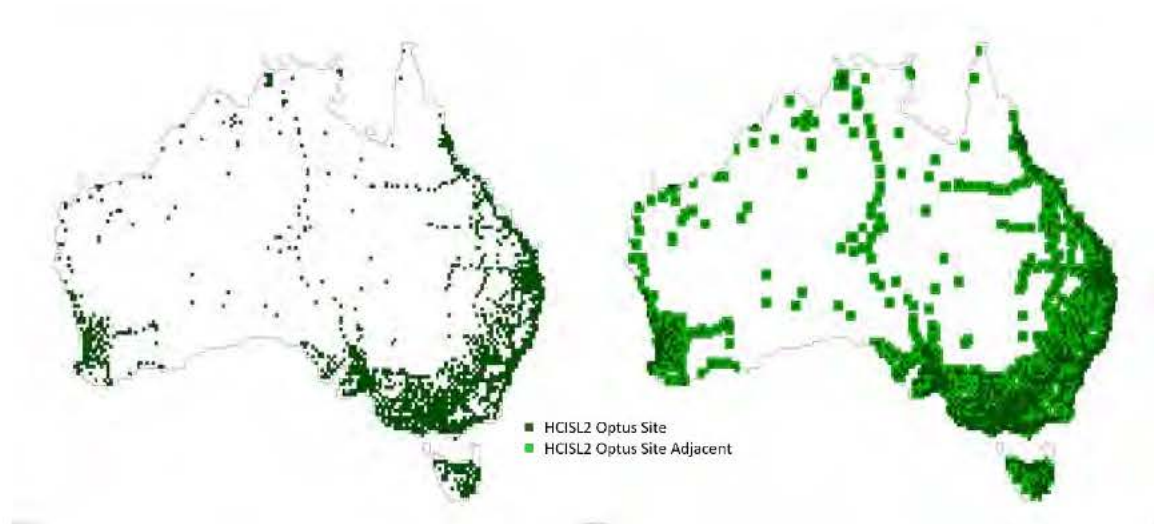


Figure 2: Optus Site Locations per HCISL2 Block and Adjacent HCIS L2 Blocks (RFNSA Existing June 2024)



- 26. Telstra now claims that as “Australia’s pre-eminent” regionally focussed operator, it should in effect obtain any unused or “under-utilised” spectrum.¹⁵ This is because Telstra

¹⁵ Telstra’s submission, p.19

suggest that ESL spectrum for which there is “no demonstrable plan” to use, should be re-allocated via auction.

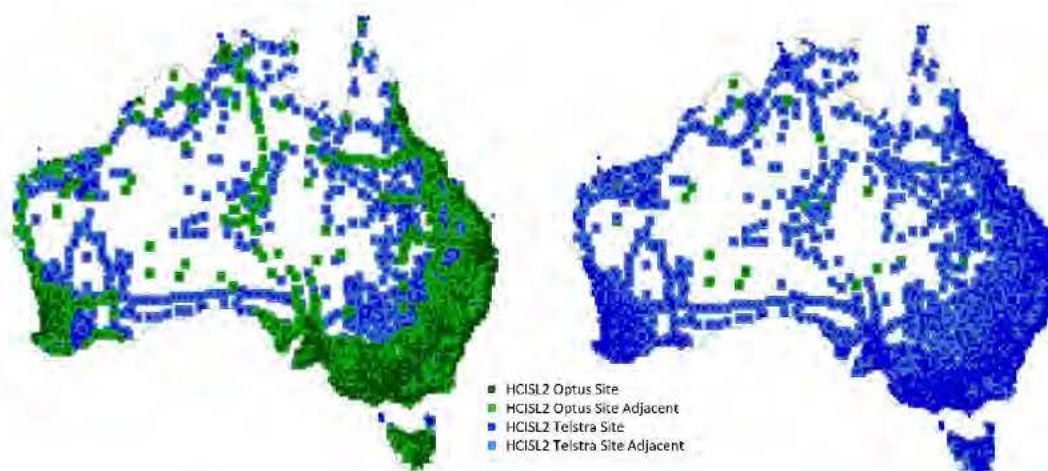
27. An auction in such circumstances will not be competitive as Telstra’s significant financial reserves, relative to the rest of the sector, will enable it to outbid any rivals. It will then be in a position to secure vast quantities of spectrum and effectively become a spectrum monopolist outside of Optus’ network footprint. The adverse impact will extend beyond regional and remote areas to competition in the national mobile market, given the importance of geographic coverage as a point of differentiation in consumer preferences.
28. Optus’ submission makes clear that the existing allocation of spectrum remains efficient because ESL spectrum has been previously auctioned or renewed and there exists a secondary market for spectrum. An auction should only be used to re-allocate ESL spectrum where an incumbent decides not to renew that spectrum. It would be a failure of the ESL process if either ESL spectrum is not renewed and was re-auctioned to be acquired by the existing holders or if Telstra was able to acquire more ESL spectrum via auction, thereby reducing competition in regional areas.
29. Telstra also states that competition limits have denied Telstra sufficient spectrum to efficiently serve its customers while providing “an enduring and inefficient surplus of spectrum to MNOs with far fewer customers in significant parts of their licence area”.¹⁶ This view ignores the fact that Telstra has significantly larger spectrum holdings than either of the other two MNOs which, combined with its legacy network infrastructure, much of it co-funded by public finance, has provided it with enduring market power in regional Australia. This assertion by Telstra was also rejected by the Competition Tribunal and should be similarly rejected by the ACMA.
30. Telstra’s view also downplays the significant and well recognised long-term benefits that Optus’ infrastructure-based competition has delivered for Australian end users. Optus’ investment has been enabled by our access to ESL spectrum. While Optus’ acquisition of 900MHz spectrum has somewhat levelled the playing field in low band spectrum holdings, Telstra continues to hold as much, if not more, regional mid-band spectrum as Optus and TPG combined.¹⁷
31. However, Optus has continued to invest and it is this investment that has put pressure on Telstra to invest – where Optus is unable to deploy commercially, Telstra is under no competitive pressure to invest and upgrade its network.¹⁸ This is highlighted in Figure 3 below.

¹⁶ Telstra’s submission, p.19

¹⁷ See for example Optus’ submission, p.50

¹⁸ ACCC; Reasons for Determination; Application for merger authorisation lodged by Telstra and TPG in respect of the proposed MOCN commercial arrangements and spectrum sharing Authorisation number: MA1000021; 21 December 2022; p.vii

Figure 3: Optus & Telstra comparison Maps based on Site Locations & Adjacent HCISL2 Blocks



32. Optus' submission highlights that a key consideration in examining use is understanding how spectrum is utilised in network deployment decision-making. To re-allocate spectrum via auction, enabling Telstra to expand their current spectrum holdings by securing further ESL spectrum, would only serve to undermine Optus' capacity to respond to changes in demand and lock in Optus' network footprint at the point in time at which use is assessed, foreclosing any opportunity of future investment or competition with Telstra beyond our current network footprint.¹⁹

Telstra's approach to UIOLI conditions is self-serving and will lead to regulatory failure

33. Telstra has stated its support for the imposition of UIOLI conditions on all renewed ESLs. Optus' submission explains that the imposition of alternative licence conditions is likely to have an anti-competitive effect given Telstra's existing competitive advantages mean that it will be less likely to be adversely impacted. The imposition of UIOLI risks undermining sustainable competition as Telstra will be more likely to be found to be "using" its spectrum than other MNOs and therefore less likely to lose it than its MNO competitors.²⁰ In addition, Telstra's greater financial strength means that it can deploy to retain its ESL spectrum which may not be possible for its competitors in the short term.
34. Telstra's support of UIOLI is primarily designed to limit Optus' ability to ever match Telstra on coverage. Optus submits that Telstra is seeking to use the ESL process to encourage a future spectrum licencing regime whereby Optus is not able to compete in all markets in Australia under the guise of supporting competition of new players. This is because there is little to no threat to Telstra from niche entrants particularly where their offerings are for private place-based network use.
35. The left-hand image in Figure 3 above illustrates the area where Telstra seems to suggest that UIOLI should be applied for "unused" spectrum and then auctioned to the highest bidder, with no meaningful allocation limits. For Optus, this is conceivably any

¹⁹ As Optus has noted, a granular approach to use imposes a retrospective condition on spectrum that has a comparable effect to a "renewal" statement (which cannot be imposed on ESLs issued prior to the Modernisation Act 2020); see para 1.19 and section 3 of Optus Stage 2 submission

²⁰ Optus' submission, p.81

area outside our existing network footprint. This is a blatant spectrum grab and will irrevocably harm competition.

36. Similarly, if conditions are imposed that allow smaller players to enter the market in place of Optus in these areas, Optus' capacity to compete in the national mobile market will also be significantly harmed. Existing market mechanisms already facilitate efficient spectrum use. There is an opportunity cost of not using spectrum, through the secondary market, if the secondary market use causes no harm to the MNO network. Optus argues that this should be sufficient to prevent inefficient use of ESL.
37. Telstra's submission also highlights the complexities of implementing alternative licence conditions, such as UIOLI, including the numerous, arguably subjective, threshold tests that the ACMA will need to determine to give them effect. Optus reiterates that such arrangements are highly unlikely to deliver more efficient outcomes than existing market mechanisms of spectrum access provide under the Act, risking regulatory failure.²¹ As recognised by the Competition Tribunal, a reduction in competitive constraint would also be likely to reduce the pressure that Telstra faces to invest in and upgrade its network.²²
38. If competitor national MNOs are prevented from accessing spectrum outside Optus' network footprint, then this will serve to foreclose any infrastructure-based competition in these areas forever. It will also undermine the opportunities of a "single network future" presented by the entry of LEOSat direct to mobile services use cases and future interoperability of terrestrial and non-terrestrial networks.
39. Entrenching Telstra's market dominance via auctions or the imposition of UIOLI will only serve to enrich Telstra's spectrum dominance and condemn regional Australians to poorer service outcomes for the long term, contrary to ESL policy objectives. We repeat that a reduction in competitive constraints would also be likely to reduce the pressure that Telstra faces to invest in and upgrade its network. Accordingly, the ACMA should reject Telstra's proposed approach.

REGULATED ACCESS WILL UNDERMINE SPECTRUM EFFICIENCY AND NETWORK INVESTMENT

40. A number of submissions from prospective licensees support UIOLI and UIOSI, but fail to consider the implementation risks, ignoring the most basic tenets of spectrum and interference management. The public benefits of continuing to use ESL spectrum for national public mobile networks and services, combined with the harm to such networks and services of carving up ESL spectrum, means that supporting prospective licensees access to ESL spectrum via the ESL process is not in the public interest.
41. Optus' submission clearly demonstrates that carving up ESL spectrum will cause disproportionate harm to national mobile networks. In summary:

²¹ See further section 5 of Optus' submission

²² Australian Competition Tribunal; Applications by Telstra Corporation Limited and TPG Telecom Limited (No.2) [2023]; paras 224 and 672

- (a) Introducing new geographic boundaries, particularly via any AWLs in low band, will cause spectrum denial and undermine efficiency objectives;
- (b) To carve up national FDD ESL spectrum now would also undermine the potential of IMT LEOSat DTM services;
- (c) Regulatory intervention to modify licence types or conditions resulting in non-renewal of ESLs or the imposition of UIOLI/UIOSI conditions fail the public interest test as they support private networks over national public networks;
- (d) Apparatus licences are highly contested and spectrally inefficient, as observed in multiple submissions. This is also Optus' experience when attempting to register devices in the 1.8GHz and 2GHz bands in remote areas. Ultimately, it is end-users who are affected due to inconsistencies in spectrum availability.

AWLs for low band will disproportionately harm national mobile network deployments

42. National spectrum licences are not consistent with AWLs – a spectrum licence is not national if it is “carved up” by AWLs. The adverse impact that AWLs would have on low band has been recognised by the ACMA and illustrated by Optus' case studies.²³ Optus strongly endorses the ACCC's view that “sub 1GHz band may be currently allocated for its ideal use case, i.e., wide-area mobile broadband deployment, due to its propagation characteristics”.²⁴ All the submissions from prospective licensees appear to overlook the technical issues of the suggestions they make in seeking access to low band.
43. For example, Pivotal claim that “low band spectrum is effectively lying fallow” in substantial parts of Australia and claim that the solution is “a combination of spectrum licencing, complemented by Area Wide Licences (AWLs) in key bands for place-based connectivity solutions, as opposed to a blanket national spectrum licence approach”.²⁵ Pivotal's solution is uniquely unsuited to the low band spectrum it claims it needs to more cost effectively deploy a regional mobile network. Pivotal offer no suggestions as to how interference between AWLs will be managed or the size of the AWLs needed to overcome co-channel interference between public and private networks. As this is the critical reason why the two licence types are not compatible to co-exist in low band, it is very concerning that it has not been addressed at all. In contrast, Optus has provided ample explanations about why is not feasible and would be spectrally inefficient.
44. We note that Pivotal's reference to the success of the UK's Shared Access Framework fails to acknowledge that none of the approximately 1600 shared access licences issued were for low band spectrum.²⁶ As noted in our submission, place-based connectivity solutions can be better delivered via non-spectrum licensed spectrum (e.g., 3.8GHz).²⁷ Optus also takes the opportunity to highlight Pivotal's acquisition of AWLs in the 3.4GHz band to illustrate the potential risks of extending such an approach to low band. As shown below, Pivotal's holdings effectively cause spectrum denial in all regional towns within their licence area, which is what prospective licensees accuse MNOs of doing.

²³ See section 7 of Optus' submission

²⁴ ACCC's submission, p.2

²⁵ Pivotal's submission, p.4

²⁶ OfCom; [Evolution of the Shared Access Licence Framework \(ofcom.org.uk\)](https://www.ofcom.gov.uk/consult/condocs/2023/2303/23030101/23030101.pdf); Call for Input; March 2023; p.4

²⁷ Optus' submission; p.39

Figure 45: Pivotel 3.4 GHz Band AWL Source ACMA RRL

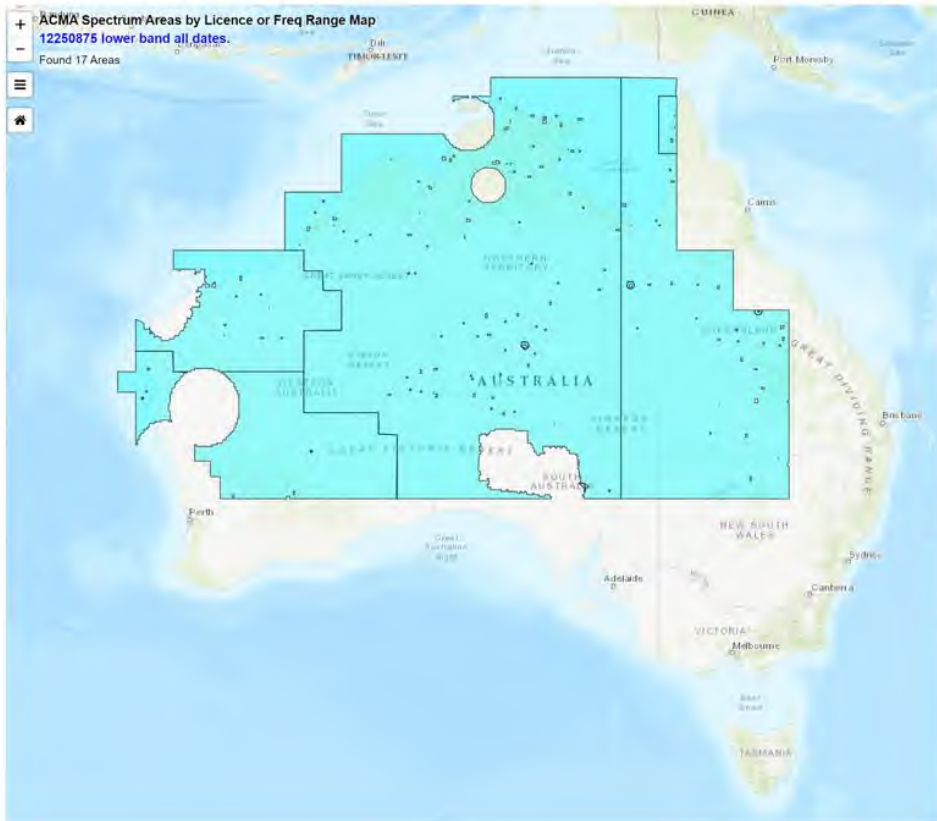
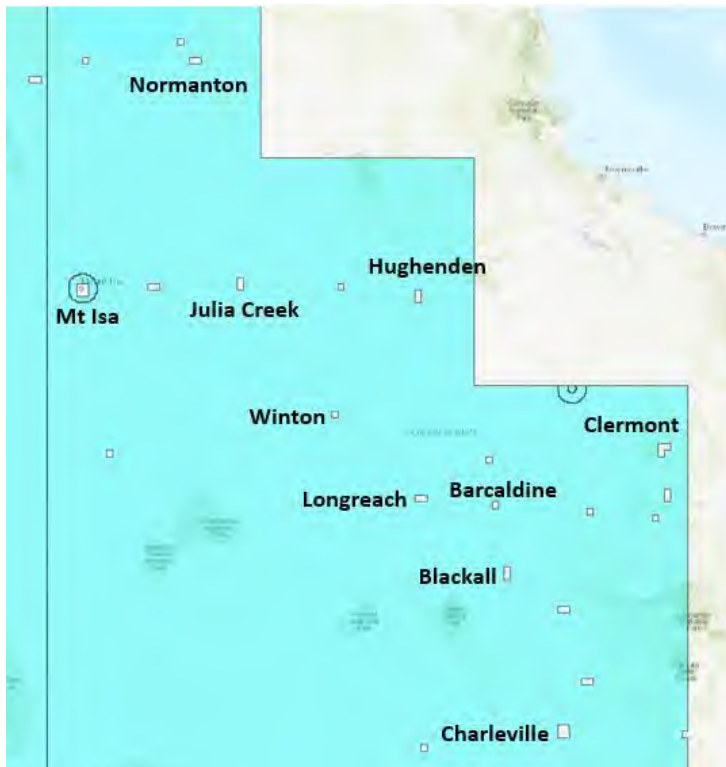


Figure 56: Pivotel 3.4 GHz Band AWL Source ACMA RRL Western QLD Zoom



45. This is a clear illustration of an acquisition of spectrum in a regional area that denies access to up to 80MHz of spectrum in the highest population centres where the need for spectrum is likely to be greatest. The “holes” in the spectrum map are too small to enable effective coordination, meaning that services will be denied to those wishing to operate in those smaller centres.
46. The implementation of an AWL regime in low band spectrum would have an even more devastating effect by preventing access to mobile services altogether in much larger “holes” than those present in Pivotel’s 3.4GHz AWLs. This is because low band spectrum, with its substantially more favourable propagation characteristics and associated interference, will be susceptible to harmful interference over much greater distances than mid-band spectrum. On this evidence alone, the ACMA has sufficient reason to reject the use of AWLs in low band.
47. We also consider that the “northern NSW” example in Connected Farms’ submission is not a valid representation of “locked up” spectrum as the issues they are confronted with are a result of operating next to the apparatus licenced 1800MHz and 2GHz areas, where they are required to coordinate with multiple licensees.²⁸
48. We also note Pivotel’s claims that the design of the 850/900MHz spectrum auction (2021) prevented it from acquiring 2x10MHz of regional spectrum.²⁹ Optus consider that the ACMA correctly rejected the proposal from prospective licensees (Pivotel) of allocating rural and remote low band spectrum as small geographical AWLs or apparatus licences in favour of wide area spectrum licences. Optus strongly encourages the ACMA to take a consistent approach for low band ESLs.

The market remains the most efficient means of facilitating access to ESL spectrum

49. As highlighted in Optus’ submission and the attached expert reports from Dr Chris Doyle and Coleago Consulting, the current allocation of ESL is efficient because (a) all ESL spectrum was initially acquired via auction and/or subsequently renewed and; (b) there is a secondary market for spectrum access supported by the Act. Further, spectrum is traded for commercial and spectrum efficiency enhancing purposes.
50. The ACMA has invited prospective licensees to identify if they have sought access to ESL spectrum via the secondary market. None of the submissions from prospective licensees provide public information confirming that they have sought access to spectrum from incumbents. For example, Pivotel does not confirm or deny whether it has sought access to ESL spectrum via the secondary market. It also redacts text in this section of its submission which means it is impossible for Optus or any other ESL holder to comment on the accuracy of Pivotel’s claims.³⁰ Similarly, Omnitouch claims that it has tried for several years to secure “subletting/leasing” agreements with no success but does not identify the ESL holder(s).³¹ While spectrum holdings differ, in most areas of Australia, including regional and remote areas, there are three MNOs with accessible spectrum holdings. Therefore, a prospective licensee could theoretically engage with all three MNOs to obtain the best terms of access for their desired spectrum.

²⁸ Connected Farm’s submission, p.10

²⁹ Pivotel’s submission to the Department’s consultation on the draft (ESL) Ministerial Policy Statement (MPS) 2024; p.3

³⁰ Pivotel’s submission, p.8

³¹ Omnitouch’s submission, p.4

51. Optus also dispute any suggestion that the geographic area of spectrum licences somehow limit access or are used by incumbents to prevent competitive entry for local area use cases.³² The existing ACMA spectrum licence trading rules enable trades of “one or more whole standard trading units” of a spectrum licence, which geographically corresponds to an area of 9km x 9km – i.e., sufficiently small areas to support local area use cases, individually or in aggregate.³³ Therefore, claims that incumbents are potentially acting anti-competitively to exclude local area rivals should be treated with suspicion, particularly where not backed up with clear evidence.
52. Other claims about the state of the market that Optus considers should be corrected:
- (a) Active neutral host models are not necessarily more efficient than MNOs, and in fact may raise monopoly concerns if a host becomes sole owner of spectrum in a particular area.³⁴ All three MNOs have divested passive infrastructure (i.e., created a passive neutral host market) and are concluding network sharing agreements (e.g., MOCN). These outcomes have been delivered by the market, rather than requiring regulatory intervention.
 - (b) While there are clearly documented processes to implement UIOSI/UIOLI,³⁵ facilitating such arrangements does not require the imposition of new licence conditions – rather the market is able to deliver such outcomes through negotiation between MNOs and access seekers.
 - (c) Omnitouch praises the greater levels of geographic segmentation in the US approach to spectrum licensing as enabling more MNOs in that country,³⁶ but does not acknowledge that geographic boundaries introduce much greater interference potential resulting in poor customer outcomes as described above. We also note the US has over 15 times the population of Australia with a much bigger addressable market able to sustain more networks.
 - (d) The spectrum trading market already functions in accordance with established trading rules and the ACMA’s role in overseeing spectrum trades is mainly to promote transparency, with ACMA “approval” (or permission) required only for assignments resulting in spectrum licences that specify a part of the spectrum that is less than the minimum contiguous bandwidth (MCB) for a spectrum band – the intention being to limit fragmentation of spectrum bands.³⁷
 - (e) There is a high risk of regulatory failure in seeking to “regulate national radio and infrastructure businesses in such a way that replicates incentive properties of a competitive market” – Optus submit that Consunet’s submission seeks to create a market for its DUST micro-licence trading technology rather than address any real market failure.

³² Vocus’ and Pivotal’s submission to the Department’s consultation on draft MPS 2024

³³ See sections 5 and 9 of the Radiocommunications (Trading Rules for Spectrum Licences) Determination 2023; which define standard trading unit as the “combination of (a) a geographic area corresponding to Level 1 cell; and (b) a part of the spectrum, where the lower and upper limits of the part are integers when described in Hertz”.

³⁴ One Wi-fi’s submission, p.1

³⁵ Omnitouch’s submission, p.8

³⁶ Omnitouch’s submission, p.4

³⁷ See section 10 of the Radiocommunications (Spectrum Trading Rules) Determination 2023 the MCB is 5MHz for all spectrum licensed bands except 3.4-3.8GHz (10MHz) and mmWave (50MHz)

Bespoke use cases should be supported via non-spectrum licensed spectrum

53. Optus recognises that there may be use cases that demand dedicated access to spectrum and in this regard, we note the claims from Boeing and the Australian Association for Uncrewed Aircraft Systems (UAS), Gilmour Space Technologies (telemetry links in 2GHz band) as well as the NSW Telco Authority and the Victorian Government (Public Safety Mobile Broadband at band 5 of 850MHz band).
54. In regard to PSMB, we note that other jurisdictions have also considered the economies of scale of MNOs as highly supportive of enabling national access for public safety and emergency services.³⁸ Further, because emergency services do not use spectrum all the time, and require priority treatment only when needed, dedicated spectrum is not required for this use case.
55. For other use cases, we note that if the ACMA considers that demand cannot be fulfilled via existing ESL arrangements and market-based mechanisms of access to ESL spectrum, then the ACMA should consider whether there is non-spectrum licensed spectrum that may be available. For example, there are AWLs in the 3.8GHz band, apparatus licences available in the 2GHz band, or class licensing arrangements that may be considered to complement existing LIPD arrangements.
56. Optus' position reflects the fact that opening up access to existing spectrum licenced spectrum for new use cases must not be done without balancing costs and benefits. The inevitable consequence of the ACMA introducing any UIOLI or UIOSI obligations into a renewed licence, where the outcome results in differential boundaries between MNOs on substitutable ESLs, will be a reduction in spectrum utility, efficiency, competition and public benefit. We point to the well intentioned, though highly inefficient, outcomes of catering to a diverse range of use cases in the 3.4 – 4.0GHz band. As has been highlighted many times, the interference risk of new inefficient boundaries will reduce the utility and efficiency of spectrum on both sides of the border, drive costs into interference management and network deployment and ultimately undermine investment in critical infrastructure and essential services that underpin Australia's digital future.

Regulatory intervention will undermine investment and may be inconsistent with the Act

57. A number of submissions endorse options for regulatory intervention over and above UIOLI/UIOSI, the implementation of which raise legal concerns as well as serious implications for the broader investment environment, including sovereign risk considerations.³⁹ In particular, Optus reiterates its strong opposition to variations to in-force spectrum licences and considers that the imposition of the alternative licence conditions described in the ACMA's consultation paper in such a manner would directly impact the core conditions of said spectrum licence and should therefore be subject to the agreement of the licensee.⁴⁰

³⁸ para 3.172; Optus' submission

³⁹ ACCAN's submission refers to using "mandatory information requests" to monitor spectrum use, establishing "licence conditions that provide the ACMA proportionate tools to respond to non-compliance" and "a review process which allows the ACMA to alter the conditions of an in-force ESL" largely in the name of supporting "spectrum end-users" – Optus submit that "spectrum end-users" or consumers are more likely to be harmed by introducing mechanisms that increase regulatory uncertainty for licensees by providing ACMA too broad a discretion to intervene.

⁴⁰ As per section 72 and 73 of the Act

PRICING FOR A SUSTAINABLE INDUSTRY IS IN THE LONG-TERM PUBLIC INTEREST

58. As has been clearly articulated in Optus' submission and supported by expert reports from Dr Chris Doyle and Coleago Consulting, existing arrangements for ESL spectrum have and will continue to promote the long-term public interest.
59. Existing arrangements that have supported tens of billions of dollars of network investment and incalculable economic and social benefits to the Australian community should not be adjusted without clear and substantiated evidence of market failure. Optus reiterates our view that all MNOs should be offered the opportunity to renew all their ESL spectrum at a price that supports sustainable competition in the national mobile market.
60. All MNOs identified declining returns on invested capital (ROIC) as a threat to industry sustainability and giving rise to the potential for a "digital investment gap".⁴¹ Some MNOs face a much tighter financial situation than others and Optus agrees that "high spectrum costs will amplify the existing structural instability in the industry".⁴² In this context, Telstra's, and to a lesser extent, TPG's, approach to pricing should be treated with some caution. Optus note that both advocate for the need to assess a market value in renewal pricing.⁴³
61. The long-term benefits to the economy and society of a sustainably competitive mobile sector far outweigh any short-term benefits to Government finances of high spectrum prices, therefore negating any need for auctions. Optus reiterates that pricing should be formulated with priority given to sustaining an industry that deploys national critical infrastructure and supplies essential services that are crucial to Australia's future prosperity and security. As set out in our Stage 2 submission, renewal of ESLs at a nominal price will best promote the long-term public interest.⁴⁴

Use of benchmarking will result in pricing that is not suited to Australia

62. Telstra advocate for a "conservative" approach to pricing and suggest the use of international benchmarking, adjusted to reflect current market values. Optus agree with Telstra that "the value to operators from a marginal unit of additional spectrum is much lower now, after the completion of the 5G era awards, than it was at the end of the 4G era".⁴⁵ However, Telstra do not provide any explanation as to why and how to square market value with the other principles cited in its submission, including "sustainability and affordability".⁴⁶ Telstra's professed support for pricing that reflects industry sustainability and affordability is also inconsistent with its strong preference for

⁴¹ TPG's submission, p.8; Telstra's submission, p.50-51

⁴² TPG's submission, p.8

⁴³ Telstra's submission, p.49; TPG submission, p.30 (p.2 of Analysys Mason report attached to submission which highlights the difficulties in accurately estimating the market value of spectrum "given ever-changing market conditions")

⁴⁴ Optus' submission, p.4

⁴⁵ Telstra's submission, p.50

⁴⁶ Telstra's submission, p.5, 49 and 50 stating that "the value to operators from a marginal unit of additional spectrum is much lower now, after the completion of the 5G era awards, than it was at the end of the 4G era"

auctions.⁴⁷ In this context, it is reasonable to conclude that Telstra's version of industry sustainability does not reflect wider industry affordability.

63. Optus also refers the ACMA to its expert report from Coleago Consulting for a detailed examination of why nominal pricing rather than benchmarking is the optimal methodology for pricing renewed ESL spectrum in Australia. Coleago notes that benchmarking is an unsound methodology as it is unlikely to accurately reflect the policy and industry demands of a local market because:
- (a) There are major difficulties in using historical global or domestic price benchmarking to set future renewal prices;
 - (b) Benchmarking requires a large number of subjective assumptions to be made;
 - (c) Prices paid in spectrum auctions are in large part driven by domestic market context.
64. Coleago adds that "prices paid for spectrum licences at auction in other countries say nothing about the value of spectrum to operators in Australia" and concludes that benchmarking is not appropriate to set renewal prices in Australia.⁴⁸

TPG's approach to pricing is not equitable and risks greater spectrum fragmentation

65. Optus does not support TPG's advocacy of differential or "scaled" pricing,⁴⁹ though we do support other aspects of TPG's approach, including the proposal for annual payments. Our view is that differential pricing and licence terms will undermine spectrum trading and therefore efficiency, by creating different spectrum products and entrenching fragmentation. To this end, Optus also support alignment of licence expiry dates across all renewed licences, to the greatest extent practicable.
66. TPG has stated that "pricing certainty is of high importance" and Optus strongly agrees.⁵⁰ We also agree with TPG's proposed principles to guide the ACMA when setting renewal fees:
- (a) renewal fees should be low given ongoing sustainability challenges faced by the industry;
 - (b) fees should be paid on an annual basis rather than in lump sum payments; and
 - (c) there should be identical pricing structures for technically substitutable spectrum bands.⁵¹
67. However, Optus does not support differential scaling of licence fees according to a licensee's relevant service revenue or market share. In Optus' view, this has the potential to reward inefficiency, with lower licence fees for the MNO with the least market share, which taken to the extreme would mean an MNO with no customers would pay nothing. TPG have suggested a minimum and maximum fee to avoid extreme

⁴⁷ Telstra's submission, p.52

⁴⁸ See pages 21-24 and 34 to 35 of the Coleago "ESL Pricing Paper"; 15 March 2024

⁴⁹ TPG's submission, p.1

⁵⁰ TPG's submission, p.1

⁵¹ TPG's submission, p.1

outcomes,⁵² which would translate into TPG paying the least, Telstra paying the most and Optus somewhere in the middle. Differential spectrum pricing for MNOs is unprecedented in Australia and has not been a feature of the last renewal process or any previous spectrum auctions. To introduce differential pricing in this ESL process is not warranted.

68. Optus supports spectrum fees in line with low or nominal pricing which should be affordable for all MNOs. It could therefore be scaled on customers, market share, revenue and ROIC for the MNO with the lowest score and then applied for all. The PMP for a given band should be the same for all MNOs.
69. Optus does not support TPG's proposal of trading alternative licence conditions for lower spectrum fees in mid band (TPG does not support UIOSI for low band).⁵³ This has not been a feature of ESL renewal processes or previous spectrum auctions due to the barriers this would create to spectrum trading and defragmentation. Optus believes that if spectrum fees are set at a low or nominal level there is no need to trade alternative licence conditions for lower prices as competition combined with lower fees will provide sufficient incentives for future deployment.

⁵² TPG's submission, p.21

⁵³ TPG's submission, p.17