



House of Representatives Standing Committee on Communications and the Arts

Inquiry into 5G in Australia

Submission by Giles Tanner (Senior Research Fellow) and Jock Given (Professor of Media and Communications), Swinburne University of Technology

Thank you for the opportunity to make a written submission to this timely inquiry into the deployment, adoption and application of 5G in Australia.

Swinburne has been conducting research into spectrum regulation in Australia as part of an Australian Research Council-funded Discovery Project 'Spectrum after Scarcity: Rethinking Radiofrequency Management'. An important focus has been the optimisation and re-optimisation of spectrum use over time as new technologies, applications and business models emerge and evolve. In 2017, Jock Given co-edited a special issue of the leading international journal *Telecommunications Policy* on that topic with British spectrum specialist Martin Cave. In 2018, a report about investment timeframes and spectrum licensing, referred to later in this submission, was commissioned from Ovum's David Kennedy.

Our submission examines shortcomings in Australian spectrum legislation that may hinder the deployment of 5G and other advanced wireless technologies and makes five legislative reform recommendations designed to help overcome them.

The submission reflects the views of the authors, not necessarily those of the University.

Executive summary

Why is spectrum legislation relevant to 5G deployment?

- 5G providers will require additional spectrum to meet rising wireless data demand. When and how this spectrum is planned and licensed will affect how soon and how cheaply the benefits of 5G can be enjoyed.
- 5G uses spectrum in quite different ways from previous wireless broadband technologies. Existing telecommunications carrier holdings may not be optimal for 5G deployment.
- This means an increasing focus on how to reconfigure or ‘de-fragment’ bands already used by telecommunications carriers. The regulator may not have appropriate powers to drive the re-optimisation of current holdings for 5G.
- The characteristics of licences will affect whether 5G service providers have the freedom, confidence and incentive to invest in the technology.

What is wrong with the current legislation?

- Australia’s spectrum laws were mostly written in the 1990s. They have served us well but were not designed with all of today’s challenges in mind. Without reform, they will tend to slow replanning and licensing to facilitate 5G and its successor technologies.
- Under current legislation, ‘**spectrum licences**’ are the long-duration, high value, fully-tradable licences favoured by mobile network operators for wide-area deployment of 5G:
 - i. The processes for creating new spectrum licences are slow and cumbersome. They are also inflexible and poorly designed for the task of de-fragmenting existing spectrum licensed holdings.
 - ii. The laws governing end-of-term arrangements for spectrum licences can result in reduced investor confidence during the final years of a licence.
 - iii. Current powers to re-issue expiring spectrum licences in the public interest may also hinder the regulator’s power to de-fragment existing holdings.
- ‘**Apparatus licences**’ are the typically smaller, cheaper, customised licences that will suit small wireless internet providers and non-telco actors seeking to deploy 5G:
 - i. They confer fewer rights than spectrum licences and investor confidence in the tenure of these licences could be improved.

The Government’s proposed reforms

- Government has been conducting a review of Australia’s spectrum legislation since 2014. Proposed amendments of the *Radiocommunications Act 1992*, foreshadowed by the Department of Communications in late October, should help address some of the above shortcomings.

- In particular, foreshadowed amendments to clarify licence renewal arrangements for spectrum licences, also to better align arrangements for apparatus licences with those of spectrum licences, have the potential to improve investor confidence in these licences.
- In the absence of further detail, however, we offer recommendations and suggestions for making the current law more flexible and less cumbersome and to optimise investment confidence for spectrum and apparatus licence holders.

Should we follow the US and use TV spectrum for 5G?

- 5G in some overseas markets will deploy spectrum currently used for television in Australia. With alternative bands available for 5G locally, it is too early to contemplate legal amendments to allow re-farming of broadcaster spectrum for 5G.

What do we recommend?

- The submission concludes with a list of five legislative reform recommendations designed to promote the deployment of 5G and other advanced wireless technologies.

INTRODUCTION

Giles Tanner is a senior research fellow at Swinburne University of Technology. Until December 2018, he was the head of the Australian Communications and Media Authority's division responsible for radiofrequency spectrum management.

Jock Given is professor of media and communications at Swinburne University of Technology and chief investigator on an Australian Research Council-funded project 'Spectrum after Scarcity: Rethinking Radiofrequency Management'.

Scope of submission

This submission examines shortcomings of the *Radiocommunications Act 1992* that may hinder the deployment of 5G and other advanced technologies.

We note that the Australian Communications and Media Authority (ACMA), in its *Five-year spectrum outlook 2019-23*, gives high priority to several pieces of work that should see additional spectrum made available for 5G and other advanced wireless broadband technologies.ⁱ We make no comment on the ACMA's work program.

DISCUSSION

1. Spectrum regulation and 5G

How spectrum is planned and licensed will affect how soon and how cheaply we can enjoy the benefits of 5G. A well-run spectrum management regime should be as open as possible to opportunities emerging in key overseas markets and give spectrum users the opportunity, confidence and incentive to invest in those technologies locally. Under the *Radiocommunications Act 1992*, there are three ways to allow a potential 5G operator to use the spectrum.

- **Spectrum licences**

These can be compared to long-term leases granted over real estate. They confer secure, long-duration, fully tradeable property rights over 'blocks' of spectrum space (defined by bandwidth and geographic area), subject only to limits on out-of-band emissions that may cause interference to other users. Provided these limits are met, the choice of technical standard and the detailed planning and deployment of networks are left to licensees themselves. Spectrum licences have proven well suited to applications where large operators need intensive access to large (geographical and bandwidth) blocks of spectrum, with little scope for sharing by other applications. In practice they have been mainly used for wide-area networks delivering mobile telecommunications and wireless broadband. Most spectrum licences are held by Telstra, Optus, Vodafone, NBN and TPG. Their flexibility has often, though not always, been sufficient to allow changes in

use, such as re-farming of telecommunications spectrum from 2G to 3G or 4G, without further reference to the regulator. Some demand for 5G spectrum has already been met using existing spectrum licences.

- **Apparatus licences**

Although many bands have moved to spectrum licensing over time, this more traditional form of individual authorisation is still prevalent and remains critical for accommodating innovation. Although apparatus licences confer weaker property rights than spectrum licences, they are easier to create, allocate and vary and can take many more forms. Typically more customised and affordable than spectrum licences, they may authorise a particular service and no more, allowing multiple users and different applications to share a single band. Apparatus licences are commonly used by smaller wireless broadband providers such as 'WISPs' (wireless internet service providers), including potentially for 5G, who typically do not need, and cannot afford, wide-area spectrum licences.

- **Class licences**

The most durable and flexible form of permission, these allow the operation of whole classes of transmitters or receivers to be authorised by a single legal instrument. In a world of ever smarter technologies, class licensing permits authorisation of any device that doesn't need the interference protection conferred by costly individual licences. 'Millimetre wave' (mmW) 5G technologyⁱⁱ will permit a range of in-building and industrial applications that are well-suited to class licensed operation, similar to wi-fi today.

All three licence types are important for the deployment of 5G. An example of a potential 5G deployment model using a combination of spectrum, apparatus and class licences can be found in the ACMA's recent proposals for re-purposing of the 26 GHz band.ⁱⁱⁱ

2. The Spectrum Review

Malcolm Turnbull, who was at the time the Minister for Communications and the Arts, announced a review of Australia's spectrum policy and management framework in May 2014. In 2015, a departmental report found there were 'substantial deficiencies' with Australia's 20-year old spectrum management regime, which was described as 'slow, rigid and administratively cumbersome'.^{iv} Two years later, an incomplete exposure draft of a new Radiocommunications Bill was released. The centrepiece was a single licensing system, to replace spectrum and apparatus licences. Class licences were also to be replaced, but by something similar – in effect, class licences by another name.

The Department of Communications and the Arts has recently confirmed the government is no longer proposing to replace the *Radiocommunications Act 1992* and will instead amend the existing legislation.^v We have previously written in support of this change of direction.^{vi} Streamlining and modernisation of existing law is likely to assist over time with the deployment of 5G and other advanced wireless technologies, while avoiding disruption to existing spectrum users.

Common criticisms of the current regime of relevance to 5G deployment are:

- The licensing process is cumbersome and inflexible; and
- Existing licences fail to optimise investor confidence.

Though short on detail, the changes to the Radiocommunications Act 1992 recently foreshadowed appear to be designed to address some of these deficiencies. While generally supporting the direction of reforms announced to date, we make some additional or supplementary suggestions.

2.1 Processes are cumbersome

Spectrum licences were a radical innovation in the 1990s and the procedures for creating them reflect an initially cautious approach by the legislature. The promise of spectrum licensing was that market players with high-grade, fully tradable property rights would be able to address pressures to change spectrum use without involving the government or regulator. To make room for markets to operate, spectrum licensing limited the government's own capacity to change planning arrangements. Until expiry, spectrum licences cannot be resumed without compensation and it is difficult to change their technical properties without the agreement of all affected licensees. While Australia's experience of spectrum licensing has been positive – tellingly, most expiring spectrum licences to date have been rolled over for a further 15 years – the processes for offering new spectrum as spectrum licences remain as they were designed in the 1990s and are ripe for reform.

Under current law, a part of the spectrum can only be offered as spectrum licences through 're-allocation' or 'conversion'. 'Conversion' permits ACMA and the Minister, working in tandem, to offer apparatus licensees a pathway to upgrade to spectrum licences for the same or a similar part of the spectrum. Conversion processes have been relatively infrequent but the tool retains its utility.^{vii} Re-allocation is the process typically seen when the ACMA 're-farms' a band by setting a final cancellation date for all existing (apparatus) licences while moving to issue spectrum licences for the same band. The new licences must be issued by 'price-based allocation,' including but not limited to auctions.

Different statutory procedures apply to the allocation of spectrum licences by conversion, by reallocation of unencumbered spectrum, and by reallocation of encumbered spectrum. (Spectrum is encumbered if it is currently used by one or more apparatus licensees). In the common scenario where spectrum licences are issued via reallocation of encumbered spectrum:

- The ACMA must make a formal 're-allocation recommendation' to the Minister, after consulting with all affected apparatus licensees on a draft of the recommendation;
- The Minister must make a 'spectrum re-allocation declaration,' including a 'reallocation period' and a 'reallocation deadline'. The reallocation period determines when existing apparatus licences will be extinguished. The declaration will fall away if no spectrum licence is issued before the reallocation deadline.
- On receipt of a reallocation declaration, the ACMA must prepare a 'marketing plan' and determine the procedures for price-based allocation of the spectrum licences

- The Minister is able to set bidder limits. In practice, the Minister usually consults with the competition regulator before setting limits.

While there should always be consultation with incumbents and potential purchasers when reallocating an encumbered band, the current process is far too cumbersome. Political pressure from spectrum-hungry fixed and mobile network operators has led to an unhealthy focus on how to hurry through the multiple formal steps, risking the rushed development of technically complex and legally sensitive instruments. The current processes also unnecessarily involve the minister in the regulator's day-to-day implementation work.

A more appropriate division of roles would see the Minister responsible for overall strategic direction and the regulator(s) responsible for implementation and program delivery. A requirement for the spectrum regulator to prepare for ministerial endorsement a detailed forward work program, updated at least annually, should be sufficient to ensure strategic alignment, noting that the Minister retains the power to give specific directions as to exercise of ACMA powers and functions. We note that the ACMA's annually updated 'Five-year spectrum outlook' (FYSO), settled following consultation with industry, already serves to flag the bands where the Authority believes conversion or reallocation of spectrum may be appropriate.

These observations are not new. The Productivity Commission made similar recommendations in 2002.^{viii} In November 2014, a discussion paper from the Department of Communications and the Arts proposed just such a clarification of the respective roles of Minister and regulator, including a proposal for regular forward work programs.^{ix} We will touch on the Department's spectrum review later in this submission.

The setting of bidder limits, including the role of the ACCC, raises separate issues. At present only the minister can set these limits and is not confined to consideration of competition issues. Given its limited remit, some ongoing requirement on the ACMA to consult, or to take directions, on bidder limits, at least where the quantum of spectrum on offer is substantial, would seem appropriate.

Recommendation 1: The processes for creating spectrum licences should be simplified. The respective roles of the Minister, ACMA and ACCC in licence creation should be reviewed and clarified.

2.2 Processes are inflexible

The current procedures were designed in anticipation of re-farming entire bands that were vacant or occupied only by apparatus licences. A quarter of a century later, a growing role of spectrum licence creation is to assist in the 'de-fragmentation' and optimisation of bands that are already wholly or partly spectrum licensed. Telecommunications services need to make efficient use of the bands already assigned to wireless broadband use. The expensive and disruptive clearance of legacy radiocommunications services from other bands, to

provide fresh spectrum for wide-area wireless broadband, may become politically unpalatable if carriers are using their existing bands wastefully.

Spectrum licences planned in the past may be sub-optimal or unsuitable for 5G and its successor technologies. This is because:

- 5G uses time-division duplexing (TTD) rather than the frequency-division duplexing (FDD) preferred in Australia for earlier generations of standards. TTD services use a single block of spectrum for transmissions to and from the base station, while many legacy spectrum licences were planned for FDD services, which use ‘paired’ channels, that is, two channels separated by a guard band. This is a current issue affecting use of the 3.4-3.5 GHz band. Optimisation of this band for 5G services will require the ‘de-fragmentation’ of current holdings.^x
- 5G uses wider bandwidths compared to earlier standards, meaning legacy spectrum licences may offer too little bandwidth.
- The interference characteristics of (TDD) 5G base stations and devices are different from legacy equipment. This can render the geographical boundaries of existing spectrum licences sub-optimal.^{xi} When metropolitan and co-channelled regional spectrum licences are separately owned, both operators may be prevented from deploying services in densely populated areas on either side of the boundary.
- International developments in spectrum harmonisation may mean that existing spectrum-licensed bands are in the wrong place. This is currently an issue for spectrum licences in 850 MHz, which would need to re-tune 1 MHz downward to optimise use of the adjacent 900 MHz wireless broadband allocation.^{xii}

The technical flexibility and tradability of spectrum licences provide some capacity for markets to address these problems unaided. Optimisation, however, may require access to spectrum that is not currently spectrum licensed. As legacy spectrum licences occupy ever more spectrum, and as technical standards evolve, rendering their existing configuration obsolete, assisting markets with the de-fragmentation and reconfiguration of existing spectrum licensed bands will form a growing part of the regulator’s (and the minister’s) work. The ACMA’s priorities in the current FYSO include work to optimise planning arrangements in the 850 MHz - 900 MHz and 3.4-6 GHz bands. In both cases, the outer boundaries (geographical, bandwidth) and configuration of existing spectrum-licensed spectrum would need to change to optimise the bands for wireless broadband.

The current procedures for converting spectrum into spectrum licences were not designed for the de-fragmentation of current spectrum-licensed holdings. For example, it isn’t possible for the regulator simply to offer to current spectrum licensees a 1 MHz block of spectrum below a current spectrum licence, in return for the voluntary surrender of the 1 MHz at the top of that or an adjacent spectrum licence. (Such a power might assist in achieving a desirable 1 MHz downshift of the 850 MHz licences.) Under current rules, the ACMA and the Minister must use the same tools (conversion; reallocation of encumbered or unencumbered spectrum via price-based allocation), and the same cumbersome processes, as for whole-of-band re-farming.

Where de-fragmentation is not possible during the lives of spectrum licences, the ACMA should be able to use the expiry of these licences to reconfigure them as needed. While in theory expiry leaves the Minister and regulator with a free hand, the government has to date made extensive use of its powers to offer renewal of spectrum licences in the public interest. Section 82 of the *Radiocommunications Act 1992* allows the ACMA to re-issue a spectrum licence to the existing licensee if it is in the public interest to do so, or if the licence is used to provide a service that is in a class of services determined by the minister. Use of this power arguably avoids the risk of any disruption to important consumer services that might flow from re-auctioning spectrum. To cater for the scenario where such licences are seriously sub-optimally configured for future technical standards, it is timely to review the power in s.82 and consider if the regulator and the Minister have the flexibility they require, for example, to offer to renew parts of licences, or the same licences but subject to very different core conditions, or equivalent licences but consolidated in a different part of the band. Such powers would strengthen the government's reserve power to push industry towards more efficient configurations where commercial negotiations have failed, or where commercial negotiation cannot do the job because the boundaries of the spectrum-licensed space are in the wrong places. Checks and balances on such a power might include a requirement that it be foreshadowed well before expiry of the licence. Alternatively, we note that a number of overseas jurisdictions have re-planned and auctioned expiring long-term licences over spectrum. Such a process is envisaged in current law and the ACMA itself has proposed re-planning and re-auctioning as the best way to optimise the configuration of carrier licences in 900 MHz, noting that these are not currently spectrum-licensed.^{xiii}

Recommendation 2: The ACMA should have greater flexibility to create and issue new spectrum licences, including wider recourse to administrative rather than price-based allocation where appropriate.

Recommendation 3: The ACMA's power to re-issue spectrum licences in the public interest and the Minister's power to make class of services determinations should be reviewed so as not to compromise the regulator's freedom to optimise the efficient configuration of a band or bands following licence expiry. For example, the ACMA could be empowered, with sufficient warning and following proper consultation, to offer a different licence, of equivalent or greater utility, if to do so would maximise the overall public benefit obtained from the band or bands in question.

2.3 Existing licences fail to optimise investor confidence

The other common criticism of current spectrum law is that the licensing scheme fails to optimise the confidence of licence-holders to invest in spectrum applications. Apparatus and spectrum licences raise different issues around investor confidence.

2.3.1 Apparatus licences fail to optimise investor confidence

The criticism is more pressing in the case of apparatus licences, which have shorter maximum terms than spectrum licences (5 versus 15 years) and can be cancelled with as

little as 2 years' formal notice under the 'reallocation' process for creating spectrum licences described above. This inferior tenure may have reflected expectations in the 1990s that apparatus licences were a mere extension of legacy spectrum access arrangements until spectrum licensing became more universal. Contrary to these expectations, apparatus licences have remained widespread to this day and are used to license much critical infrastructure, potentially including 5G services provided by smaller internet service providers or non-telco players such as mining companies. For the foreseeable future, apparatus licensing is likely to remain the most equitable and efficient way to provide access to bands:

- with multiple users and uses;
- with no clear higher value use; and
- where individual authorisation, following technical coordination with other users, is the most efficient and cost-effective way to derive benefit from the band.

In this light, we are encouraged by the recent indication from the Department of Communications and the Arts that 'the arrangements for apparatus licences are also being aligned with spectrum licences to the extent possible.' In the absence of any further detail, we offer some observations and suggestions.

First, any strengthening of the tenure of an existing apparatus licence needs to be weighed carefully against the need for residual government flexibility to accommodate rapid and unexpected changes in the highest value use of bands. There may be circumstances where the benefits of 5G will be maximised by clearing existing apparatus-licensed users from a band and reallocating the spectrum as wide area spectrum licences having quite different technical configurations. This may be so, even if the existing apparatus licences are themselves capable of being used for 5G. Australia's recent experience with 5G use of the 3.6 GHz band (see case study at **Attachment A**) goes directly to this point.

Second, the length of guaranteed tenure is only one component of investor confidence. This issue has been examined in more detail by David Kennedy in a report for Swinburne University of Technology.^{xiv} Kennedy made the points that licence duration is but one source of investor risk and in practice this risk is able to be mitigated in a number of ways. We would observe that examples of mitigations in the case of apparatus licences today include the reasonable expectation of licence renewal, the due process and statutory time frames surrounding re-allocation or replanning of apparatus-licensed bands and other ACMA practices, including the regular public reviewing of band re-planning priorities in the *Five-year spectrum outlook*. For these reasons it can be questioned to what extent, in reality, the legal tenure limitations of apparatus licences have decreased investment in radiocommunications.

With these caveats, the regulator should be free to set the tenure of apparatus licences for commercial applications such as 5G on a band-by-band basis, having regard to the balance between maximising investor certainty, on the one hand, and, on the other, retaining flexibility to re-farm bands where markets alone cannot move spectrum to its highest value use. In a few exceptional cases, tenure similar to spectrum licences may be warranted.^{xv} In his article David Kennedy also drew attention to the innovation of 'indefinite licences':

One approach that has been adopted in the UK has been to create “indefinite” licenses. These licenses have a minimum duration, but may be rescinded after that time with a minimum of five years’ notice. This arrangement has flexibility at both ends of the license period: at the beginning, when the regulator can set the fixed minimum term, and at the end when the regulator can recover spectrum with five-year notice. Traditional fixed-term licenses can provide the former, but not the latter option, so indefinite licensing has advantages for a regulator that seeks to maximize investor confidence but also wishes to retain some discretion to recover spectrum at a future time.

We support further exploration of this idea and would add that periods longer than the 5 years used in Kennedy’s example should be considered in some cases. Australia’s recent experiences with ‘5G spectrum’ at 3.6 GHz provide a textbook example of rapid and unexpected change in the highest use of a band (see **Attachment A**). Yet in regional areas the government and ACMA concluded that 7 years of continuing tenure, rather than the minimum permitted 2 years, was appropriate for existing apparatus licences. This suggests the transition of 3.6 GHz to wide-area 5G use in those regional areas would not have been delayed, had the ACMA previously been issuing ‘indefinite’ apparatus licences of at least seven years’ guaranteed duration in regional areas.

Transplanted into an Australian context, characteristics of an ‘indefinite’ apparatus licence might also include the capacity to pay for licences in annual instalments (as many apparatus licence holders prefer to pay) without becoming liable for the fees due for future years, in the event of early surrender of the licence. The law might also provide for discounts for licence fees paid more than 1 year in advance. By better matching licence design to the real needs and circumstances of SME users, such measures may do more to foster investor confidence than simply empowering the regulator to issue very long duration apparatus licences, which are likely only to suit large operators such as government agencies or mobile network operators.

Recommendation 4: The tenure of apparatus licences and the reallocation procedures for apparatus licenced spectrum should be reformed in recognition of the enduring importance of apparatus-licensed services. Tenure arrangements in apparatus-licensed bands should strike an appropriate balance between optimising investor confidence and preserving regulatory flexibility to accommodate changes in highest value use. Tenure reform should not focus solely on licence duration, but should be holistic and take account of the needs of SMEs and non-telco 5G users.

2.3.2 Spectrum licences fail to optimise investor confidence

Spectrum licences confer strong property rights but the law provides no assurance about what becomes of the spectrum after their terms expire. At present the government may re-auction the licences, offer to re-issue them to their present holders on one of the public interest grounds in s.82 of the Radiocommunications Act, or resume the spectrum for other uses. Although the next tranches of spectrum licences in major mobile telecommunications bands do not expire until 2028, improving clarity about end-of-term arrangements is likely

to contribute to investor confidence in the long term, particularly during the final five years before expiry.

The recent indication from the Department of Communications and the Arts is that ‘... spectrum licence terms will be extended to a maximum of 20 years, with clearer licence renewal processes.’ We support this reform subject to our previous comments about section 82 of the Radiocommunications Act. Though it makes sense to improve the investor confidence of spectrum licence holders, this should not come at the expense of further weakening the government’s residual powers to effect a de-fragmentation of spectrum licensed bands, where the existing licensees either cannot or will not trade their way to more efficient and productive overall configurations.

To optimise investor confidence, a realistic goal would be to increase predictability and timeliness of the processes surrounding licence expiry in good time before the final 5 years of the licences. To enable the spectrum to be seamlessly put back to market if re-issue in the public interest is offered but the licensee chooses not to take the offer up, licensees should be required to give a binding commitment in sufficient time before a licence expires, to permit the timely re-auctioning of the licences if necessary.

Recommendation 5: The rules around end-of-term arrangements for spectrum licences should be reviewed to optimise investor confidence in the final years prior to expiry, while safeguarding and strengthening the government’s residual powers to optimise the configuration of spectrum licences on expiry. If licensees are eligible for re-issue in the public interest, a binding election should be required in sufficient time to re-auction licences before expiry if necessary. To the extent any reform would be inconsistent with any accrued rights of existing spectrum licensees, improved rules should apply to future spectrum licences.

3. Other issues: 5G and television spectrum

Another regular criticism of Australian spectrum legislation relates to the special treatment of spectrum used for free-to-air broadcasting. Broadcasting spectrum law has evolved separately because of the unique roles of TV and radio in a democracy. To safeguard them from political pressure from governments, broadcasters’ licences are in effect perpetual and regulated more at arm’s length from the minister than other licences. In its 2015 paper on spectrum law reform, the Department of Communications and the Arts made the normalisation of broadcaster spectrum access arrangements, subject to a guarantee of ongoing access to spectrum, a key recommendation.^{xvi}

Television spectrum access arrangements are arguably relevant to 5G deployment, as the 600 MHz spectrum used by TV in Australia has been reallocated for 5G in North America. For 5G mobile network coverage to match that of previous standards, wide-coverage cells using sub-1 GHz spectrum will be needed. However, the 600 MHz band in Australia is currently fully utilised carrying television to the millions of households still reliant on free-to-air signals. Fortunately, there is suitable spectrum for 5G in other sub-1 GHz bands, which

are already licensed to telecommunications carriers in Australia.^{xvii} As mobile network operators can re-farm their current sub-1 GHz spectrum, lack of access to 600 MHz in Australia is unlikely to delay the rollout of 5G.

The television industry is currently evaluating more efficient technical standards.^{xviii} Savings in the overall amount of spectrum required for television broadcasting is one potential application of those standards. However, experience with Australia's previous 'digital dividend,' from the switch-off of analogue TV, suggests any process for clearing part of the TV bands would be extremely expensive and take a number of years. Currently there would appear to be no clear business case for a second digital dividend resulting from 5G. The work of devising bespoke legal amendments to facilitate further access to television spectrum for wireless broadband services should await a compelling proposal and business case.

CONCLUSION

To summarise, we have identified a number of shortcomings in Australian spectrum legislation that may hinder the deployment of 5G and other advanced wireless technologies and make five legislative reform recommendations designed to help overcome them:

Recommendation 1: The processes for creating spectrum licences should be simplified. The respective roles of the Minister, ACMA and ACCC in licence creation should be reviewed and clarified.

Recommendation 2: The ACMA should have greater flexibility to create and issue new spectrum licences, including wider recourse to administrative rather than price-based allocation where appropriate.

Recommendation 3: The ACMA's power to re-issue spectrum licences in the public interest and the Minister's power to make class of services determinations should be reviewed so as not to compromise the regulator's freedom to optimise the efficient configuration of a band or bands following licence expiry. For example, the ACMA could be empowered, with sufficient warning and following proper consultation, to offer a different licence, of equivalent or greater utility, if to do so would maximise the overall public benefit obtained from the band or bands in question.

Recommendation 4: The tenure of apparatus licences and the reallocation procedures for apparatus licenced spectrum should be reformed in recognition of the enduring importance of apparatus-licensed services. Tenure arrangements in apparatus-licensed bands should strike an appropriate balance between optimising investor confidence and preserving regulatory flexibility to accommodate changes in highest value use. Tenure reform should not focus solely on licence duration, but should be holistic and take account of the needs of SMEs and non-telco 5G users.

Recommendation 5: The rules around end-of-term arrangements for spectrum licences should be reviewed to optimise investor confidence in the final years prior to expiry, while

safeguarding and strengthening the government's residual powers to optimise the configuration of spectrum licences on expiry. If licensees are eligible for re-issue in the public interest, a binding election should be required in sufficient time to re-auction licences before expiry if necessary. To the extent any reform would be inconsistent with any accrued rights of existing spectrum licensees, improved rules should apply to future spectrum licences.

Attachment A

3.6 GHz: a case study

Changes in the highest value use of spectrum bands may occur over long periods, foreshadowed by lengthy international consultation in forums such as the ITU. By contrast, international interest in deployment of 5G in spectrum in the range 3.4-3.8 GHz emerged with little warning. The result was a rapid and unanticipated change in the highest value use of the 3.6 GHz band in Australia. 3.6 GHz was already used by a range of apparatus-licensed services, including small wireless internet services (WISPs) in regional areas. The ACMA's first public acknowledgement of interest in the band for 5G came as late as 2016.^{xix} Mobile network operator interest in deploying wide-area 5G networks was strong and the ACMA and the minister were persuaded to auction spectrum licences in the 3.6 GHz band in metropolitan and regional areas in 2018. The lack of tenure of apparatus licences used by WISPs generated substantial controversy, despite the then minister's decision to set a reallocation period of seven, rather than the minimum two, years before cancellation of the licences.

3.6 GHz illustrates the tension between government flexibility to accommodate unanticipated changes in the highest value use of spectrum and the investor confidence of incumbent spectrum users. In the present case, the laws allowing re-allocation of encumbered spectrum are likely to have promoted competition in the supply of ubiquitous, wide-area 5G services. Prior to the 3.6 GHz auction, only Optus and NBN enjoyed access to substantial amounts of spectrum suitable for wide area deployment of 5G fixed and mobile networks. The WISP controversy was exacerbated because ACMA was unable to offer WISPs alternative bands for re-tuning or future expansion that were as attractive as 3.6 GHz. The case study also highlights the larger problem that wireless broadband technologies including 5G are attractive to many players other than incumbent mobile network operators. Many WISPs are small to medium-sized enterprises serving niche markets. A range of other industries, such as mining and transport, also seek to use wireless broadband technology including 5G, although for local, as opposed to wide area, applications. For reasons of equipment availability, these industries seek access to the same spectrum, internationally harmonised for wireless broadband, as mobile network operators require for wide-area telecommunications.

ⁱ See, for example, pp. 54, 56-7, 59-60. Available at: <https://www.acma.gov.au/Industry/Spectrum/Spectrum-projects/5-Year-Spectrum-Outlook/five-year-spectrum-outlook>

ⁱⁱ 'Millimetre wave' refers to emissions whose wavelengths are short enough to be conveniently expressed in millimetres. Radio emissions at these frequencies typically offer much greater bandwidth (meaning data carrying capacity) than the lower-frequencies used for wireless broadband to date but are less able to transmit over distances or through obstructions.

ⁱⁱⁱ See, for example, p.4 of the consultation document at: <https://www.acma.gov.au/theACMA/draft-spectrum-reallocation-recommendation-for-the-26-ghz-band>

^{iv} Department of Communications, 'Spectrum Review,' March 2015, p.5.

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- ^v Email from Laurine Kelson, Department of Communications and the Arts, 25 October 2019.
- ^{vi} See Giles Tanner and Jock Given, *Whatever happened to spectrum reform?*, Inside Story, 1 July 2019, available at <https://insidestory.org.au/whatever-happened-to-spectrum-reform/>
- ^{vii} The ACMA invited public comments on proposals including conversion of apparatus licences held by NBN in *Optimising arrangements for the 3.4 – 3.575 MHz band, Options paper*, April 2019, available at: <https://www.acma.gov.au/Home/theACMA/optimising-the-3400-3575-mhz-band>
- ^{viii} See pg.293, *Radiocommunications Inquiry Report*, Report No.22, July 2002, Productivity Commission, available at <https://www.pc.gov.au/inquiries/completed/radiocommunication/report/radiocomms.pdf>
- ^{ix} *Spectrum Review Potential Reform Directions, November 2014*, Department of Communications and the Arts, at p.6, available at <https://www.communications.gov.au/have-your-say/spectrum-review-potential-reform-directions-paper>
- ^x See *Optimising arrangements for the 3.4 – 3.575 MHz band, Options paper*, op. cit.
- ^{xi} See *Draft spectrum reallocation recommendation for the 3.6 GHz band*, October 2017, ACMA, at p.32, available at: <https://www.acma.gov.au/theACMA/spectrum-reallocation-for-the-3-6-ghz-band>
- ^{xii} See *Reconfiguring the 900 MHz band, Options paper*, April 2019, ACMA, at pp 8-9, available here: <https://www.acma.gov.au/theACMA/reconfiguring-the-900-mhz-band>
- ^{xiii} See *Reconfiguring the 900 MHz band, options paper*, April 2019, ACMA, available at <https://www.acma.gov.au/theACMA/reconfiguring-the-900-mhz-band>
- ^{xiv} *Investment Timeframes and Spectrum Licensing*, David Kennedy, Ovum Consulting and Swinburne University of Technology, n.d., available at <https://apo.org.au/sites/default/files/resource-files/2018/01/apo-nid127041-1111671.pdf>
- ^{xv} An example is apparatus licensing of government agencies in relation to bands internationally harmonised for air safety.
- ^{xvi} See *Future Directions for Spectrum Released*, 22 May 2015, available at https://webarchive.nla.gov.au/awa/20150629141417/http://pandora.nla.gov.au/pan/143024/20150630-0000/www.minister.communications.gov.au/malcolm_turnbull/news/joint_release_with_the_hon.html
- ^{xvii} As reported in *Communications Day* on 10 October 2019, Telstra has already announced the progressive re-farming of its existing 850 MHz spectrum for 5G.
- ^{xviii} See *Second phase of DVB-T2 trial commences*, Broadcast Australia, 11 March 2019, available at <https://www.broadcastaustralia.com.au/second-phase-of-dvb-t2-trial-commences/>
- ^{xix} *Future use of the 1.5 GHz and 3.6 GHz bands*, October 2016, p.33, ACMA, available at <https://www.acma.gov.au/theACMA/future-use-of-the-1-5-ghz-and-3-6-ghz-bands-2>