Chapter Two

The new proposal

2.1   The Panel of Experts released its Evaluation Report on the outcomes of the government's *Request for Proposals (RFP) to Roll-out and Operate a National Broadband Network for Australia* on 21 January 2009. Following the release of the report, the government repeatedly stated that it was considering the report, but failed to make any announcement on the outcome of the bids. This lead to months of industry speculation and a high level of uncertainty within the telecommunications sector.

2.2   On 7 April 2009, the Rudd Government made a joint ministerial announcement of the 'establishment of a new company to build and operate a new super fast National Broadband Network.'[1] The announcement signalled the termination of the RFP process, based on the view of the Panel of Experts that none of the national proposals offered value for money, which was the overarching qualifier upon which all RFP evaluation criteria were based.

The 'New National Broadband Network'

2.3   The announcement detailed the government's new policy direction and included a commitment to ensure that 'every house, school and business in Australia will get access to affordable, fast broadband.'[2]

Specifications of the new network

2.4   Although highly anticipated, it would be fair to comment that the details of the government's announcement took most in the industry by surprise. While the previous RFP provided the option for proponents to utilise either fibre-to-the-node (FTTN) or fibre-to-the-premises (FTTP) network architecture, there was no such option within the new proposal. In addition to specifying that the technology would be FTTP, the network also was to support a large increase in the speed of broadband services.

2.5   The new National Broadband Network (NBN) was to:

- Connect 90 per cent of all Australian homes, schools and workplaces with broadband services with speeds up to 100 megabits per second;

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1   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

2   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

- Connect all other premises in Australia with next generation wireless and satellite technologies that will deliver broadband speeds of 12 megabits per second; and

- Directly support up to 25,000 local jobs every year, on average, over the eight year life of the project. [3]

2.6   The announcement stated that the FTTP network will extend 'to towns with populations of around 1000 or more people.'[4] The fact that the remainder of the population not reached by fibre would now be guaranteed the same minimum speed promised to metropolitan subscribers under the previous RFP process, could be seen as a benefit to those living in remote areas.

2.7   In addition, the government announced its intention to provide new fibre optic transmission links connecting cities with major regional centres and rural towns. This measure addresses the issue raised by many within the industry that the lack of backhaul access and interconnection is a major factor in the dearth of affordable broadband in areas of lower population densities.

2.8   Most telcos welcomed the new proposal, as was reported widely in the media in the days following the announcement. *Communications Day* provided a concise sample of industry commentary, which included statements from iiNet, Optus, Primus, Internode and Macquarie Telecom. For example, Mr Maha Krishnapillai from Optus was reported as saying that the government had taken 'a visionary and nation building step in the right direction', while Mr Michael Malone from iiNet reportedly said:

> This is the best of all possible outcomes … In terms of key criteria we were looking for in a National Broadband Network – open access, structural reform, fixing backhaul 'blackspots' and regulatory reform – the government has delivered.[5]

2.9   A main feature of the new network was the announcement that it would be a national wholesale-only, open access broadband network. This sent a clear message to the telecommunications industry that the government intended to impose strict regulatory reforms in order to address competition issues in the current market.

2.10   As a supplementary feature, the government announced that the building of the NBN was to be a 'major nation-building project' with the ability to support, on average, 25,000 local jobs every year, a figure that would peak at 37,000. This announcement was welcomed in view of the impact of the global financial crisis across many Australian sectors. The government also claimed that not only would this major infrastructure project stimulate employment in the short term, it would also

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3   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

4   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

5   *Communications Day Extra*, 7 April 2009, p. 4.

provide productivity gains and increased innovation, the benefits of which would 'continue to flow for decades beyond the completion of the project.'[6]

NBN Co Limited

2.11   A major aspect of the project was the establishment of a new company to build and operate the new network. This company has since been registered as NBN Co Limited (NBN Co). While the government is listed as the company's major shareholder, 'significant private investment in the company is anticipated'. The government has committed to an initial investment of $4.7 billion, with joint private sector investment of up to $43 billion over the build time of 8 years.[7]

2.12   The government will seek private investment of up to 49 per cent of the company, with the objective of benefiting from private sector capacity and expertise in the telecommunications industry. However, there are to be limitations on ownership to ensure the government can deliver on its promise of retaining the network as a wholesale, open access operation.

2.13   The government has stated its intention that, once fully operational, it will sell its share in NBN Co to the private sector:

> The government will make an initial investment in this company but intends to sell down its interests in the company within 5 years after the network is built and fully operational, consistent with market conditions, and national identity security considerations.[8]

2.14   There is speculation that NBN Co as a regulated monopoly provider will leave the Australian telecommunications sector in a similarly uncompetitive position to that which the government is currently seeking to address. Until full details of NBN Co's governance framework are made available, including any ownership limitations, this speculation will undoubtedly continue.

2.15   The government has stated that its investment in the company will be funded through the Building Australia Fund (BAF) and the issuance of Aussie Infrastructure Bonds (AIBs), providing an opportunity for households and institutions to invest in the NBN. Further details relating to the funding of the NBN can be found in chapter five.

2.16   Further details of the operation and funding of the NBN Co are also discussed in chapter five.

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6   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

7   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

8   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

Plan of action

2.17   The government has also announced a 'plan of action'[9] to launch NBN activities, stating that they would immediately:

- Commence an implementation study to determine the operating arrangements, detailed network design, ways to attract private sector investment – for roll-out in early 2010, and ways to provide procurement opportunities for local businesses;

- Fast track negotiations with the Tasmanian Government, as recommended by the Panel of Experts, to build upon its NBN proposal and begin the roll-out of a FTTP network and next generation wireless services in Tasmania as early as July [2009];

- Implement measures to address 'black spots' through timely rollout of fibre optic transmission links connecting cities, major regional centres and rural towns – delivering improvements to telecommunication services in the short term;

- Progress legislative changes that will govern NBN Co and facilitate the rollout of fibre networks, including requiring greenfields developments to use FTTP technology from 1 July 2010;

- Make an initial investment in the network of $4.7 billion; and

- Commence a consultative process on necessary changes to the existing telecommunications regulatory regime.

Closer examination of detail

2.18   The committee shared the surprise expressed by many within the industry at the announcement of the new NBN proposal. The new NBN amounts to a major shift in government policy, requiring architecture delivering FTTP to 90 per cent of Australian homes, schools and businesses, with alternative technologies of satellite and wireless proposed for more remote communities.

2.19   In its first interim report published in December 2008, the committee concluded that the then NBN platform 'should be broadened to enable a greater level of technology convergence where more appropriate than fibre.'[10] Consequently the committee acknowledges this aspect of the announcement as a welcome improvement.

2.20   The committee believes that the decision by the government to nominate FTTP architecture over the previous, optional FTTN architecture, reflects the general

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9   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

10   National Broadband Network, *Interim report*, December 2008, p. xx.

consensus expressed by key industry stakeholders that investing in FTTN would result in a network based on out-dated architecture that would not be future-proofed.

FTTP vs FTTN

2.21   Indeed, the government's change in policy direction is reflective of evidence taken by this committee throughout the RFP process period, highlighting that a FTTN network could not subsequently be efficiently and effectively upgraded to FTTP. Representative of this view was Dr Ross Kelso, when he stated that:

> I am particularly concerned about prescription of fibre to the node technology for the national broadband network. I believe that … if we are to move down the path of the network being engineered for fibre to the node where it makes it difficult for it to go beyond that to fibre to the home, it is a retrograde step.[11]

2.22   There is general consensus throughout the telecommunications industry that FTTP architecture is the only option that will support future technology upgrades, given the rapid changes in telecommunications technology, even over the last five years.

FTTN[12]

2.23   Broadband is currently being delivered to many Australian homes through ADSL technology, which involves specialised modems situated in telephone exchanges utilising existing copper wire networks. The problem with ADSL is that, due to the limitations of the copper infrastructure, the maximum speed that data can reach is limited by the home's distance from the exchange. In fact ADSL will not run effectively beyond certain distances, with around four kilometres generally accepted as the limit.

2.24   FTTN resolves this problem by decreasing the distance that the data needs to travel over copper. The FTTN proposal would have seen fibre rolled out, generally from the local telecommunications exchange, to a 'node' or mini-exchange that would be located on the footpath. These cabinets, generally within 800m of a consumer's premises, would house the DSLAM equipment of numerous service carriers that was positioned in the exchanges. They would also need to be large enough to house the air conditioning equipment required to keep the DSLAMs at the correct operating temperatures.

2.25   By taking the fibre closer to the premises, FTTN would decrease the distance impediment experienced by ADSL technology, whereby the further a customer was from the exchange (or DSLAM equipment), the greater the likelihood that the customer could not access ADSL. Although FTTN would have been a significant step

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11   Dr Ross Kelso, *Committee Hansard*, Brisbane, 21 November 2008, pp 20-21.

12   Incorporates information from Alcatel Lucent, *Submission 51*, pp 7-8.

forward, it did not eliminate the dependence on copper infrastructure, and the associated problems of age deterioration and also the restrictions inherent in the amount of data even new copper can carry.

FTTP[13]

2.26   FTTP eliminates the dependence on copper. Each premises will have its own optical fibre connection from the street to the outside of the premises, with a connection to a new type of modem that is capable of converting the optical signals. Fibre optic cables are composed of strands of pure glass, the dimensions of human hair, which carry data over long distances in pulses of light. Because data is transmitted in light pulses, distance no longer impacts performance, so that a premises located 30 km from the exchange will receive data at the same speed as a premises right next to the exchange.

Technology explained

2.27   There are two main options for the government to consider when choosing the FTTP technology: point-to-point (P2P) or Gigabit Passive Optical Networks (GPON). The government has stated that it will use leading edge technology in the deployment of the FTTP network, but has declined to provide more specific details, stating that this level of detail will be provided in the Implementation Study, due by the end of February 2010. However, in responses to Questions on Notice taken during May Budget Estimates, the Department of Finance and Deregulation stated that:

> DBCDE considered that for the local distribution component of the FTTH [FTTP] network that a passive optical network was the most appropriate basis for the development of a preliminary cost estimate.[14]

P2P

2.28   Point-to-point technology would see every premises allocated a dedicated fibre, which would connect to a local Optical Line Termination (OLT). These OLTs would need to be located on most street corners, in a similar fashion to the 'nodes' under the previous FTTN proposal. OLT cabinets would need to contain significant electronics and would require cooling in hot weather.

2.29   P2P may seem ideal in providing dedicated fibre to every customer, thus providing greater scope for service differentiation. However, in reality this option would be far more costly to deploy and would also result in street-scape issues and noise pollution from the electronics and air-conditioning within each OLT.

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13   Incorporates information from Alcatel Lucent, *Submission 51*, pp 11-16.

14   Department of Finance and Deregulation, Answer to Questions on Notice, Budget Estimate Hearing – May 2009, Question F36 ii).

GPON

2.30   In the GPON alternative, a single optical fibre is utilised for multiple premises, which then share the bandwidth available on the fibre. As explained in an Alcatel-Lucent brochure:

> In a GPON environment, a single fibre runs from a central OLT site serving up to 64 users. Consumers up to 30 kilometres away can be economically connected on this single fibre. Close to the consumer's premises, the cable is split inside a junction box, similar to those used in today's telephony network. … No power is required at any point between the exchange and the home installation.[15]

2.31   The GPON option would be more cost efficient, due not only to the reduced amount of fibre required but also the corresponding reduction in the number of fibre joins. This naturally translates to less man hours and labour costs for a GPON deployment. Another advantage of GPON is the fact that it requires no power between the exchange and the premises. As the brochure concludes:

> …it is probably fair to say, from a visual, noise and carbon footprint standpoint, GPON is preferable for residential fibre coverage.[16]

Possible functional layers

2.32   The NBN is underpinned by the government's policy requirement that it will be an open access, wholesale-only network. Although to date the government has not elaborated on how this will operate, some suggestions have been made by the industry.

2.33   It is reasonable to assume that there will be three basic types of service providers, with three corresponding functional layers of the network, as follows:

- **NBN Co:**   The public-private partnership established to build and operate the NBN. Returns are assumed to be regulated and the company will be excluded from providing retail services. This company provides wholesale access services to the Network Service Providers.

- **Network Service Provider (NSP):**   NSPs will have a retail relationship with customers and provide Internet protocol (IP) access to applications. They may choose to develop and provide applications themselves.

- **Application Service Provider (ASP):**   ASPs provide the applications such as television, video, voice telephony and internet access. They will also be the providers of applications and services that are yet to emerge

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15   Alcatel Lucent, *Submission 51*, pp 34-35.

16   Alcatel Lucent, *Submission 51*, p. 35.

from non-telecom areas such as health, education and power management.[17]

2.34   Today, a typical Internet Service Provider (ISP) fulfils the role of an integrated NSP/ASP, having retail relationships with customers and providing access to standard internet services, while others also offer telephony and paid video services.[18]

Network architecture

2.35   From this point the options multiply almost exponentially, with considerations before the Implementation Study that will include: connectivity for multi-dwelling units; the Optical Network Termination (ONT) device and its connection to one or more Residential Gateways (RG) within the premises; ownership of those devices; battery back-up requirements; and billing options.

2.36   One of the many complex decisions required will be the determination of the wholesale point of interconnect and service boundary point scenarios. A useful diagram illustrating the end-to-end architecture vision was provided in Alcatel-Lucent's submission, and is copied at Figure 1 below.

Figure 1[19]

PON reference architecture with defined interfaces
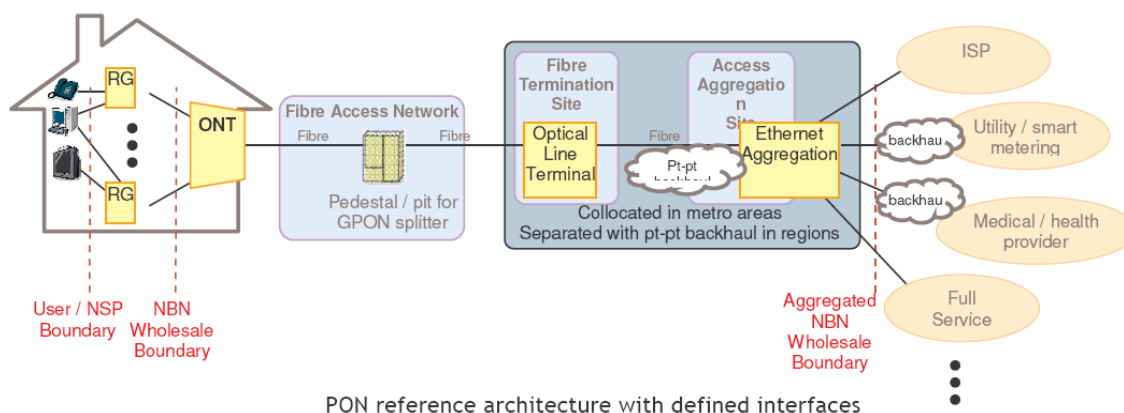
The 90/10 footprint

2.37   Australia possesses a geographically diverse topography, with a dense population around the coastline and sparse, but often economically significant, communities scattered across remote areas. After terminating the FTTN proposal, the

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17   Alcatel Lucent, *Submission 51*, pp 17-18.

18   Alcatel Lucent, *Submission 51*, p. 18.

19   Alcatel Lucent, *Submission 51*, p. 20.

government has included 'next generation wireless and satellite technologies … to people living in more remote parts of rural Australia.'[20]

2.38   The committee notes that there is still varied opinion as to whether the policy will result in what could be seen as a broadband 'patchwork' rather than a network, and how the subsequent risks regarding the capability for national connectivity can be mitigated. This will need to be resolved in the context of the network architecture solution, which should be a major component of the Implementation Study.

2.39   One issue that has remained unresolved since the first NBN RFP proposal was announced in April 2008 is that there is still no detail of the geographic footprint of where the FTTP network will connect and where wireless and satellite might operate. This causes uncertainty for potential investors as well as for consumers.

2.40   The current proposal is that 90 per cent of Australian homes, schools and businesses will have access to FTTP, while the remaining 10 per cent will be connected via wireless or satellite. When discussing the 90 per cent/10 per cent footprint at the Sydney public hearing, the Australian Information Industry Association (AIIA) explained that they had spoken with Treasury officials trying to clarify the footprint:

> …we were making inquiries as to what the 90 per cent and the 10 per cent would mean. What does 10 per cent mean? It was put to AIIA that as a rough rule of thumb it would be those parts of Australia that are populated thinly – for example, fewer than a thousand people.[21]

2.41   The minister has been reported as stating FTTP could reach towns with populations less than 1000 people if the necessary infrastructure is available, or able to be readily deployed. However, in the committee's view, this potentially adds to the level of uncertainty.

2.42   At the Hobart hearing, satellite provider Intelsat gave evidence that, as an infrastructure provider, details of the 10 per cent footprint were a critical issue. When asked about possible customer numbers that might be covered by satellite, Mr David Ball answered that:

> I don't know. I think the 100,000 [estimated satellite customers] are in very remote areas which would probably fall outside the 90 per cent [FTTP] geographically. Again, it gets back to my opening question as to how the NBN Co. defines that geographically.

> …What of the 10 per cent could you serve by wireless terrestrial means? What is the residuum that gets served by satellite beyond that?[22]

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20   http://www.minister.dbcde.gov.au/media/media_releases/2009/022, accessed 5 October 2009.

21   Ms Loretta Johnson, AIIA, *Committee Hansard,* Sydney*,* 5 August 2009, p. 61.

22   Mr David Ball, Intelsat Asia-Pacific, *Committee Hansard*, Hobart, 8 October 2009, p. 39.

2.43   When the committee questioned officials from the Treasury regarding the footprint, their response was:

> That is a detail that you would really have to take up with the department of broadband. … It is not within our competence to provide that level of advice.[23]

2.44   Taking up Treasury's suggestion, at the Canberra public hearing the committee questioned Mr Quigley, CEO of the NBN Co, as to the areas included within the 10 per cent; Mr Quigley responded that:

> It is scattered predominantly in regional and rural areas, obviously, but there are also places not that far outside the metropolitan areas that still have difficulties with coverage – … When you look, for example, at the satellite footprint that you might want to plan for, some of those areas are closer in to the cities than you would otherwise expect …
>
> We do not have a very clear picture; we have a rough picture at this point.[24]

2.45   Whenever the committee has pressed for specific details of the FTTP network's coverage, the answer was invariably the same: that this will be examined in the Implementation Study. Mr Quigley gave this detailed response to a question he subsequently took on notice at the Canberra hearing:

> Providing consolidated information on the "geographic spread" of what is meant by the 'last 10 per cent' is extremely difficult. Ultimately, the final details of where the 'last 10 per cent' is located will not be known until at least the final report of the Implementation Study …[25]

Digital divide heightened

2.46   The committee notes that the disparity of access that currently exists between metropolitan premises and those in regional and remote communities – the so called digital divide – will remain, despite the new policy direction for FTTP.

2.47   The proposed minimum 12 Mbps speed for those within the 10 per cent footprint contrasts with the 100 Mbps connection to be provided to the other 90% of the network footprint. The committee notes the digital divide will be heightened as a result of the mandated coverage requirement for the fibre network being revised downward.

2.48   The committee notes that as a consequence of the revised NBN policy, some 2.2 million Australians (10 per cent of the population) will now miss out on access to the top level broadband via the fibre network.

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23   Mr Richard Murray, Department of the Treasury, *Committee Hansard,* Canberra, 1 October 2009, p. 9.

24   Mr Michael Quigley, NBN Co Limited, *Committee Hansard,* Canberra, 1 October 2009, p. 64.

25   Mr Quigley, Answer to a Question on Notice, received 26 October 2009.

2.49   In addition, the government has yet to detail, for example, how schools and educational facilities in rural and remote areas will be able to access the same quality services that those in inner metropolitan areas will be accessing.

2.50   The committee notes that questions surrounding the issue of the FTTP footprint and the consequential digital divide are key issues that will remain unanswered until the final report of the Implementation Study is available, at the earliest. This will continue to perpetuate uncertainty within the telecommunications industry, among potential investors, suppliers of wireless and satellite infrastructure and among Australian consumers.

Roll-in vs Roll-out

2.51   Despite concerns expressed by the committee in the two previous interim reports that underserviced communities, particularly those in regional, rural and remote areas, must gain access to affordable broadband before those that receive adequate services, the government has yet to provide any assurance that this will eventuate.

2.52   In its first Interim Report, this committee specifically called on the government, under the terminated RFP FTTN proposal, to roll-IN the network from those underserviced communities rather than to roll-out from urban areas that, in comparison, are largely well serviced.

2.53   Notwithstanding the government's announcement of the regional backhaul initiative, the committee firmly believes that this does not go far enough to provide certainty to these communities that their needs will be prioritised.

Recommendation 1

2.54   That the Implementation Plan clearly states the government's intention to prioritise the needs of underserviced communities, particularly those in regional, rural and remote areas, over those with comparatively well-serviced urban areas.

Next generation satellite and wireless technologies

2.55   Very little detail has been provided relating to the 'next generation wireless and satellite technology' that will provide broadband connectivity for approximately 10 per cent of Australian homes, businesses and schools.

Wireless technology

2.56   Wireless technology, as the name implies, involves the transmission of information using radio waves or microwaves rather than underground or overhead wires or cables. It can be used to establish long distance backhaul, particularly in more remote regions, or it can be used for the 'last mile' connection to the premises or to a hand-held device. It requires an antenna on any premises wanting to receive the

transmission and numerous strategically placed base station aerials that can relay signals across the skies.

2.57 Wireless is ideal where geographic conditions are not conducive to fixed line cabling. For example, wireless can provide coverage over short spans of water and across mountainous regions. This was clearly illustrated to the committee secretariat on a site visit that covered an area within approximately 45km of the Canberra CBD. A small local service provider, YLess4U, has installed and currently operates a successful wireless broadband network. This currently services communities, businesses and individuals within that area, all of whom were previously unable to access broadband due to the granite-based mountains surrounding the capital. More details of the applications made possible by this entrepreneurial network can be found in chapter seven.

Growth in wireless

2.58 The incidence of the wireless transmission of data has grown exponentially over the last two years, with the rapid increase in the number of mobile broadband connections showing no sign of slowing. Australia has been an international leader in this trend, with the number of mobile phones in Australia exceeding its population. In more populous developing countries, such as India, the growth of wireless technology has been slower; however potential for growth in those markets is enormous.

2.59 In Australia, Telstra currently has the largest footprint for mobile telephone coverage under their 3G network and upgraded Next G wireless network. Telstra claims that those networks cover close to 99 per cent of the population. At the recent Telstra Annual Investor Day, Telstra's CEO Mr David Thodey, told investors that Telstra currently had one million wireless broadband customers and around 2.5 million fixed line broadband customers. Mr Thodey was quoted as saying that the company expected the growth in wireless broadband take-up to continue, and predicted that by 2015 around 60 per cent of Telstra's broadband customers would use wireless connections.[26]

2.60 The Australian Bureau of Statistics June 2009 results on Internet usage in Australia is detailed in chapter six. The latest figures demonstrate a remarkable continuation of the increase in wireless broadband uptake, growing from 1.298 million in December 2008 to 1.961 million in June 2009[27]. Subsequent to the release of these statistics, Citigroup analysts were reported as saying:

> The market … has consistently under-estimated the wireless broadband market over the past two years …

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26 *Communications Day*, 29 October 2009, p. 1.

27 http://www.abs.gov.au/AUSSTATS/abs@.nsf/ProductsbyReleaseDate/6445F12663006B83 CA256A150079564D?OpenDocument, accessed 6 November 2009.

> Wireless broadband as a growth driver is nothing new in Australia but the magnitude of the growth continues to surprise…[28]

2.61   The committee is concerned that the government's requirement for FTTP technology to underpin the NBN ignores this trend in wireless broadband uptake, impacting the ability of the network to meet future demand.

Wireless limitations

2.62   However, the 3G network has some significant drawbacks that are consistent with international experience. These drawbacks include the cost of 3G phones and the high cost broadband services to handheld devices. The latter is particularly evident in more remote areas where Telstra is the only carrier offering wireless broadband.

2.63   Additionally, although Telstra claims to cover 99 per cent of the population, this does not equate to 99 per cent of the Australian landmass. It is a common complaint that there is a lack of service availability in more remote areas, along even major highways, with corresponding implications for travellers and local remote residents alike.

2.64   A prominent industry stakeholder, AUSTAR, has been quoted as stating that 3G networks were not suitable for NBN purposes:

> [The NBN] is about a wireless data network, built and priced to deliver data based services at affordable prices.

> The 3G networks are voice networks with data as an overlay, they don't have the capacity, the pricing structure, or the spectrum to provide the services that are needed in the 10% areas where fibre won't reach.[29]

Wireless improvements

2.65   The industry has already moved to address some of the technical issues with wireless technology. For example, upgraded standards have been developed, in particular Long Term Evolution (LTE) which is based on an all-Internet Protocol (IP) network infrastructure and uses advanced wireless technology such as Multiple-Input and Multiple-Output (MIMO). MIMO is a form of smart antenna technology, involving the use of multiple antennas at both the transmitter and receiver to improve communication performance. This offers significant increases in data throughput and link range without additional bandwidth or transmission power.

CSIRO's cost saving solution

2.66   The committee heard evidence from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) relating to developments they have made in

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28   *Communications Day*, 23 September 2009, p. 2.

29   *Communications Day*, 24 September 2009, p. 1

wireless technology, which have the potential to be quite ground-breaking. The solution addresses the 'last 10 per cent', and is called the *CSIRO regional access solution.* The submission from CSIRO describes the solution as follows:

> In simple terms, the *CSIRO regional access solution* proposes the use of existing broadcast infrastructure [base stations and aerials] and broadcast spectrum in the new NBN. By using CSIRO technology …, beams using new synchronisation and co-operative networking methods will form signals over the long distances to individual premises.[30]

2.67   The CSIRO submits that their technology is superior to 3G/4G and WiMAX technologies, able to deliver a higher quality service with fewer base stations at a significantly lower capital cost.[31] CSIRO believes their development would be able to more efficiently manage backhaul requirements in the 'last 10 per cent', providing backhaul via point-to-point microwave radio relay. Once fully developed and patented, the CSIRO believes that this development will not only be able to provide the NBN with a home-grown technology solution, but will also have significant potential in a growing international market.[32]

2.68   The cost savings estimated by the CSIRO through the utilisation of the *CSIRO regional access solution* are extraordinary:

> When compared with 3G/4G the capital savings are estimated to be $12 billion; and when compared to WiMAX, the capital savings are estimated to be $5.0 billion.[33]

2.69   CSIRO has stated that the cost of implementing their *CSIRO regional access solution* would be in the order of $255 million, which would provide backhaul services to the last 10 per cent of the Australian population.[34]

2.70   The committee acknowledges that the CSIRO is in a unique position to provide ground-breaking, Australian-developed technology for backhaul access, advice on the technologies, independent advice around network costs and designs and also on applications development in the areas of health, energy management and the delivery of government online services.

2.71   Given the obvious level of expertise, the committee asked whether the CSIRO had been commissioned by the government to assist in the NBN rollout. The CSIRO was careful in its responses, noting that '[W]e provide regular briefings around our technologies.' When the committee pressed further whether they had been asked to

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30   CSIRO, *Submission* 80, p. 8.

31   CSIRO, *Submission* 80, p. 8.

32   CSIRO, *Submission* 80, pp 13-14.

33   CSIRO, *Submission* 80, p. 13.

34   CSIRO, *Submission* 80, p. 14.

advise specifically in relation to the rollout in rural and remote areas, their response was:

> It is nice to be asked, and we hope we are asked, but sometimes we are not.[35]

2.72   The committee is concerned that the CSIRO was not consulted in the formulation of the revised NBN policy, and that insufficient consideration was given to emerging technology prior to the 7 April announcement by the government, which included the requirement for FTTP to underpin the NBN.

2.73   The advantage of mobile connectivity via lap tops or mobile hand held devices to an increasingly mobile workforce is obvious. This in turn is driving demand for wireless connectivity. In fact, there have been questions raised as to whether the 90 per cent footprint FTTP should be more flexible, given the move by service providers and application developers to cater for this growing market segment. AUSTAR made the following comment in their submission:

> …it does not make any sense to limit the building of a wireless network to only 10 per cent of the population, particularly given the benefits of portability and interoperability inherent in the wireless product. … AUSTAR believes that the rapid deployment of a WiMAX wireless broadband network using 2.3Ghz spectrum provides a excellent opportunity for NBN Co to provide immediate, affordable, high speed broadband services to many Australians.[36]

Spectrum issue

2.74   If wireless broadband is to be deployed, the government will need to ensure that sufficient spectrum is reserved at appropriate frequencies and that this allocation can continue to meet the demand requirement caused by the rapidly growing uptake of wireless broadband.

2.75   The imminent digital switchover of analogue television transmission to digital TV will result in the freeing up of spectrum previously used by analogue TV services. There will no doubt be strong competition for the purchase of licenses for this spectrum, with industry groups lobbying in the media to publicly stake their claim. There are calls on the government to ensure that at least a portion of this freed spectrum is reserved for the specific purpose of facilitating wireless broadband. The CSIRO is a strong advocate of this view to enable its wireless access solution:

> By utilising the digital dividend of reusing the broadcasting towers and spectrum (UHF and VHF) currently allocated to analogue TV… the CSIRO regional access solution can deliver broadband services at 100 Mbps to sparsely populated communities at significantly lower costs than WiMAX or 4G. …

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35   Dr Alex Zelinski, CSIRO, *Committee Hansard*, Sydney, 5 August 2009, p. 36.

36   AUSTAR, *Submission* 73, p. [4].

> To deploy the CSIRO access solution, it will be necessary for ACMA to re-allocate at least some of the spectrum currently allocated to analogue TV. …It is recommended that at least 35 MHz in the 400-800MHz frequency range is assigned for fixed wireless access to rural broadband.[37]

2.76　It is unclear whether this issue is receiving an appropriate level of consideration under the government's Implementation Study.

2.77　AUSTAR has also highlighted that the government needs to ensure that adequate spectrum for the wireless solution is available. AUSTAR has spectrum that it believes would be suitable for the wireless broadband network:

> …AUSTAR invested A$183 million in 2000 to obtain spectrum licenses covering 98Mhz of contiguous spectrum in the 2.3Ghz band and … obtained 65Mhz in the 3.4-5Ghz band…[38]

2.78　Further, their submissions states that:

> AUSTAR has made clear to the Government and to third parties that it is willing to enter into commercial arrangements for the sale of our spectrum licenses to facilitate the rollout of wireless broadband services.[39]

2.79　It is apparent that spectrum is as important in the facilitation of the wireless network as the fibre is to the fixed line fibre network. However, the issue of spectrum allocation has not been clearly addressed by the government in relation to the requirements for the NBN. This will need to be a priority discussion within the Implementation Study.

Satellite technology

2.80　Satellite technology is, in reality, a subset of wireless technology, which enables global transmission of data via satellite. However, satellite and terrestrial wireless technologies have different benefits and disadvantages.

2.81　There are three main types of satellite systems that are generally categorised by the height of their orbit: low-earth orbit (LEO) at around 2,000km altitude; medium-earth orbit (MEO) at around 9,000 km; and geosynchronous orbit (GEO) at 40,000 km.

2.82　Geosynchronous satellites are most common. They are seen as stationary from the earth and have large coverage areas and consequently fewer satellites are required and can provide a wide or even global coverage. The disadvantages of the GEO systems are that it takes a great deal of power for data to reach the satellite and there is

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37　CSIRO, *Submission* 80, pp 4&5.

38　AUSTAR, *Submission* 73, p. [23].

39　AUSTAR, *Submission* 73, p. [5].

the increased delay or latency issue with the greater distances involved. Latency issues have come to the fore due to the increased use of satellite for video, interactive games and Voice over Internet Protocol communications. GEO satellites are also more costly to launch and have higher maintenance costs, given the higher orbit from which they operate.

2.83   The committee heard evidence and received written submissions from two satellite providers, Intelsat and O3b networks. Intelsat claims to be the largest fixed satellite services provider globally, with 50 satellites covering 99 per cent of the world's populated regions. In its submission, Intelsat states that:

> …the direct-to-consumer element of the satellite NBN will require two multi-spot Ka-band satellite payloads to … deliver service into multiple high power spotbeams providing contiguous coverage across the desired service area.[40]

Footprint uncertainty concerns

2.84   The issue discussed above relating to the lack of detail of the geographical footprint of the 10 per cent was an issue for both satellite providers. Without this certainty, providers cannot commence planning what type and how many satellites might be required to meet the needs of the 10 per cent. Intelsat noted that the 'Implementation Study will need to consider a wide range of issues relating to satellite delivery direct-to-consumers.'[41] This concern was reiterated when Intelsat's Regional Vice-President for Asia-Pacific gave evidence at the Hobart hearing:

> One of the first activities that has to be undertaken by the department or by NBN Co is truly defining where the 90 per cent is geographically and where the 10 per cent is in terms of the 100 megabit and the 12 megabit definitions that have been provided. … Is it a traditional satellite that is in orbit today that can provide services to customers, or is there a much larger number of customers that need to be addressed that lead you to putting up a KA band satellite which would be dedicated to NBN?[42]

Eliminating the latency issue

2.85   Mr Greg Wyler from O3b Networks gave evidence at the Melbourne public hearing and explained very clearly the operation of satellite and the issues that his satellite system could overcome. O3b stands for the 'Other 3 billion', a reference to the people in the most remote and least populous regions of the world who are currently not able to access the Internet, let alone broadband services.

2.86   O3b is designing a satellite infrastructure system that will see eight MEO satellites launched in 2011 that will orbit at around 8,062 km above the equatorial belt,

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40   Intelsat Asia Pty Ltd, *Submission 64,* p. 6.

41   Intelsat Asia Pty Ltd, *Submission 64,* p. 7.

42   Mr David Ball, Intelsat Asia-Pacific, *Committee Hansard*, Hobart, 8 October 2009, p. 37.

with coverage of plus or minus 45 degrees north and south of the equator. Mr Wyler stated that O3b's network would have beams that would be 'steerable', whereby the footprint of the satellite can be altered to meet community and capacity requirements. Mr Wyler outlined what he believed to be the advantages of O3b's satellite system, as follows:

> Geosatellites have been very expensive – about $250 to $300 million to produce. Our satellites are … about $22 million to produce. We put them in orbit at I think about 8,062.7 kilometres, which is 4.6 times closer to the earth than a geosatellite. The satellites being a lot closer to the earth means that they use a lot less power to bring just as much capacity to the earth or to the customer. On top of that we have allocated 4.3 gigahertz of capacity, which is much more than any of the geosatellites.[43]

2.87   The MEO satellite system deployed by O3b would immediately address the latency issue that currently inhibits the quality of services. Mr Wyler suggested that an additional four satellites would most likely be needed to provide coverage for the Australian landmass, including Tasmania, at a cost of $150 million to $200 million for those four satellites. This is less than the cost of just one GEO satellite.

Satellite limitations

2.88   Both the GEO and MEO satellite systems provide a highly reliable connectivity, 'even in comparison to fibre and microwave'.[44] However the one issue that neither GEO nor MEO satellites can eliminate is the susceptibility of satellites to adverse climatic conditions. Both O3b and Intelsat suggested that Australian satellites should utilise the Ka band frequency, which unfortunately is more affected by rain than other frequencies.

2.89   Mr Wyler explained that the susceptibility of Ka band satellites to weather can be overcome by strategic system design that would manage this issue and minimise the impact of adverse weather patterns. This would be necessary in Australia, given that the O3b satellites would orbit over the tropical monsoonal areas. However, as pointed out by Mr Wyler:

> Nothing is foolproof. There can be moments of outages in any [network] topology…
>
> Satellites can certainly be designed to have very limited sensitivity to weather conditions.[45]

Oversubscription and contested networks

2.90   Another disadvantage with both wireless and satellite technologies is that the services received are 'contested'. The speed that the network offers is a maximum

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43   Mr Greg Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, p. 8.

44   Mr Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, p. 2.

45   Mr Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, p. 9.

speed, and is shared among the number of users in that particular network. This only becomes an issue in more populous areas, where more people are likely to be using broadband services simultaneously.

2.91   Both Mr Wyler and Mr Ball warned that for this reason, any operator of a satellite network must take into consideration the oversubscription limitations under which their network can effectively operate. Mr Wyler gave a clear example of the effect of oversubscription:

> Oversubscription is a key factor. …
>
> If you provide 12 megabits piped into a town and then put up a WiMAX tower and then offer everybody 12 megabits to their home and you have 100 customers, then you have 100 times oversubscription. You have promised 100 people 12 megabits, but the reality is there are only 12 megabits … Unless you watch the oversubscription, or at least take note of it, it is possible to find that the quality you are hoping for is not really achieved.[46]

2.92   However, as Mr Ball explained, this issue also applies to ADSL technology and to any wireless technology, and needs to be monitored and managed:

> [Oversubscription] is one of the challenges you have with any wireless technology as you start to load it up, and indeed any ADSL type technology today. As you start to oversubscribe point of presence, you end up having to provide additional capacity.[47]

2.93   Mr Wyler concurred with this view:

> There will definitely be oversubscription. There is oversubscription in every network; it is inherent. But you do not want too much.[48]

2.94   Adding satellite capacity in order to address oversubscription in a region is a long term, expensive project. Both O3b and Intelsat stated that it is generally a three year process from the planning phase to launch of a satellite service. Mr Wyler stated that consequently, it is critical to gain a clear understanding of the population densities and the capacity requirements of each area, to ensure that the oversubscription issue is managed to achieve and maintain quality service.[49]

2.95   The committee believes that, given the vast geographic expanse of the Australian continent, its varied climatic conditions, and its diverse topography, the technologies of both wireless and satellite should be considered as complementary to the FTTP network.

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46   Mr Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, p. 6.

47   Mr Ball, Intelsat Asia Pacific, *Committee Hansard*, Hobart, 8 October 2009, p. 41.

48   Mr Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, p. 6.

49   See discussion Mr Wyler, O3b Networks, *Committee Hansard*, Melbourne, 7 October 2009, pp 6-8.

2.96   In addition the committee believes that there is scope for greater flexibility in the FTTP footprint, and that the technology/ies best suited to a particular location should be selected for deployment in that location, thus ensuring optimal quality broadband services to all Australians.

2.97   The committee also calls on the government to the release details of the 90 per cent/10 per cent footprint as early as possible to enable wireless and satellite providers optimal planning capabilities, which will in turn provide for informed estimates of the cost of deploying the 90/10 network.

OPEL?

2.98   In discussion of wireless and satellite technology options, the issue of the Coalition Government's cancelled OPEL proposal was raised a number of times, generally in reference to the fact that, if allowed to proceed, the OPEL solution would have almost been fully deployed at the time of reporting.

2.99   The OPEL network was a joint venture partnership between Elders and Optus that, among other services, would have utilised wireless technology to provide improved backhaul access. Specifically targeting underserviced areas through a subsidy program, the OPEL proposal would have delivered ADSL2+ broadband services for 1.5 million premises in regional areas by upgrading an additional 312 exchanges.

2.100   The OPEL proposal was never initiated, so the doubt cast by the government on the viability of OPEL's solution cannot be tested.

2.101   Although the current NBN is promising higher speeds to regional areas than OPEL offered, the committee again states its concern that the underserviced areas still have no guarantee that they will receive priority attention in the roll-out implementation plan.

2.102   Despite the government's claims of providing better broadband services to regional and remote Australians than the OPEL initiative, the committee highlights that under OPEL, these underserviced areas would now be accessing broadband at ADSL2+ speeds. This would have been a vast improvement to the government's record of inaction and the status quo – which could persevere for the full length of the NBN rollout.

2.103   The committee notes that due to the lack of available cost benefit analysis data, it is difficult to quantify whether the rural and regional component of the $43 billion NBN commitment is a positive value proposition compared to the $1 billion in public funding required by the OPEL initiative.

Committee view

2.104 The committee remains concerned whether the 90/10 footprint will meet the demand profile for broadband services now and into the future and is particularly concerned that the 90/10 footprint has not been clarified for the Tasmanian roll-out.

2.105 Despite the commencement of roll-out, Tasmanians are still in the dark as to which towns the fibre will touch and which it will by-pass.

2.106 The committee acknowledges the multiple complexities facing the government as it makes decisions around the architecture that will provide the optimal solution, both for the NBN Co and for all Australians.

2.107 The architecture is one of the key components in determining the cost to the tax payer of this network, as discussed in chapter five. Hence an early decision on the network architecture will enable a rigorous cost-benefit analysis to be undertaken.

2.108 The committee notes the significant cost and energy efficiencies to be gained by deploying GPON architecture as compared to a P2P network; however, the committee also notes that P2P architecture provides greater scope for service differentiation.

2.109 Importantly the committee highlights the continuing rapid growth in the proportion of wireless broadband connections and questions whether the 90/10 percentage for FTTP and wireless/satellite connections should be more flexible to leverage this increase.

2.110 Evidence brought before this committee has stated that a wireless broadband network could be deployed relatively quickly, particularly if optimal use is made of existing base stations. In this manner, wireless could be seen as a 'first step to address the long standing needs of underserved communities.'[50] In the longer term, wireless and fixed-line fibre will be complementary components within the NBN. The interrelated issue of the allocation of sufficient spectrum to enable the wireless deployment requires urgent attention and resolution.

2.111 The committee is particularly concerned that substantial savings, in the magnitude of billions of dollars, are a very real possibility when the CSIRO solution for backhaul re compared to the alternatives of WiMAX and 3G/4G deployments. The committee is concerned that the government seems totally unaware of these savings, following the recent commencement of a major WiMAX rollout in South Australia as part of the Regional Backhaul Blackspots initiative.

2.112 The committee urges the government to consult with CSIRO prior to the awarding of any new regional backhaul contracts to determine the feasibility and

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50   See discussion in AUSTAR, *Submission* 73, p. [19].

possible development timeframes involved in this cost-saving and superior backhaul solution.

2.113   The committee also urges the government to consider the alternative options for satellite deployment featured in this chapter.