



Australian Government

Regional Telecommunications Review

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Review 2015**

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Regional Telecommunications Review

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Australian Government

Regional Telecommunications Review

The Hon Malcolm Turnbull MP
Minister for Communications
Parliament House
CANBERRA ACT 2600

Dear Minister,

Together with my colleagues, Ms Su McCluskey, Ms Georgie Somerset and Mr Robin Eckermann, I am pleased to submit to you the 2015 Report of the Regional Telecommunications Independent Review Committee.

In conducting our Review, the Committee engaged with a broad range of users and providers of telecommunications services in regional Australia as well as infrastructure investors, state and local governments, and peak bodies. The Committee sought responses in webinars, online surveys and submissions, as well as holding face-to-face meetings and teleconferences. The adequacy of telecommunications services clearly means a great deal to people living and operating businesses in regional Australia. It was a privilege to consult with them.

As the national broadband network (NBN) rolls out, people living in regional Australia can expect improvements in fixed broadband capability. There is also significant mobile network investment in regional Australia, although mobile coverage gaps are likely to persist in areas that are uneconomic to serve.

This Report focusses on those areas of regional Australia where less choice is leading to poorer consumer outcomes. We recommend a number of targeted measures that are designed to assist new market entry, including by means of NBN infrastructure. We encourage NBN Co to continue to respond to the needs of regional Australia, recognising that diverse solutions may be required.

The rollout of the national broadband network and increasing consumer demand for data is leading to the rapidly declining relevance of the Universal Service Obligation. We urge the phased introduction of a new Consumer Communication Standard for voice and data. We also advocate the establishment of a new Consumer Communication Fund that can replace the existing telecommunications industry levy and underwrite over the longer term, necessary loss-making infrastructure and services in regional Australia. An accompanying monitoring regime is also needed to improve our understanding of infrastructure availability and affordability in a rapidly changing market environment.

I commend this Report to you.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Deena Shiff'.

Deena Shiff
Chair, Regional Telecommunications Independent Review Committee
23 August 2015

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Acronyms

Acronym	Definition
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
ACCAN	Australian Communications Consumer Action Network
ACMA	Australian Communications and Media Authority
ADSL	asymmetric digital subscriber line
BCR	Bureau of Communications Research
CSG	Customer Service Guarantee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CVC	connectivity virtual circuit
DRCS	digital radio concentrator system
DSL	digital subscriber line
HCRC	high capacity radio concentrator
HFC	hybrid fibre-coaxial
IoT	Internet of Things
ISS	Interim Satellite Service
LSS	line sharing service
LTE	long-term evolution
LTSS	Long Term Satellite Service
MBSP	Mobile Black Spot Programme
NBN	National Broadband Network
NSS	NBN Co's Satellite Support Scheme
POI	points of interconnect
PSA	public safety agency
PSTN	public switched telephone network
RSP	retail service providers
STS	standard telephone service
TIL	Telecommunications Industry Levy
ULLS	Unconditioned Local Loop Service
USO	Universal Service Obligation
VoIP	Voice over Internet Protocol

The 2015 Regional Telecommunications Review

A Regional Telecommunications Independent Review Committee is established every three years to conduct a review into telecommunications services in regional, rural and remote parts of Australia. The 2015 Committee comprises Ms Deena Shiff (Chair), Ms Su McCluskey, Mr Robin Eckermann and Ms Georgie Somerset.

Under the terms of reference, the Committee is required to review the adequacy of telecommunications services in regional, rural and remote parts of Australia. In determining the adequacy of these services, the Committee must:

- have regard to whether people in regional, rural and remote parts of Australia have equitable access to telecommunications services that are significant to people in those parts of Australia, and currently available in one or more parts of urban Australia
- make provision for public consultation and consultation with people in regional, rural and remote parts of Australia
- have regard to any policies of the Australian Government notified to it by the Minister for Communications, and such other matters as the Committee considers relevant
- prepare a report of the review and give it to the Minister. The report may set out recommendations to the Australian Government. In formulating a recommendation that the Australian Government should take a particular action, the Committee must assess the costs and benefits of that action.

For this Review, the Minister for Communications asked the Committee to have particular regard to the Government's national broadband network (the NBN) and Mobile Black Spot Programme policies, and whether current consumer protections continue to be appropriate following the rollout of the NBN.

The Committee undertook its work from May through to August 2015 and, despite the short timeframe, broad consultation occurred with individuals, businesses, peak bodies and other interested organisations. This included webinars, face to face meetings and teleconferences. An Issues Paper identifying key questions of interest to the Committee was released on 9 June 2015 and submissions were invited until 15 July 2015. Provision was made for a short online submission for those who just wanted to make a few comments. A total of 426 submissions were received.

The Committee would like to thank all those who took the time and effort to make submissions and participate in the consultation process. The Committee would also like to thank those organisations that facilitated input from others. The insights and real life examples provided were greatly appreciated by the Committee and have added to the factual basis of this report.

The issues and the opportunities that emerged from these consultations were clear. These include:

- the importance of mobile coverage
- the potential to maximise benefits from the rollout of the NBN
- the need to develop consumer safeguards for the future to support regional Australia.

Executive summary

The Committee has been asked to review the adequacy of telecommunications services in regional* Australia. The evidence presented to the Committee was compelling that telecommunications has and will continue to shape the lives and improve the economic opportunities of people in regional Australia.

In its recommendations set out below, the Committee emphasises the fact that regional Australia has a different telecommunications market structure to urban Australia. It also has a diverse population with very different needs.

Mobile coverage – the next frontier

Submissions to the Review confirmed that the quality and extent of mobile coverage was a major concern of people in regional Australia. Regional Australians have a higher dependency on mobiles than their urban counterparts because of the broader geographic range within which many conduct their working and everyday lives.

Material gains in mobile coverage have been achieved, and are likely to continue, as carriers increase their investment in mobile networks. Coverage will be further augmented as a result of the success of investment stimulus schemes such as the Mobile Black Spot Programme (MBSP), which has attracted mobile carrier investment in new base stations in conjunction with Commonwealth, state and local governments.

Despite these gains, and the fact that Australians enjoy among the highest penetration of mobile broadband in the world, the low population density over the remaining geography means that new approaches are needed to assess the priorities of those in the 70 per cent of Australia's land mass that has no mobile coverage, and to improve poor coverage elsewhere. These geographies are economically challenging for the extension of existing high speed mobile networks.

The Committee recognises that this will be an area requiring ongoing investment and considers that:

- A more granular approach to determining the cost and benefits will be needed in deploying public funds to fill further market gaps. Social and economic benefits to a town or community are not easily measured under the current MBSP. State governments are developing regional development planning tools that would be usefully harnessed in any future Australian Government co-investment scheme or industry fund.
- More attention to achieving target outcomes with high social and economic benefit is required:
 - Highway coverage will be an ongoing issue on main road corridors. For example, where the Australian Government funds regional road or freight corridors, it should require the recipient to commit to a communications deployment or upgrade as part of the loan or grant.

* This paper uses the term 'regional' to refer to regional, rural and remote collectively.

-
- Agricultural productivity gains will be achieved from the wave of innovation associated with sensors and tracking devices (the ‘Internet of Things’, or IoT). These commonly involve low bandwidth applications that can be supported on wide area narrowband networks. Depending on the application, there may be a need to connect into carrier or NBN networks.
 - Public Safety Agency networks in the bush need to be interoperable and transport data as well as voice. An upgrade to radio links in regional Australia would also create redundancy where there is sole reliance on a single carrier’s mobile network. A new approach to upgrading these radio networks could unlock co-investment from other infrastructure owners, such as utilities. If a mobile coverage component could be built into the scheme, this would improve public access to mobile services.
 - More use can be made of NBN infrastructure in supporting new, niche and existing mobile and wireless operators who wish to offer regional wireless coverage extensions. Although NBN Co is not a provider of wholesale mobile services, it has taxpayer funded inputs (tower and backhaul in particular) which can assist a range of carriers investing in or upgrading infrastructure in regional Australia.

Maximising the rollout of the national broadband network for the benefit of regional Australia

By the completion of the national broadband network (the NBN) rollout, the network will supply high speed broadband connections to approximately 12 million Australian premises. Australians living and working in regional areas comprise 33 per cent of the total Australian population. Regional Australians have the most to gain from the arrival of higher bandwidth and higher quality fixed broadband services. It is clear from the difficulties some regional customers currently experience with fixed lines and poor quality or no DSL, as well as from the positive experiences of customers moving onto the NBN terrestrial network, that there will be significant improvements to lifestyle and business productivity associated with the move to the NBN.

The majority of the regional population, particularly those living or working in or near townships, will be serviced by the NBN’s fixed line services. However, for the anticipated eight per cent of Australian premises that fall outside of the fixed line footprint, an estimated five per cent of the total premises will be connected by fixed wireless technology, and the remaining three per cent by the NBN’s *Sky Muster*, the Long Term Satellite Service (LTSS). The Committee notes that a significant majority of that three per cent of premises are located in regional areas, including in some of the most remote geographies of Australia.

The rollout will inevitably involve a period of transition where some premises will be connected before others. While the three per cent within the satellite footprint will be amongst the first to be ‘connected’, the location of these customers presents the greatest complexity in providing service equivalence with their regional, let alone urban, counterparts. This is because satellite, by its nature, has constrained capacity and suffers from issues relating to reliability and latency. LTSS users are, by virtue of geography, more reliant on telecommunications, so data restrictions and higher effective prices present issues unique to this group.

There is no ideal solution for all remote users (particularly many remote Indigenous communities), or one that will be a perfect fit with all applications, such as those that require interactive real time voice applications. However, the LTSS will be a big step up and can support other services. For example, as well as providing improved direct-to-home services, it could provide the backhaul for a WiFi hotspot. As noted elsewhere, ongoing attention should be given to leveraging this significant investment. The diversity of demand, especially in regional Australia, will require a flexible approach on the part of NBN Co and other service providers and a willingness to depart from a 'one size fits all' approach.

Telstra is only required under the current Universal Service Obligation (USO) arrangements to offer voice, not data, in these areas.

The Committee has identified a multi-pronged approach to improving the telecommunications outcomes of people in regional Australia within this three per cent group:

- NBN Co will need to proactively manage traffic using best practice and taking advantage of software innovation to optimise the available LTSS capacity. This may mean removing some restrictions on their wholesale satellite operations so that innovative caching or demand management practices can be introduced for end users.
- The Committee considers that the application of the Interim Satellite Service (ISS) Fair Use Policy has had unacceptable consequences. To minimise the detrimental impact of shaping and suspension on users of the LTSS, NBN Co's LTSS Fair Use Policy and tariff structures need to encourage Retail Service Providers (RSPs) to better manage demand. RSPs should enable their customers to monitor their own consumption and alert them well before they reach their limits.
- The Committee is concerned that current data allowances do not enable regional users to effectively manage businesses, and differentiated retail products are to be encouraged.
- Some applications (such as distance education) should be exempted from data allowance quotas, and Public Interest Premises* included in these exemptions.
- As demand for capacity grows, the number of users supported on particular satellite beams may need to be reduced to maintain acceptable levels of service. Alternatives must be created that broaden the choice for this population. This could include developing wholesale products and extending the footprint of fixed and mobile networks.

Notwithstanding the rollout of the NBN, there are likely to be persistent market gaps in very specific areas, giving rise to lack of RSP choice and gaps in mobile coverage as described above.

* Public Interest Premises refers to government, health and education premises

To this end, significant opportunities exist for NBN Co to leverage its own infrastructure:

- NBN Co is encouraged to continue to engage with state and local governments and related stakeholders who wish to co-invest or coordinate planning to get the optimum overall infrastructure outcome for their area.
- NBN Co is also encouraged to proactively engage with carriers who wish to partner to use new towers or other facilities and extend their coverage footprint, recognising that this requires sufficient time to adjust planning and provisioning on both sides. Opportunities also exist to support new market entrants offering innovative services, such as IoT over narrowband networks.
- NBN Co should be enabled to develop carrier-to-carrier wholesale products such as backhaul from its own infrastructure as a separate business line. The Committee recommends this business line focus on the parts of regional Australia which are demonstrably underserved and where NBN Co participation in commercial wholesale markets would minimally distort competition.

The Committee acknowledges the scale and difficulty of the overall national rollout to be undertaken by NBN Co over the next three years. It is therefore mindful that providing additional support to regional Australia should neither distract from, nor be subordinate to, the overriding goal in NBN Co's Corporate Plan of meeting Australia-wide connection targets.

Consumer safeguards for the future to replace the USO of the past

The aim of current consumer safeguards and funding provided by the USO is to preserve the minimum entitlement of all Australians to a basic telecommunications service, wherever they reside. The USO assures access to a standard telephone service (STS) as defined in section 6 of the *Telecommunications (Consumer Protection and Service Standards) Act 1999*. The STS is a basic voice service predominantly provided over Telstra's copper network (the public switched telephone network, or PSTN). USO funding also provides for public payphones. Consumer safeguards include the Customer Service Guarantee (CSG), which sets the standard by which the STS is delivered.

Modern consumer standards and funding of safety nets – as illustrated in Finland and New Zealand – operate to ensure that consumer equity is maintained, notwithstanding that services in regional areas may incur losses.

From 1 July 2012, Telstra entered into a contract with the Australian Government to deliver the STS and to maintain the PSTN for a term of twenty years. The resulting USO costs are borne partly by the Government and partly by industry under the Telecommunications Industry Levy (TIL).

The Committee found that:

- The present STS is of rapidly declining relevance. Within the next few years the majority of consumers, and notably those in regional Australia, will not be using voice calls over the PSTN, but will be using mobiles, Voice over Internet Protocol (VoIP) and other social media applications, as their primary communication method.
- As the NBN rolls out, the universal fixed network infrastructure will be broadband, not the copper PSTN, resulting in voice calls largely migrating away from that network.
- The historic nature of the STS and the accompanying USO funding arrangements means it fails to target the areas of greatest need or deal adequately with inequality of outcomes in regional Australia.
- The cost effectiveness of the USO agreement between the Australian Government and Telstra is questionable.

The Committee recommends the development of a new safeguard in the form of a Consumer Communication Standard for voice and data which would provide technology neutral standards in terms of availability, accessibility, affordability, performance and reliability.

The implementation of the Standard would be based on consultation and market experience. The Standard could, for example, include such matters as social tariffs, other measures for low income groups, or the data plan exemption of selected government and education sites to improve affordability and support social inclusion.

Enforcement of the new standard would need transitional arrangements, with a preference for industry code development.

The current STS CSG Standard would be subject to specific 'grandfathering' provisions to protect consumers with ongoing dependence on the STS.

The Committee recommends the establishment of a new funding mechanism in place of the existing levy, the Consumer Communication Fund, which would support necessary loss-making regional infrastructure and services. This would enable the consolidation and more efficient management of existing outlays with scope to include the proposed new subsidy arrangements for non-commercial NBN services (Satellite and Fixed Wireless) in a single scheme. Other social equity elements that merit funding under the proposed Consumer Communication Standard could also be a part of the overall fund. The Committee recommends the Fund be developed in consultation with industry and consumer groups and suggest the following principles guide its design:

- technology neutrality
- contestability
- transparency
- economic efficiency, and
- sustainability.

The Committee recognises that these changes would impact the current USO funding arrangements. Given the existing contractual arrangements with Telstra, this is a matter for the Australian Government.

In addition, the Committee has made specific recommendations to improve stakeholder and consumer information during the rollout of the NBN.

Finally, the Committee recommends that benchmark data on availability and affordability of broadband data and voice services, including mobile services, in regional Australia is collected and reported annually. This will enable comparative analysis of regional versus urban consumption patterns and costs. It could also draw on information on the NBN rollout in regional Australia made available by the Australian Competition and Consumer Commission (ACCC) under its proposed Record Keeping Rules, and report on broadband infrastructure availability.

Subject to this benchmark data being collected and reported, the Committee suggests that future reviews could be undertaken less frequently.

Summary of recommendations

Recommendation 1 – To optimise finite LTSS capacity, NBN Co should actively manage demand, prioritise traffic and support the caching of content using satellite management best practice and innovative software. If restrictions on wholesale satellite operations preclude improvements to end user experience, those restrictions should be removed.

Recommendation 2 – NBN Co's Fair Use Policy and wholesale tariffs should be structured to give RSPs sufficient price and product flexibility so that the detrimental impact of shaping and suspension of LTSS services can be minimised. Further, NBN Co will need to work closely with RSPs to improve their support of LTSS customers. Customers should be able to monitor their data consumption and be alerted before they reach their data limits.

Recommendation 3 – To give the best possible outcome for regional users, NBN Co should where practicable extend the boundaries of its Fixed Wireless footprint as a substitute for satellite.

Recommendation 4 – The Australian Government should consider co-investing with state governments and carriers to support upgrades to regional state-based public safety wireless networks that could also deliver mobile coverage improvements.

Recommendation 5 – To make the most efficient use of Australian Government funding of major public infrastructure in regional Australia (such as transport corridors and utility facilities), there should be a requirement to incorporate a telecommunications deployment or upgrade plan as a precondition of that funding.

Recommendation 6 – Given the lack of information on underutilised regional assets, Infrastructure Australia is encouraged to collect and make available public data and information about any infrastructure that might be of assistance to investors in telecommunications. This might include dark fibre or towers with a power source in other sectors such as gas and electricity.

Recommendation 7 – The Australian Government should leverage its investment in the NBN by enabling NBN Co to make better use of its infrastructure in regional Australia. NBN Co should be permitted, and resourced, to provide carrier-to-carrier products that could include satellite backhaul, terrestrial backhaul for mobile carriers, and options to support new and niche infrastructure providers.

Recommendation 8 – Current consumer safeguards as they relate to the STS are increasingly irrelevant. The Australian Government, in consultation with industry and consumer groups, should develop a new Consumer Communication Standard for voice and data which sets technology neutral standards in terms of availability, accessibility, affordability, performance and reliability.

Recommendation 9 – The Australian Government should establish, in consultation with industry and consumer groups, a new funding mechanism, the Consumer Communication Fund. The Fund would replace the current levy and support loss-making regional infrastructure and services with scope to include subsidy arrangements for the non-commercial NBN services (Satellite and Fixed Wireless) as well as social equity elements that merit funding under the proposed Consumer Communication Standard. The design of the Fund should reflect the following principles:

- technology neutrality
- contestability
- transparency
- economic efficiency
- sustainability.

Recommendation 10 – Recognising the significant changes in the regional telecommunications market, the Australian Communications Consumer Action Network should continue to make representations on the affordability and accessibility of services, including the promotion of tools to help consumers make more informed decisions regarding their services.

Recommendation 11 – NBN Co and the Department of Communications should examine ways of providing better information on the timing and the range of technologies being rolled out across Australia.

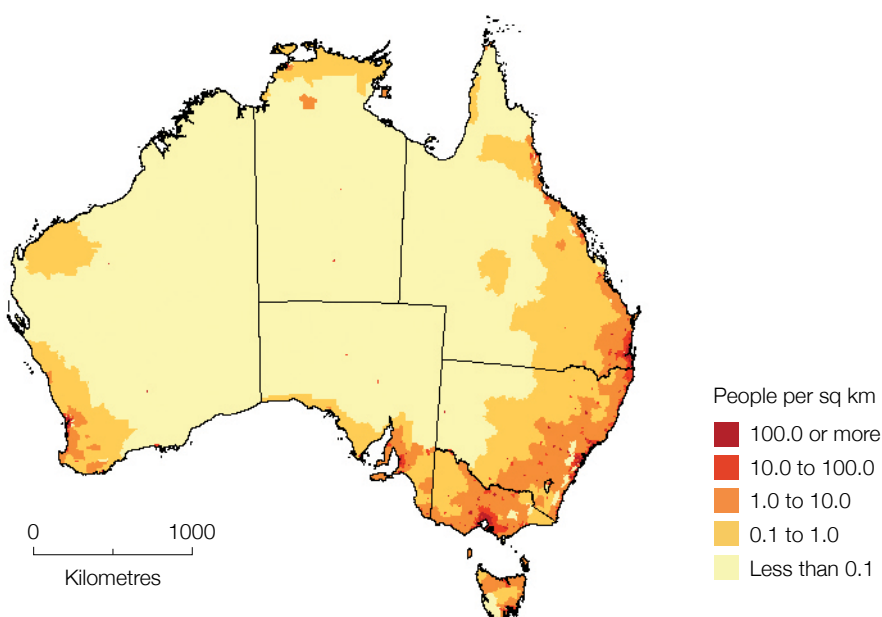
Recommendation 12 – In order to improve the understanding of the changing circumstances of regional telecommunications, benchmark data on availability and affordability of broadband data and voice services (including mobile services) should be collected and reported annually. This may also enable future reviews to be undertaken less frequently, but on a more informed basis.

CHAPTER ONE: Market background

This Chapter provides background to the main telecommunications infrastructure in Australia – the three cellular networks and the legacy copper and hybrid fibre-coaxial (HFC) networks. It discusses the impact on the market of the rollout of the NBN and the investment in and reliance upon mobile networks.

Regional Australia's vast land mass and extreme population dispersion presents unique challenges. A third of the Australian population lives outside of the capital cities.* Location will therefore greatly affect the telecommunications choices available to people living in those areas.

Figure 1: Population density – June 2014



Source: ABS, 3218.0 – Regional Population Growth, Australia, 2013–14

* Two thirds of the population live in areas designated by the Australian Bureau of Statistics (ABS) to be 'Greater Capital City Statistical Areas'. These areas include not only the urban area of each state and territory capital city, but also the surrounding and non-urban areas where much of the population has strong links to the capital city – for example, through commuting to work.

Understanding these geographic determinants, as well as the diverse needs of regional Australians, is key to ensuring that people in regional Australia enjoy adequate telecommunications services.

Mobile networks

Mobile networks operated by Telstra, Optus and Vodafone cover more than 99 per cent of Australia's population measured on a per premises basis.* However, for many regional Australians, coverage away from the premises in which they live or work is important.

Coverage of non-metropolitan areas is lower than in urban areas, as shown in the table below.

Table 1: Mobile coverage by operator (% of population – 2014)

	Telstra		Optus		Vodafone	
	3G	4G	3G	4G	3G	4G
Metro	100%	95%	100%	89%	99%	87%
Non-Metro	98%	74%	96%	60%	87%	50%

Source: Venture Consulting, *Background to the mobile and towers sector in Australia*

Telstra has mobile equipment on about 9,600 sites, Optus on 7,400 and Vodafone on 6,700. Telstra owns about two-thirds of its sites and has a 48 per cent share of the mobile tower market, compared to Optus' 11 per cent and Vodafone's three per cent. Telstra also has the largest backhaul network in Australia and in many parts of regional Australia, is the only carrier with infrastructure.¹ Accordingly, in many parts of regional Australia, Telstra is the sole mobile network provider.

Australia's use of mobile communications is high, with penetration by connection hovering at around 120 per cent for the past two years. Australia's mobile broadband penetration is among the highest in the world. The Organisation for Economic Co-operation and Development (OECD) ranks Australia fifth, after Finland, Japan, Sweden and Denmark (as at December 2014).²

The mobile networks have seen explosive growth in data demand since the mid-2000s. Between June 2013 and June 2014, mobile handset internet consumption in Australia almost doubled.¹³ Much of the growth in demand for mobile data has been fuelled by the advent of affordable smart phones and tablets, enabling users to fully engage in the digital world while on the move.

* Telstra's network, the largest of the three, now covers 99.3 per cent of Australia's population.

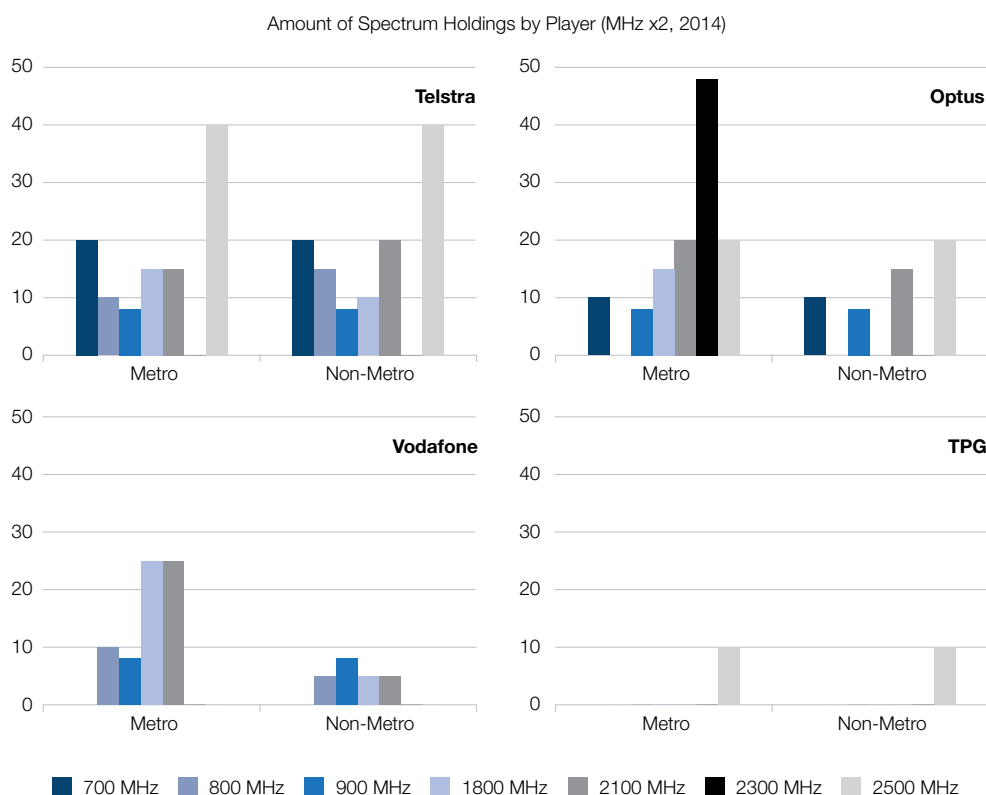
† Data consumption increased by 97 per cent from 19,636 TB to 38,734 TB.

The three mobile operators have invested heavily in their networks to meet the growing demand for data, and to achieve competitive coverage claims. Over the past five years they have collectively invested more than \$11 billion in their wireless networks (excluding spectrum spend).

All three operators have set aggressive timelines for 4G network expansion. Telstra and Optus are both targeting 90 per cent coverage of the national population by 4G in 2015.*

Telstra and Optus have also collectively spent approximately \$2.0 billion acquiring spectrum in the 700 MHz and 2,500 MHz bands at the 2013 digital dividend auction.† Telstra currently holds significantly more spectrum in non-metropolitan areas than its competitors, as shown in the following chart.

Figure 2: Spectrum holdings



Source: Venture Consulting, *Background to the mobile and towers sector in Australia*

* More than 90 per cent of mobile connections are now 3G/4G, and most of the remainder will be on 3G/4G by late 2016.

† Telstra and Optus purchased 40MHz and 20MHz of 700MHz spectrum respectively. Spectrum in the 700MHz band provides greater in-building penetration and wide coverage and can be used to transmit signals over further distances than higher spectrum frequencies.

In May 2015, the Australian Government announced that additional spectrum in regional Australia will be made available to support mobile broadband services.⁴ The Australian Communications and Media Authority (ACMA) is planning to hold an auction in November 2015 for spectrum in the regional 1800 MHz band.

The overall increases in carrier investment has generally focused on expanding high-speed data capabilities, both by evolving to a finer cellular network topology in high-density areas and by upgrading to 4G technology.

Based on the information provided to the Committee, current investment plans and competitive dynamics are likely to provide additional regional coverage in the near future. However infrastructure-based competition becomes more difficult in areas where there is insufficient traffic and higher costs. This reflects the natural monopoly character of parts of the telecommunications market, and prompts different policy responses.

Material improvements in mobile coverage will also be provided under the Australian Government's Mobile Black Spot Programme (MBSP). Under this scheme, mobile carriers can partner with local communities and co-investors from state and local government to bid for Commonwealth funding to extend coverage in black spots. Funds are awarded on the basis of a scoring system which weights a range of factors such as population coverage.

The locations to benefit under Round 1 of the MBSP were announced in June 2015, delivering almost 500 new or upgraded mobile base stations in outer metropolitan, regional and remote Australia (429 Telstra and 70 Vodafone). The first base stations funded under the MBSP will be rolled out over three years, commencing by the end of 2015.*

In addition, Telstra will build up to 200 4G mini base stations in locations in small towns where suitable infrastructure is available. These mini base stations will provide mobile data coverage in a radius of around 200-300 metres and will support voice services as the technology for 4G-based voice becomes available.

A further \$60 million has been committed by the Australian Government for Round 2 of the MBSP, with funding to be available over two years from 1 July 2016.⁵

Telstra is also investing \$100 million over five years to build Telstra Air, a national WiFi network which will help alleviate network congestion issues by providing data offload capabilities. At the time of launch, Telstra Air comprised 3,000 public WiFi hotspots across 250 towns and cities and is expected to grow to around 8,000 hotspots. iiNet has also developed its own national WiFi service, and Optus has released a smartphone app which allows its customers to make

* The programme will provide new handheld coverage to 68,600 square kilometres and external antenna coverage to more than 150,000 square kilometres. Also, 5,700 kilometres of major transport routes will receive new handheld or external antenna coverage. The total to be invested in Round 1 is \$385 million, comprising funding commitments from: the Commonwealth (\$100 million, excl. GST); the state governments of NSW (\$24 million), Victoria (\$21 million), Queensland (\$10 million), Western Australia (\$32 million) and Tasmania (\$0.35 million); local governments, businesses and community organisations (\$1.7 million); and investment by Telstra (\$165 million) and Vodafone (\$20 million). Further information is available at the Department of Communications website.

and receive voice calls and texts over WiFi networks. Vodafone is reportedly working on a similar service.

While these highly localised WiFi hotspots are not a solution for those who want unrestricted mobility, they can support high-speed data access from the same class of devices used for mobile network access.

Despite these significant increases in investment, and the success of the MBSP, the proportion of Australia's landmass that has mobile coverage is just over 30 per cent, with the prospect of coverage for the remaining 70 per cent a difficult and uneconomic proposal. This is a significant issue for people living in remote communities in need of mobile phones, and impacts people when mobile coverage is needed on main transport corridors, on larger properties, or for emergency services.

The fixed network: copper and HFC

Telstra's copper network, designed originally for voice telephony, has 7.4 million fixed-line services, of which 1.5 million are leased by other carriers such as Optus, TPG and iPrimus.

Internet connectivity over copper is largely provided by digital subscriber line (DSL) technology offering a high-speed, always-on broadband connection.

Optus and Telstra both operate HFC networks, designed originally for delivering television services, but capable of supporting voice and data. The network footprints are largely overlapping, and cover more than three million⁶ premises. iiNet operates smaller HFC networks in Ballarat, Geelong and Mildura. Demand for fixed-line voice services has been declining sharply as households abandon fixed line services and voice calls are displaced by mobiles and VoIP. This trend has been accelerated by the proliferation of 'over the top' voice and messaging services such as Skype, Facebook Messenger, Apple FaceTime and WhatsApp.

In contrast, there has been sustained growth in the demand for data connectivity. A high-speed data connection is becoming an essential prerequisite for many households and businesses to function effectively.

There were just under 12.7 million internet subscribers (excluding mobile handset subscribers) in Australia at the end of December 2014, an increase of two per cent from the end of December 2013. The following table provides a breakdown of the different technologies used to access the internet.

* There were 966,000 cable broadband subscribers on the HFC networks in December 2014, accounting for less than eight per cent of the total broadband market in Australia.

Table 2: Subscribers by access technology*

Access type	Subscribers ('000)
Dial-up	159,000
DSL	5,099,000
Cable	966,000
Fibre	324,000
Satellite	75,000
Fixed Wireless	67,000
Mobile Broadband	5,996,000
Other	5,000

Source: ABS, 8153.0 – Internet Activity, Australia, December 2014

Including mobile handsets, for the three months to December 2014 fixed broadband subscribers represented only 20 per cent of all subscribers, but accounted for 93 per cent of the data downloaded.

Table 3: Data downloaded by connection type

	Subscribers ('000)	Data downloaded (TB)
Dial-up	159,000	25
Fixed Broadband	6,536,000	1,112,379
Mobile Broadband	5,996,000	34,339
Mobile Handset	21,032,000	52,745
Total	33,723,000	1,199,488

Source: ABS, 8153.0 – Internet Activity, Australia, December 2014

* The ABS currently counts internet subscribers via a mobile handset separately from other internet subscribers

Residential users in urban areas generally have good access to competitive fixed broadband services, but regional Australia's access and choice of service has consistently lagged behind.

- The Department of Communications' Broadband Availability and Quality⁷ report found that approximately 700,000 premises have no access to a fixed broadband service.* Apart from small pockets of poor service in metropolitan areas, these areas are typically located in regional Australia.
- Competitive retail supply of broadband services is facilitated by the use of Unconditioned Local Loop Service (ULLS) and Line Sharing Service (LSS), which enable access seekers to supply high-speed data services such as DSL via modem over Telstra's copper network. In metropolitan areas, 31.4 per cent of services are delivered over ULLS and LSS lines, compared to only 2.5 per cent in regional areas.⁸

Telstra also has a network of terrestrial microwave systems, the Digital Radio Concentrator System (DRCS) and the High Capacity Radio Concentrator (HCRC) system, which it uses to deliver standard telephone services (STS) to remote Australia as part of the Universal Service Obligation (USO). Although Telstra is currently not obliged to provide other services under the USO, it has been suggested that the radio towers could be used for mobile backhaul, or for local mobile repeaters or hotspots.

In areas where it is not feasible to deliver voice or broadband over copper, HFC or fixed wireless, satellites have played an important role in enabling access.

Optus has the largest fleet of domestic satellites in Australia with six geostationary earth orbit (GEO) satellites delivering TV, radio, voice and data services.⁹

- Telstra offers mobile voice and data services currently over the Iridium satellite network, which has 66 low earth orbit (LEO) satellites.¹⁰
- Other commercial satellite networks providing voice and broadband data services in Australia are Globalstar (LEO), Thuraya (GEO) and Inmarsat (GEO).

While satellites provide coverage over very wide areas, the capacity of these services is finite and their suitability for many applications (including voice) is impaired by latency associated with the up and down links, as well as technical issues such as susceptibility to rain fade.[†]

* The report also found that 91 per cent of premises (9.9 million) have access to ADSL broadband services delivered via ADSL technology and 28 per cent of premises (3.1 million) have access to a high-speed broadband platform (fibre to the premises, fibre to the node, HFC or fixed wireless).

† The latency issue is more pronounced with GEO satellites than with LEO satellites due to their much greater distance from earth (35,863km). LEO satellites' proximity to earth (500km – 1,500km) gives them a better signal strength, less bandwidth wastage and lower latency. However, each satellite covers a smaller area and is visible for just 15 to 20 minutes each pass, so a large number of LEO satellites is necessary for a LEO network to be useful, which is costly.

The national broadband network

The Australian Government's 2009 decision to give all Australians access to high-speed broadband by embarking upon a major upgrade to Australia's network infrastructure with the NBN will change the way fixed broadband services are delivered.

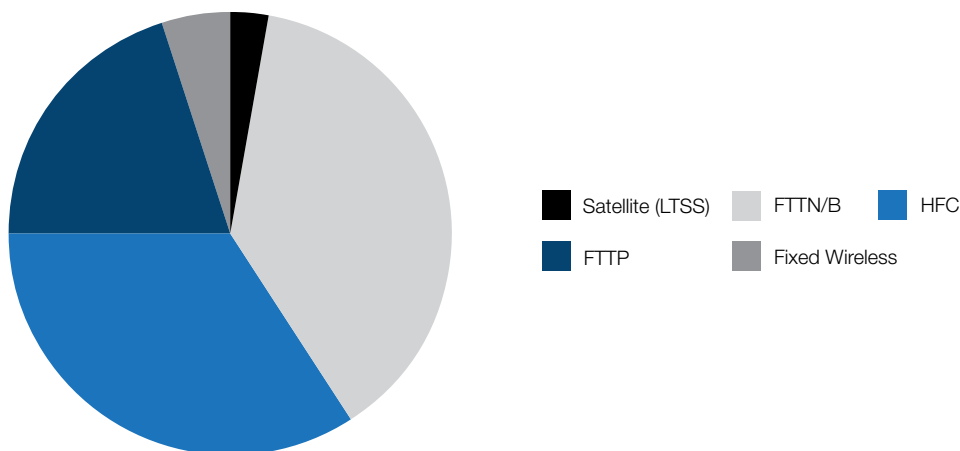
NBN Co has moved to a multi-technology mix to make greater use of existing infrastructure (notably Telstra's copper network and the HFC networks) with the objective of rolling out the network faster, and at a lower cost.

Australians living and working in regional areas comprise 33 per cent of the total Australian population. The majority of the regional population, particularly those living or working in or near larger townships, will be serviced by the NBN's fixed line services. However, for the approximately eight per cent of Australian premises that fall outside of the fixed line footprint, NBN Co's Corporate Plan states that five per cent of these will be connected by fixed wireless technology, and the remaining three per cent by the LTSS. The significant majority of that three per cent are located in regional areas, including in some of the most remote geographies of Australia.

The intention is that:

- In urban areas where HFC infrastructure is available, the networks will be upgraded to the latest data standards and broadband will be delivered over HFC.
- In areas where Telstra's copper network can be re-engineered to a fibre-to-the-node (FTTN) architecture, the upper reaches of copper will be replaced by fibre and broadband will be delivered over the resulting shorter copper loops using the latest DSL technology.
- In multi-dwelling structures (typically located in more central urban areas), optical fibre will be taken to the building and either DSL technology will be used over existing in-building copper to deliver broadband in a fibre-to-the-building (FTTB) architecture, or fibre will be continued all the way to the unit in a fibre-to-the-premises (FTTP) architecture.
- In new development areas and in selected existing populated centres not amenable to any of these other solutions, fibre will be deployed all the way to the premises in a FTTP architecture.
- In fringe areas and in many regional areas, NBN Co will install its equipment on new or existing towers and use fixed wireless technology to connect users up to 14km away.
- For all remaining users (comprising the more remote areas of Australia, and pockets of users in typically mountainous terrain not easily serviced by any of the other solutions), satellite connectivity will be used. Given the lead-time in the NBN being ready-for-service with its own long term satellite solution (the LTSS), NBN Co contracted capacity on existing satellites, including an interim satellite service (the ISS) in 2011.

Figure 3: Multi-Technology Mix (MTM) NBN rollout



Source: NBN Co, Corporate Plan 2016

Australia's telecommunications market structure is therefore undergoing major structural change.

NBN Co provides 'last mile' access to the user – that is, from one of its points of interconnect (POI) to the user's premises. Retail Service Providers (RSPs) arrange the carriage of telecommunications traffic from the NBN POIs to their own core networks, and provide services to the end customers such as telephony, internet access and video.

NBN Co will operate on a wholesale-only and non-discriminatory basis, subject to ACCC scrutiny. This recognises that in many areas – particularly residential areas – NBN Co is likely to be the sole wholesale provider of fixed broadband services.

However, NBN Co does operate in a competitive environment. For example:

- Multiple competing high-speed networks service high density markets like the central business districts of cities and major regional centres.
- Developers in 'greenfield areas' (i.e. new developments) are required to ensure that their estates are equipped with telecommunications infrastructure, but can select either NBN Co or a private provider.
- Owners of existing infrastructure can continue to use and extend those networks, subject to various rules.
- Mobile networks are attracting a significant portion of the population who are 'mobile only' or who substitute mobile for fixed broadband.

To enable NBN Co to operate more effectively in markets where it faces competition, the Government changed the original uniform national pricing to wholesale price caps. The extent to which this change might contribute to lower wholesale pricing in urban areas is not yet clear.

In addition to network infrastructure designed to support 'last mile' customer access, various carriers compete in many parts of the long-distance or trunk carriage market, both within Australia and between Australia and international destinations.

Regional Australians have much to gain from the arrival of higher bandwidth and higher quality fixed broadband services. It is clear from the difficulties some regional customers currently experience with fixed lines and poor quality or no DSL, as well as from the positive experiences of customers moving onto the NBN terrestrial network, that there could be significant improvements to lifestyle and business productivity with the move to the NBN.

Going forward – regional Australia's changing telecommunications market

By 2020, NBN Co proposes to be in a position to supply high speed broadband connections to approximately 12 million Australian premises, with eight million services activated.¹¹

The rollout schedule results in the early deployment of the satellite and fixed wireless networks. This reflects the Government's expectation that where commercially and operationally feasible, NBN Co will preference those households, largely in regional Australia, which are underserved.

On this basis, the following 'Ready For Service' premises are forecast:

Table 4: Premises ready for service – cumulative

	FY14(A)	FY15(A)	FY16	FY17	FY18
FTTP Brownfields	381,000	708,000	1,080,000	1,270,000	1,515,000
FTTP Greenfields	111,000	189,000	260,000	370,000	505,000
FTTN	-	-	500,000	2,035,000	3,745,000
HFC	-	-	10,000	875,000	2,350,000
Fixed Wireless	112,000	268,000	370,000	480,000	535,000
Satellite (incl ISS)	48,000	48,000	412,000	412,000	412,000
	652,000	1,213,000	2,632,000	5,442,000	9,062,000

Source: NBN Co, Corporate Plan 2016

There may also be opportunities for individuals, communities and local governments to select the rollout of an alternate technology solution in their area by paying the incremental cost of the change under the NBN Technology Choice Program.

This rollout will inevitably involve a period of transition in which some premises will be connected before others.



Building-mounted Wi-Fi phone installed at Labrapuntja. Image courtesy of Australian Private Networks Pty Ltd

The Committee has identified several groups with less than adequate telecommunications services that are worthy of ongoing monitoring:

- **People who currently have poor or no broadband connectivity and who have no prospects of upgrade or improvement until the NBN is rolled out in their area.*** Although this group is being prioritised by NBN Co, the Committee recommends that the rollout be reported on and monitored.
- **People with poor or no mobile coverage** who are unlikely to receive coverage under the MBSP.
- **People relying on NBN's satellite solution.** While the three per cent within the satellite footprint will be amongst the first to be connected, the location of these customers presents the greatest complexity in providing reasonable service equivalence with their regional, let alone urban, counterparts. This is because satellite communications, by their nature, share finite capacity, can suffer service disruption in extreme weather, and (in the case of geostationary satellites) incur additional delays (latency). NBN satellite users are, by virtue of geography, more reliant on telecommunications, so data restrictions and higher effective prices present issues unique to this group.

* While it is difficult to quantify, with previous estimates indicating that approximately six per cent of premises have no fixed broadband service, more information is required and a monitoring mechanism is proposed in Chapter 6. Note that NBN Co has indicated that all Australian premises will be able to connect to a broadband service by 2020 – either fixed broadband, fixed wireless or satellite.

There are also people within the NBN's satellite footprint who are reliant on Telstra's fixed radio links (DRCS or HCRC) in regional areas to provide them with an STS. These networks are nearing the end of their life. There is only an obligation to offer voice as the USO provider.

In Chapter 6, the Committee recommends monitoring these users in particular during the NBN transition.

New entrants and new technologies

A range of emerging technologies and initiatives could potentially play a role in improving regional telecommunications services in the future.

For example:

- Small cell technologies* are being deployed by the carriers as base stations in their mobile networks, providing opportunities for more economic base stations to be built (subject to available backhaul) which would be suitable for small townships of several hundred people.
- The CSIRO has developed a wide range version of WiFi suitable for outdoor networks called Ngara. The system operates by sending focused beams to households or remote nodes from transmitters mounted on existing mobile or broadcast towers. Field trials have been conducted since 2012 and the CSIRO is involved in a number of projects to demonstrate the technology's potential application in remote Australia.¹²
- Project Loon is a research and development project by Google that aims to deliver internet access to remote areas of the world using high altitude stratospheric balloons that create an aerial wireless network with up to 3G-like speeds. Google has been conducting Project Loon tests with Vodafone in New Zealand, Telstra in Australia and Telefonica in Chile.¹³
- OneWeb plans to deploy a constellation of more than 648 LEO satellites to provide low latency high speed internet access globally, and is planning full satellite deployment by 2019.[†] As well as globally targeting internet hotspots in hard to serve geographies, it is also proposing to offer small cell user terminals that will operate to extend the range of a mobile network in hard to serve geographies.
- Through NBN Co's deployment of its satellite and fixed wireless networks, there are ongoing opportunities for NBN Co to offer wholesale inputs to support niche and competitive infrastructure providers in these underserved areas.

* Small cells are low-powered, short-range mobile phone base stations used to complement larger towers.

† Initially backed by Virgin Group and Qualcomm, the company announced a \$500 million 'Series A round' that attracted investors including Airbus Group, Bharti Enterprises, Hughes Network Systems, Intelsat and The Coca-Cola Company.

CHAPTER TWO: Demand for services in regional Australia

In conducting the Review, the Committee sought submissions from the general public that would enable it to form a view on the current and future patterns of demand for telecommunications services in regional Australia.

It is evident from the submissions that regional users, like their urban counterparts, are evolving rapidly in their consumption of telecommunications services. They are making society-wide changes in the way that they absorb entertainment and information, conduct their businesses and receive public services. They also have distinct needs and challenges arising from their geographic location and more mobile-dependent lives.

For example, users in regional areas are more likely to:

- travel long distances and spend extended periods of time outdoors, relying on mobile services for communication and safety
- have a high dependence on online channels for accessing entertainment, shopping and essential services such as banking, education and healthcare
- run home-based businesses, with different communications needs in comparison to other residential premises
- face somewhat different risks during natural disasters, creating a higher dependency on reliable emergency service connections, and also a greater risk of mass service disruptions due to damage to infrastructure.

It is noteworthy that regional Australia is trending towards becoming highly mobile-centric.

In general, consumers are increasingly choosing mobile services as their primary means of communication.

- The number of mobile services in operation in Australia has reached 31.01 million.¹⁴
- A total of 4.9 million mobile phone users do not have a fixed-line home telephone service, a significant increase of more than 33 per cent since June 2013.¹⁵
- The number of fixed-line telephone services in operation fell by two per cent to 9.19 million (between June 2013 and June 2014), in line with the trends reported over the previous three financial years.¹⁶
- Approximately two-thirds of all the calls made to the Triple Zero (000) emergency service are now made from mobile devices.¹⁷

Regional mobile preference is more pronounced than in the cities. A recent survey by the ACMA indicated that there was a higher level of use of mobile technologies in regional Australia than in urban areas.¹⁸ The proportion of exclusively mobile users in regional areas is 50 per cent higher than in capital cities (15 per cent vs 10 per cent), representing adult Australians who do not have a fixed-line phone or fixed internet connection and instead use mobile connection for voice communications, messaging and internet access at home. Similarly, the proportion of mobile-only internet users is higher in regional areas (26 per cent) compared to capital cities (19 per cent).

It is not surprising then that almost 80 per cent of submissions to the Review commented on the importance of mobile coverage in regional Australia (see Appendix B).

Notwithstanding these broad differences between regional and urban users, it is essential in setting policy that regional users not be treated as a homogenous group. Different regional communities have very different demand needs, based on a range of factors. This will determine selection of communication services and types of applications that are in use.

Restricted availability of technology options and lack of choice of RSPs was a major theme in submissions. It is a significant driver of the higher costs incurred by regional users.

The effective prices experienced by regional users are higher, despite mobile and NBN broadband pricing plans being the same price nationally. For example:

- Rural consumers with fewer technology options will likely face higher charges than their urban counterparts, as they will not be able to efficiently select between WiFi, fixed broadband with VoIP (e.g. Skype), mobile VoIP, and standard calling to the same extent.
- Rural customers without effective mobile coverage will be unable to achieve the same bundling benefits as their urban counterparts and may experience drop outs with resulting 'wasted' call charges.
- Within a remote homestead, there may be several demand types, simultaneously consuming data within one plan – for example a farm business, a non-farm business and an additional household.
- Satellite customers in particular may face additional access costs relative to an NBN fixed line customer, as the LTSS for data and fixed line for voice will likely come from separate suppliers.

A sample of representative data packages providing 50 GB* of data per month have been selected to see what is available in different geographies. For a customer in an area served only by satellite, the cheapest option would be the top ISS plan for about \$155 per month with usage constrained to 25 GB during peak hours. In comparison, a customer with access to a basic NBN fibre 50 GB plan would incur a cost of about \$60 per month. This is without having regard to the potential in areas with multiple technologies to shop around and get the best bundle.

* 50 GB per month represents the average consumption per fixed line in Australia, according to the ABS.

Table 5: Comparison of plans available to a user requiring 50GB data per month

Type of Service	Example RSP Plan	Download Limit (GB/Month)			Maximum Speed (Mbps)		Price (\$/month)
		Total	Peak	Off peak	Down	Up	Unbundled
Satellite (NSS)	Clear NSS012	60	15	45	4	1	\$369.95
4G Mobile Broadband	Telstra BigPond Mobile Broadband 25 MB	50 (2x25)	No restriction		2–50	1–10	\$350.00
Satellite (ISS)	SkyMesh NBN-Max-80 Plus 10 x 10 GB Data Blocks	50	25	25	6	1	\$154.95
NBN Fixed Wireless	iPrimus Fixed Wireless Light Family	200	100	100	12	1	\$69.00
NBN FTTN	iiNet NBN Fibre 1	50	No restriction		12	1	\$59.90
ADSL2+	TPG ADSL2+ \$29.99 Plan	50	25	25	10	1	\$29.99

*Source: Compiled from publicly available information**

Retail competition also goes to the willingness of RSPs to address local requirements through product or pricing innovation targeted at specific regional users so that they get the service most suited to their needs.

Throughout the Review, the Committee noted with particular interest those cases where individuals and small communities showed innovation and initiative in addressing their communications needs. These cases offered useful insights into the potential success of innovative uses of backhaul and private infrastructure to solve small community needs. Such examples demonstrate the value of community involvement and local input into shaping demand profiles for areas, offering tailored solutions in lieu of a one-size-fits-all approach to product offerings.

* There are some differences between the plans in terms of additional inclusions; for example, iiNet's plan includes a VoIP service that provides free local and standard national calls.

Improvised solutions fitting the needs of local communities

During the webinars the Committee heard from Ms Raelene Hall, who lives 210 km north-east of Meekatharra in the East Gascoyne region of WA. While Ms Hall has access to satellite, she has also obtained access to the mobile network supporting the nearby mining facility, providing the farm with two new channels of communication.

In their submission to the Committee, Mr Jock Graham and Mr William Harrington detailed their experiences trialling the installation of low-cost, solar powered relay towers on hills to provide greater wireless access, including access to business applications on farms.

In conducting the Review, demand profiles for particular segments of the community emerged from submissions and stakeholder consultation as requiring special consideration:

- education
- health
- business
- remote Indigenous communities
- emergency services.

These areas are discussed in more detail below.

Education

Of the 426 submissions received by the Review, 38 per cent specifically addressed education challenges.

While reliable telecommunications services are essential for all students, those living in regional areas are uniquely dependent on them for their ongoing education. This is most clearly highlighted by School of the Air, which provides distance education to isolated students in remote farming stations, micro tourism industries, small Aboriginal communities, outstations and smaller rural farming blocks. The geographic dispersion of their students is extreme, with the Alice Springs School of the Air servicing around 125 students across 1,300,000 square km. These schools rely heavily on telecommunications services, usually satellite, to deliver lessons and provide students with access to learning resources.

The quality of learning received by distance education and home-schooled students is greatly affected by the reliability, speed and data limits of their internet services. For example, in early July 2015 the NSW Isolated Children's Parents' Association conducted an online survey showing that 80 per cent of respondents had experienced communications barriers that had negatively impacted their child's education, while 45 per cent had experienced positive education outcomes as a result of becoming better connected.

Respondents reliant on satellite services consistently exhausted their data allocation before the end of the month, impacting students' capacity to conduct research or submit assessments and also impacting businesses run out of the family home or the general use of other vital internet services such as banking.

The recent introduction of NBN Co's Fair Use Policy has resulted in RSPs significantly lowering data caps on satellite plans. RSPs now typically offer plans that cap peak period downloads to 10–25 GB per month, where previously these caps were much higher. This is an area of particular concern:

"Distance education students need a maximum download of at least 30 GB per month to accommodate appropriate educational interactions between student, teacher and class and it is imperative that either satellite or mobile technology provides this."

NSW Isolated Children's Parents' Association

Slow internet speeds were also described as a limitation, excluding some students from homework programs and personalised education services. For some families, internet and mobile coverage simply did not extend to the home, requiring families to travel to urban centres to complete school work or send their children to boarding schools. Such experiences are described below:

"Due to restricted downloads (maximum 25 GB per month) and slow download speeds (on average 2 Mbps) children are unable to access homework programs such as Reading Eggs and Mathletics. They do not develop the habits of using the internet for research... as their access is restricted. At school the speeds are so slow that the teachers do not use the internet [in] their programs."

"Our internet and mobile coverage is not great and our children have found it difficult to complete tasks their schools and universities have requested. Our children have often had to go to our nearest town to the local library to do their work. Not easy when you live a distance from the town and they often need a number of days to complete their work."

NSW Isolated Children's Parents' Association

The effective cost of educating a child at home is also a key factor, given the reliance on a combination of technologies to deliver interactive voice, real-time videos and access to online resources. Distance education is delivered by state governments and there are various connectivity funding arrangements for families.

Any response to these challenges must recognise regional customers' varying levels of dependence on online education tools. While for some students slow data speeds impact private research and homework only, those using formal forms of distance education (such as that provided by School of the Air) are completely dependent on internet services to complete their education.

Similarly, any response must anticipate the increasing trajectory for schooling materials to be exclusively accessed online, and in more interactive and data-intensive formats (such as through video tutorials and streamed classes).

NBN Co has demonstrated a willingness to address education needs as a distinct and vital demand type, and has acknowledged the variety of different services it needs to address. The Distance Education and Broadband Working Group, which brings together Commonwealth, state and territory education officials and satellite experts from NBN Co, is working on developing appropriate products and services.

NBN Co has acknowledged that the ISS has not met expectations. In particular, the amount of data during peak times is inadequate and speed is often an issue. However, there is currently no capacity on the ISS to allow students extra data.

The NBN's LTSS will have much greater capacity and will enable users to access speeds of up to 25/5 Mbps in late 2016. Primary school students require 25–30 GB per month, which exceeds the proposed LTSS peak time (7am–1am) limit per household. NBN Co is working with education departments to offer a second, dedicated port on the home network device that will provide students with a direct link to support educational videoconferencing, lesson streaming and data allowances distinct from other uses.

Another key long-term issue is mobile broadband costs. For communities relying on mobile devices to access the internet, the data access costs of using educational websites may be a significant disincentive to participation, particularly where prepaid packages are preferred. In response to these concerns, Telstra recently announced that it would provide free mobile broadband access to 38 educational websites.

While not prominently featured in submissions, the Committee also considers access to other forms of online education, such as distance university education and business or industry training tools, to be significant in supporting equality of access and participation for regional Australians.

Tertiary students in regional areas may face significant barriers in using innovative online services such as EduOne, which provides next generation online interactive learning tools for tertiary students. In particular, network speed and data costs may make it impossible or prohibitively expensive to participate in online lectures, at times forcing prospective students to travel or abandon their study plans.

"Our daughter...is trying to complete a university degree externally. This is nearly impossible with the data limits, and she has to travel into Coolah to use the free WiFi at the library to enable her to do her research and submit her assignments."

George Esdaile, NSW

"Recently our daughter attempted to undertake university externally but as our download limits were reduced from 60 GB to 20 GB by Activ8me satellite she has no alternative but relocate to another centre."

Adrian Vickery, NSW

Health

The 2008 Regional Telecommunications Review (the Glasson Review) offered an aspirational view of what could be achieved in healthcare delivery by leveraging telecommunications technology and highlighted the opportunity to enable more effective health care for patients outside the major centres.

Care providers are now starting to use telecommunications to provide regional communities with access to eHealth and telehealth solutions, enabling the remote monitoring of patients, and delivering online medical training and educational support to remote health workers.

For example:

- The Princess Alexandra Hospital in Brisbane opened a Telehealth Centre in 2012, which provides a range of health outreach services to patients in regional Queensland using telehealth technology.*
- The Northern Territory Government has successfully implemented eHealth initiatives in remote care facilities under an agreement with the Aboriginal Controlled Community Health Services. More than 80 per cent of Northern Territory remote health centres are moving towards electronic health records. The Northern Territory Government is also rolling out a new eHealth solution called iCareNet,[†] a support tool to analyse patient clinical data and make best practice advice available to clinicians.¹⁹

* The Telehealth Centre provides fully equipped clinical consultation rooms, meeting spaces and private studios for clinical consultation, providing professional support to clinicians in remote locations by videoconference and reducing the need for patients to travel to Brisbane by substituting some face-to-face consultations with telehealth appointments.

† The Northern Territory Government views iCareNet as an invaluable tool for remote health clinics, but states that the geographical extent to which it can be delivered will be limited by the level of communications available.

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- In Queensland, an ICPA-initiated trial of service web-based delivery of speech-language pathology services is currently underway. Seven rural and remote schools are participating with 13 students receiving support through a telepractice platform.*
 - The Australian College of Rural & Remote Medicine (ACRRM) hosts a web-based learning platform that provides rural general practitioners with access to both educational content and a peer-to-peer network for ongoing support.
 - ACRRM also hosts a tele-dermatology solution (Tele-Derm) which enables rural general practitioners to obtain advice from dermatologists in capital cities.

One of the new frontiers to be addressed is the migration of patient care out of the clinical environment and into the primary and allied care environment (including home care), and as a result the need to move clinical information efficiently and reliably across public networks.†

For new distributed models of care to operate effectively, frontline personnel require access to reliable mobile connectivity to allow for quick response and diagnosis in the field, while hospitals and health centres will generally have higher data requirements and need faster connectivity to allow the transfer of larger files (such as those relating to medical imaging and pathology) and the ability to conduct teleconferencing with specialists in metropolitan areas.

This raises a number of issues around the availability and performance of telecommunications services in regional areas, notably:

- network reliability for applications such as remote patient monitoring
- network capacity and cost for bandwidth-hungry applications such as video consultation (the regional deployment of which is limited due to low bandwidth capacity and high cost)
- mobile access for providing support to frontline personnel and emergency services, and for applications such as over-the-phone consultations (particularly for communities that are highly mobile centric, such as some Indigenous communities).

The importance of good mobile coverage to frontline personnel and emergency services is well illustrated by a number of submissions to the Review:

“Balranald Ambulance Service Vehicles are equipped with technology to allow for pre-hospital thrombolysis of heart attack patients. For this skill to be undertaken by local paramedics, ECG’s from our cardiac Lifepak machine need to be sent by at least 3G data network to Broken Hill Hospital for review by a cardiologist. The cardiologist will then call the paramedics on the vehicle on a designated mobile phone attached to the Lifepak

* 38 sessions had been provided through Education Queensland’s iConnect or through Queensland Health’s telehealth facility by mid-June 2015.

† The importance of “innovative and flexible solutions to enable access to allied health services by people living in rural and remote communities” was highlighted in a July 2015 position paper by SARRAH (Services for Australian Rural and Remote Allied Health), a peak body representing rural and remote Allied Health Professionals. The paper recommended that the Australian Government provide funding in this area, including the funding of services delivered using telehealth.

*unit. Without data and phone services available we would have to transport the patient closer to Balranald, delaying treatment by up to one hour. Provision of data and mobile phone services to the Clare area will improve health outcomes for patients in the area who experience a STEMI heart attack.”**

Katherine Ferguson, Station Officer, Balranald Ambulance Service, NSW

The ability of hospitals and clinics to support remotely located clinicians and patients via video conferencing and remote monitoring could be severely limited in areas serviced by satellite, which may not be able to consistently and reliably deliver the necessary capacity and technical capability.

In the most remote areas, consultations are often delivered entirely by phone (satellite or mobile) as this is the only practical option available. Improved data services would create the opportunity to enhance care using videoconferencing and other applications requiring a fast, stable internet link. This point was highlighted in the submission from the Royal Flying Doctor Service:

“In 2013–14 the RFDS provided over 82,000 Remote Consultations, with almost all of these calls originating from the remote and rural areas where we provide regular primary healthcare or emergency services. Demonstrating the particular reliance on basic telecommunication services by people in the bush, over 90 per cent of these remote consultations were over the phone, including satellite and mobile phones. In 2012–13 for example, only 312 Remote Consultations were conducted through mediums other than phone.

“Over-the-phone Remote Consultations are regularly supported by fax and picture messaging (either through mobile devices or via email) however, due high costs and ongoing issues with internet connectivity and stability in many areas where we provide services, videoconferencing is not widely used for our Remote Consultations. These technological issues and costs are significant barriers to expanding and enhancing our Remote Consultations service, and increased reliability would be required for videoconferencing to be appropriate, particularly in emergency situations.”

Royal Flying Doctor Service

A high priority group brought to the Committee’s attention is remote Indigenous communities with high co-morbidity rates. Timely and effective diagnosis, treatment and monitoring of acute chronic conditions in this community is profoundly challenging, as is delivering health education and preventative programs. By bridging time and distance gaps, and by lowering barriers to accessing support, expertise and the latest medical technology, telecommunications can play a significant role in addressing these challenges.

* The submission explains that “these type of heart attack patients (known as STEMI heart attack) can have a cardiac arrest within two hours of symptoms for up to 25 per cent of patients. Early treatment of STEMI heart attack patients increases survivability as well as reducing long term cardiac problems related to cardiac damage.”

New telecommunications-enabled healthcare models have great potential to deliver better health outcomes at lower cost in regional areas. Their success, however, depends not only on adequate telecommunications infrastructure but also better co-ordination among the multiple funding channels from Commonwealth and state governments.

Business

Seventy per cent of the submissions received by the Committee raised business as an issue.

Most businesses, both regional and urban, have a common set of basic communication needs, including:

- one or more voice lines for communicating with customers and suppliers
- a broadband data service for accessing email and the internet
- one or more mobile services to connect field workers or travelling employees.

In regional areas where the telecommunications services to support these basic needs are unavailable, unreliable or have limited capacity, businesses are constrained in their ability to operate effectively and efficiently.

This is amplified as core business applications and services migrate to online and cloud-based platforms, increasing businesses' reliance on a reliable, high-speed broadband service (fixed or mobile).^{*} Regional businesses unable to take advantage of these developments because of limitations in their telecommunications services will face a growing gap in terms of productivity and market access relative to those in better-served areas.

The importance of broadband as an essential businesses requirement was highlighted in a 2014 survey of 84 businesses in the Hunter region undertaken by Regional Development Australia (RDA) Hunter. One hundred per cent of the businesses surveyed believed that without broadband they either could not operate at all, or could function but with significant limitations. Almost all businesses surveyed (97.5 per cent) have websites.

This reality is particularly acute for businesses which, because of the nature of their product, service or supply market, are heavily reliant on high speed broadband to remain competitive. A prime example is web development businesses, as illustrated by the following submission:

"We run a website development, web programming and webhosting business from our home in rural NSW. Although we are less than two hours from Canberra, poor

^{*} Examples of business applications that have migrated, or are migrating, online:

- Office productivity and financial applications are increasingly being delivered as cloud-based Software as a Service (SaaS) solutions, e.g. Microsoft Office 365, Google Apps, Xero and DropBox
- Physical sales and procurement channels are progressively being augmented or replaced by online channels
- Online banking services require broadband, with transactions often requiring second line authentication via mobile
- Essential information, such as weather forecasts and market data, is now largely delivered via the internet.

telecommunications services impact heavily on our daily business management, profitability and ability to compete with our urban based competitors. Even with just eight GB/month download on site, 'Telephone and Internet' is our third largest business expense, after web server hire and petrol (and we travel to clients from SE Queensland to Melbourne!). There is no prospect of changed service for our location under the NBN that we are aware of. We are about to expand our download to 15 GB (mobile and home use combined), which will increase our phone and internet cost so that it is likely to outstrip any other single business expense. Yet 15 GB is still low, compared to our competitors or to personal internet access in the cities."

Diane Sutton, NSW

In addition to generic business requirements, many regional businesses have highly specific telecommunications needs as dictated by the particular applications used in their operations. The Committee noted the diversity of these applications and their underlying telecommunications requirements.

"The Australian Wine Research Institute runs an online technical platform and service program called Wine Cloud. End users undertake simple measurements on their grapes and/or wine using inexpensive equipment, enter those measurements into an online portal and receive back in real time analytical information used in making practical decisions. The platform reduces the cost and significantly increases the speed at which the analytical information is made available. This platform works well providing the end user has rudimentary internet facilities available."

Australian Wine Research Institute

"Today's new machinery has technology built into it that allows us not only to drive guided by GPS signal but also to communicate with each other, with our dealer, and with a home base. It allows us to vary (according to pre-prepared maps) rates of seed, fertiliser and chemicals applied as we work. It allows us to monitor the varying yields in our paddocks, and even the green index of our crops. For us, these are tools of trade. Sadly much of this technology REQUIRES (capitalisation intended) a mobile phone service."

David Jericho, SA

Many specialised applications, particularly those based on machine-to-machine or 'Internet of Things' (IoT) technology, do not require broadband data connections. This has created opportunities for innovative providers of fit-for-purpose narrowband products and services to enter the market.

An example of emerging IoT-based services can be found from a new Australian company, National Narrowband Network (NNN). NNN has developed a platform which enables large numbers of sensors to transmit data via existing low-power, wide-area wireless networks to a dedicated base station up to 15km away (which can then connect via a backhaul service to the internet or a central control point). This approach is well suited to applications such as water and land management that involve transmitting simple data messages (rather than images, video or voice), with connectivity potentially costing as little as \$1-2 per year, per device.

In regional Australia such technology is well established in mining and agriculture, where connected sensors in the field or on production equipment can enable remote monitoring and automation.

Large farming and pastoral operations are also exploring a range of new technologies.

The CSIRO has developed a world first high resolution crop selection platform called Phenonet, a network of wireless sensor nodes that collects information about the size, growth and performance of crops and sends this back to a laboratory in real time.*

Farmers are receptive to the potential use of unmanned aerial vehicles (drones) to help manage crops, increase yields, monitor animal health and meet targets for reducing environmental impacts.†

These innovations are likely to have implications for both the demand and the supply side of telecommunications services.

Remote Indigenous communities

As at June 2014, 2.3 per cent of Australians lived in remote or very remote areas of Australia: 323,720 people in remote Australia and 208,344 people in very remote Australia in a diverse range of settlements.²⁰

These settlements include agricultural communities (for example, farming homesteads and workers' barracks), mining communities, tourist facilities, Aboriginal and Torres Strait Islander communities and general pastoral properties. Indigenous Australians represent 16 and 45

* Its smart wireless sensor nodes work autonomously and independently, cooperating with each other to set up an ad hoc network to record environmental conditions and wirelessly transfer data to a data store.

† Other potential applications include accurately tracing irrigation systems to find leaks and assess efficiency, delivering meals to workers or replacement parts for field equipment, and checking on the welfare of workers who cannot be contacted by other means.



Freestanding Wi-Fi phone installed at Marramarrani. Image courtesy of Australian Private Networks Pty Ltd

per cent of all people living in remote and very remote areas respectively, based on 2011 Census information.

The 2011 Census also found that 63 per cent of Aboriginal and Torres Strait Islander households reported having an internet connection (compared with 77 per cent of other households), up from 40 per cent in 2006.²¹

The submission from the Indigenous Remote Communications Association (IRCA) said that:

“For many remote Indigenous people, a home telephone or mobile telephone service is the highest priority to enable unmediated communications with services and social networks across vast remote regions.”

In recognition that these are critical services which are not commercially viable, available or affordable for many residents, the Australian Government has invested in the delivery of basic internet, phone and WiFi facilities in remote Indigenous communities for many years. This has continued under the Indigenous Advancement Strategy, which includes:

- the provision of 245 community payphones to remote Indigenous communities
- fixed satellite WiFi telephones to 301 remote Indigenous communities
- funding of \$6.7m over three years for the provision of internet services, training and equipment in remote Indigenous communities.

While this has delivered basic telecommunications to some communities, the IRCA's submission indicates that people in remote areas are using more advanced communications technology for a range of applications and services. These include remote monitoring of facilities, land management, remote working and communicating with a dispersed workforce, and cloud-based information storage. While some of these are also used extensively in urban areas they are becoming increasingly important for remote operations.

The submissions from the IRCA and the Broadband for the Bush Alliance both said that:

- Remote Indigenous communities have different needs, household make-up, socio-economic conditions, environmental challenges, and usage patterns to other households in Australia.
- More community-wide and regional solutions such as WiFi sharing are needed to enable pre-paid services using portable devices and shared models of access across a region.

For many remote communities, mobile technologies are the preferred mode of communication* and there is also often a preference for pre-paid rather than post-paid billing services. The submission from the Northern Territory Government noted that:

"Smart phones and tablet devices are the product of choice in remote and particularly Indigenous communities. Prepaid mobile services assist with managing account payments and minimise cultural issues related to resource sharing. Most indigenous communities have bypassed the personal computer and laptop in favour of smartphones and tablets."

This has been confirmed in a landmark study by the Swinburne Institute for Social Research,²² a four-year study of 85 residents of Ali Curung, 170 km south of Tennant Creek. The study found that:

- Mobile devices were the most common means of accessing the internet, with 67 per cent of interviewees owning a mobile phone and 50 per cent of surveyed households having access to a tablet, compared to a third of households having access to a desktop.
- There was also a strong preference for prepaid billing services (no residents used post-paid billing services), although it was noted that 60 per cent used up their credit in less than three weeks.

The report concluded that "there was a preference in Ali Curung for portable devices and prepaid services, rather than desktop and post billing services. Generally these preferences mean that substantially higher internet costs are paid than equivalent households living in urban areas."

The Swinburne study also identified a preference in some remote communities for family or home-based access to internet facilities rather than communal or community-managed access.

* A survey by McNair Ingenuity Research Institute of 400 Aboriginal and Torres Strait Islanders on their media habits indicated that 70 per cent of Indigenous Australians owned a smartphone compared to 63 per cent of the general population. The study found that users living in isolated areas are increasingly accessing social media via tablet and smartphone devices.

This was due to a number of factors within those communities, however it emphasised to the Committee the need for community engagement in developing telecommunications solutions.*

A number of submissions also recognised the importance of digital literacy and IT training in order to help bridge the digital divide and assist in the use of digital technologies. The Australian Government has committed to provide internet services, training and equipment in remote Indigenous communities, as highlighted earlier. As infrastructure and services are rolled out, including increasing access to government services online, the training needs of those communities also need to be addressed.

Solutions for remote Australia are likely to be predominantly satellite, however the availability of nearby infrastructure, new technologies and community-based approaches may result in better communications solutions for remote areas.

Emergency services

The provision of telecommunications underpinning emergency services is critical, especially to regional communities most at risk of environmental disasters.

Nearly 50 per cent of submissions touched on the importance of emergency services to regional Australians, with a major concern being the lack of mobile coverage in an emergency. For example:

"It is accepted that the Australian population is increasingly reliant on mobile services as a convenient utility for safety and emergency purposes. However, mobile phone blackspots, extensive grey and shadow spots and mobile phone coverage failures exist in regional and remote areas of Australia meaning mobile telephones services cannot be relied upon or do not exist in some areas."

Bland Shire Council, NSW

"We rely heavily on mobile service and this obviously puts a strain on the telecommunication towers to keep up especially during peak times when people are constantly on their mobile phones (harvest, field days, weekends). It is especially difficult in the case of an emergency where a vehicle has broken down, or been involved in an accident and there is no quality mobile service to contact emergency services. Sometimes having a scratchy line cutting in/out is more dangerous in an emergency as the operators may send help to another location if they couldn't communicate with you properly."

Kelly Dolling, SA

* This point is reinforced by insights from the 2015 *Empowered Communities: Empowered Peoples, Design Report*, which notes that the demand side circumstances in Indigenous communities need to drive the supply side solutions, and advocates looking at local relevance, encouraging self-determination and enablement in social infrastructure choices. It highlights the need to monitor, review, evaluate and adapt – an approach which is not top down or bottom up, but based on ongoing engagement.

The importance of a dedicated communications network for emergency service workers was highlighted in the Hunter storm of 2015, which left many homes and businesses without landlines for weeks. The CEO of the Police Federation of Australia, Mark Burgess, highlighted the importance of phone services to emergency service workers:

"We're clearly aware of a number of the issues that arose up there with mobile communications. And you could imagine that, if police were completely reliant on the telco services, then we would be in the same situation as the rest of the public, and that would have put many, many lives at risk. What we're saying is that public safety needs something dedicated specifically for them."

The Committee notes the analysis currently being undertaken by the Productivity Commission to determine the best way to secure mobile broadband capacity to public safety agencies (PSAs) by 2020. In any such study it is important to consider the different market conditions in urban and regional Australia.

In summary, regional Australia is not homogeneous – it has very distinct demand characteristics, be it the opportunities for businesses to embrace new applications to support precision agriculture, the distinct communication needs of remote homesteads, or the needs of Indigenous communities.

In this context:

- The Committee is concerned that current data allowances do not enable regional users to effectively manage businesses, and differentiated retail products should be encouraged.
- Some applications (such as distance education) should be exempted from data allowance quotas, and the practice of designating Public Interest Premises (such as schools and libraries) should be maintained.
- Applications for health and agriculture have widely differing infrastructure requirements in terms of bandwidth and reliability.
- Encouraging more innovative and specialised infrastructure and service providers into this market would greatly assist in unlocking the opportunities that are available.

CHAPTER THREE: Adequacy of infrastructure in regional Australia

This chapter sets out the Committee's consideration of the main inhibitors and opportunities relating to adequacy of telecommunications in regional Australia with a view to setting out how these issues might be addressed in meeting regional Australia's demand for telecommunications.

Satellite

The NBN's satellite program is based around two services: the Interim Satellite Service (ISS) and the Long Term Satellite Service (LTSS).

Interim Satellite Service

The ISS commenced in 2011 as a temporary solution providing eligible rural and regional Australians with immediate access to enhanced broadband services. The ISS was initially expected to service up to 44,000 connections but by late 2013 had become oversubscribed resulting in a significant reduction in performance. NBN Co subsequently allocated \$34 million to improve capacity on the ISS and establish the Satellite Support Scheme (NSS) to provide new users with access to a commercial satellite broadband service.

The significantly higher demand than anticipated with the ISS was driven by some RSPs initially offering unlimited plans that put a strain on the satellite's finite capacity. This led to significant congestion on the service and a reduction in user satisfaction.

To further improve performance on the ISS, NBN Co began enforcing its Fair Use Policy in February 2015 to limit overall uploads and downloads during peak periods, in the context of their contractual relationship with RSPs. NBN Co also directed RSPs to withdraw plans that had large 'anytime' data allowances.

NBN Co's Fair Use Policy

The key features of the ISS Fair Use policy are:

- If total traffic across an end-user service exceeds **50 GB** in a rolling four-week period, the speed of the end-user service is 'shaped' to **128 kbps** until compliant
- If the traffic during peak time (18 hours from 7am each day) exceeds **9.7 GB** per user averaged across all users in a beam, the total capacity available to the RSP for those users is limited an average of **40 kbps** per user until compliant.

This places significant restriction on the amount of data an RSP can offer its customers.* Throughout the consultation the Committee heard of situations where RSPs have suspended service for customers who exceed their quota.

* The average monthly consumption by non-satellite NBN network users is running at 70 GB, with growth reflecting general global trends with some occasional 'step changes', as with the recent entry of Netflix into the Australian market. In contrast, the average consumption by satellite users is 10 GB per month, though this figure reflects the impact of fair use policies.

The recent enforcement of the policy has, in many cases, posed unacceptable constraints on users who are dependent on the internet – such as businesses and families with students engaged in distance education.

NBN Co is redesigning its Fair Use policy, so that RSPs will be better informed and have clearer price tiers and signals to ensure that they do not oversell, and to make provision outside the constraints associated with finite capacity. The per user data allowances are also to be liberalised.

Submissions to the Review lamented the unclear accountabilities between NBN Co and RSPs when the Fair Use Policy was first implemented. In the future, NBN Co will need to monitor consumer experiences in co-operation with RSPs, notwithstanding that NBN Co has no direct or contractual relationship with end users. On the other hand, RSPs should be fully responsible and compliant for notifying customers before they exceed their data limits, consistent with the provisions in the Telecommunications Consumer Protection (TCP) Code that require usage notifications from ISPs offering data inclusive plans.

Long Term Satellite Service

The LTSS will replace the ISS and NSS after it becomes operational in 2016. The ground stations have been built, and the two Ka Band satellites which will provide connectivity are scheduled to be launched in October 2015 and February 2016 respectively. Once operational, the LTSS will provide users with up to a 25/5 Mbps broadband service.



The service will cover the entire Australian mainland and islands via 101 dedicated spot beams. Each beam has a different capacity in terms of maximum bandwidth, which is shared amongst all end-users in the beam, and cannot be changed. The highest-capacity beam can serve up to 15,000 premises, while the 20 lowest capacity beams serve an average of approximately 700 premises each.

Experience with the ISS has coloured consumer responses to the Review, with large numbers of submissions expressing concerns about its perceived shortcomings. Particular concern has centred on data allowances and limits on downloads:

“Our internet service is via NBN Satellite and is bitterly disappointing. It is slow, expensive and totally inadequate for the demands of running a business (or even having a life). At peak times it is effectively unusable. Everyone with whom we need to communicate assumes we have blindingly fast, always available internet. We don’t.”

Russell Farr, NSW

“I am on the interim NBN satellite, as I am in an area where I have no mobile reception. This is a service that is limited in every way – bandwidth /speed /data. I started off on a 60 GB anytime plan, but this has gradually been reduced to 20GB peak/25 GB off peak, with shaping to occur after these limits were reached. No extra data packs can be purchased. The most recent communication that I received from my ISP was that now after I reach this limit, I will not be shaped – I will be cut off altogether till my plan rolls over in the following month. This has made it impossible for me to run my business from my home office and is having adverse effects on my daughter’s university studies.”

Hiromi Matsuoka, NSW

Another issue noted with satellites is latency. While latency is not particularly problematic for activities such as browsing, it can impact real-time activities such as voice-over-broadband, video conferencing, and interactive business applications or games. For regional satellite users, this is relevant when interacting online for remote education, telehealth, business activities and voice-to-voice calls – particularly if both parties are on a satellite connection.

Rain fade has also been expressed as concern. The Committee acknowledges that this concern is a reality for all satellite technology and this has been raised in the context of existing satellite performance. The ability to minimise rain fade with the deployment of the new Ka band satellites used for the LTSS is yet to be tested in the market.

Capacity of the LTSS

Customers currently on the ISS should observe a significant improvement in capacity and performance when the LTSS is launched.

Longer term, however, capacity is likely to be an issue as a result of increasing demand. The LTSS will introduce significant additional capacity (135 Gbps), but also be required to support a larger number of users.*

If Australian demand were to grow at the annual average rate of 35 per cent,[†] the average provision of 83 Kbps constant demand per user[‡] would grow in six years to approximately the same level as will be available on the LTSS, implying similar pressure on capacity to what is currently being experienced on the ISS. Additionally, if satellite users were permitted to expand their average use to equivalent levels as urban users today (ignoring future projected growth), the pressure on the LTSS would, from the outset, be comparable to what is currently being experienced on the ISS. Therefore the Committee believes that capacity limitations may re-occur on the LTSS, albeit not immediately.

NBN Co intends to deploy a second satellite. The second satellite will have the same footprint as the first satellite, and neither the capacity nor the coverage of beams on either satellite can be changed.

The Committee considered a number of strategies that might be utilised to help relieve pressure on NBN Co's satellite services.

Caching

Caching involves establishing a store of content closer to the user so that requests can be fulfilled without traversing a long communications path. This improves performance for users where information is delivered from a cache, and it eases congestion on the routes back to the original source of the information.

Unfortunately, conventional caching (usually deployed where a large number of users are concentrated) is of limited effectiveness in a satellite environment where the critical capacity constraint is 'air time' to and from the satellite. However, various satellite technology providers are working on 'push caching' strategies where smaller caches are connected to the satellite user's equipment. The Committee believes that some of these push caching mechanisms could provide innovative solutions to relieving the NBN's satellite capacity.

In a push caching environment, off-peak satellite capacity is used to multi-cast popular content for storage at the user's premises. Some of the information stored may never be used, but the more sophisticated approaches incorporate a level of prediction to distil the relevance of what is stored versus what is discarded.

* NBN Co states that more than 400,000 premises will be covered by the LTSS, with 135,000 ready for service by FY2018. For the purposes of the following demand estimates, the Committee uses a forward estimate of 250,000 connected premises.

† Cisco reports that global IP traffic has increased more than five-fold in the past five years, and forecasts a compound annual growth rate of 23 per cent from 2014 to 2019, with higher growth (37 per cent) in the busy-hour period. These global forecasts do not reflect particular local trends that may affect growth rates in particular countries. In this context, the entry of Netflix alone into the Australian market contributed to 25 per cent increase in one month.

‡ When distributed across the current base of 48,000 users this is the per user equivalent of 4 Gbps on the ISS.

Caching solutions in the marketplace

Aterlo Networks is a Canadian company which provides a solution for customers who want to watch Netflix but are limited by low data caps on their satellite service. The company's Nightshift product uses the unlimited, free off-peak data provided by some satellite services to automatically cache Netflix movies and television shows overnight. Nightshift works by having users plug a USB drive into a compatible router. The service then tracks the user's Netflix viewing and automatically downloads content during off peak times based on this profile. If for example the user watches the first episode of a television series, Nightshift will automatically preload the next few episodes the following night.

Traffic prioritisation

Satellite operators can improve the performance of satellite services by traffic prioritisation based on monitoring the flow of traffic, discerning types of traffic, and dynamically allocating priorities accordingly. The Committee considers that NBN Co should be given the flexibility to implement traffic prioritisation in the interests of providing better services to satellite users for vital network activity.

It is also possible to exempt some user demand (for instance, distance education) from traffic quotas, and to extend these arrangements to designated Public Interest Premises.

Techniques for conserving and managing traffic – whether it be push or pull caching, traffic prioritisation or more brutal video compression – are commonly used by satellite operators to actively manage their network. The current policy in Australia is for NBN Co to operate at the lowest practicable layer in the network stack (generally, layer 2). This is intended to limit NBN Co from competing with RSPs and to create opportunities for competitors. In the case of satellite services however, operating at a higher layer may provide opportunities to optimise management of capacity for the benefits of all users.

The capacity in a fibre network is relatively easy to expand, and RSPs can acquire the capacity to manage contention ratios* effectively to achieve a given level of service. However, the capacity in a satellite beam is a finite resource and very expensive to expand. Traffic management at the network level is desirable, as failure here either reduces the cost efficiency of the overall platform or causes network congestion and customer dissatisfaction. Ideally, NBN Co would actively manage network traffic holistically and hand over to RSPs as a managed service, rather than split the traffic management issues with RSPs that have been allocated connectivity virtual circuits (CVCs).

* Contention ratios refer to the amount of capacity provision vs theoretical maximum potential volume.

Allowing NBN Co to introduce some service-wide satellite traffic management techniques may be the best way to assure all users of the best possible level of service that can be achieved over finite satellite capacity. Subject to further investigation, this may involve NBN Co in some Layer 3 operations. Imposing restrictions on RSPs is arguably a somewhat blunt instrument for attempting to achieve the same outcome. The issues surrounding the quality of NBN satellite services are complex, and ultimately, not all issues (particularly those relating to capacity) can be overcome due to the finite fixed satellite beams and the growth of consumer demand. However, the Committee believes that adopting the suggested methods of traffic prioritisation and caching, and making appropriate amendments to the Fair Use Policy, could help to alleviate some of those pressures experienced by NBN satellite users.

Recommendation 1 – To optimise finite LTSS capacity, NBN Co should actively manage demand, prioritise traffic and support the caching of content using satellite management best practice and innovative software. If restrictions on wholesale satellite operations preclude improvements to end user experience, those restrictions should be removed.

Recommendation 2 – NBN Co's Fair Use Policy and wholesale tariffs should be structured to give RSPs sufficient price and product flexibility so that the detrimental impact of shaping and suspension of LTSS services can be minimised. Further, NBN Co will need to work closely with RSPs to improve their support of LTSS customers. Customers should be able to monitor their data consumption and be alerted before they reach their data limits.

When satellite is not the right fit

The Committee also considered ways in which alternate communications technologies might be introduced strategically, to relieve the number of satellite users overall and minimise the need for additional satellites to be launched after the LTSS's capacity is exhausted. There is an opportunity to target some satellite areas that would be suited to alternative forms of connectivity.

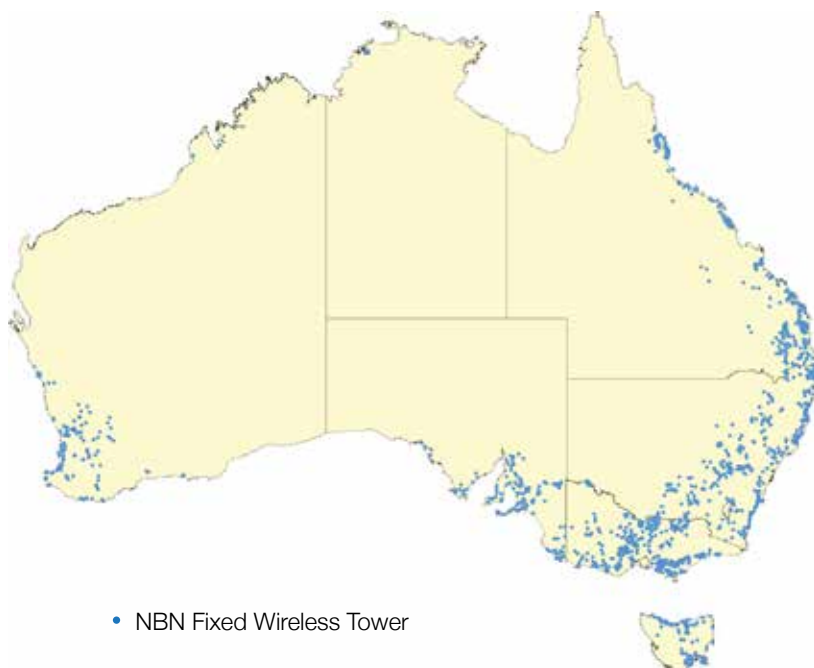
For example, the Committee noted that isolated Indigenous communities, many of which are within the satellite footprint, may be better suited to infrastructure that supports mobile connectivity or WiFi. As discussed in Chapter 2, many Indigenous Australians have bypassed desktop computers, opting instead for portable devices and wireless connectivity. In such environments, a fixed satellite-based broadband service to every premises would be more expensive and less desirable than a WiFi hotspot (or array of hotspots) sharing a common satellite-based backhaul link.

Similarly, many submissions to the Review expressed a preference for more fixed wireless NBN services to be deployed in areas currently serviced by satellite. The Committee notes that this is already being planned by NBN Co and strongly encourages the approach of extending fixed wireless further into the satellite footprint.

Fixed wireless

The NBN's Fixed Wireless network uses fourth generation mobile (LTE, or long term evolution) technology to deliver services to a fixed number of premises. NBN Co installs its equipment on new or existing towers to connect premises within a coverage area. Bandwidth per household is more consistent than mobile wireless, even in peak use periods.

Figure 6: Location of planned and existing NBN Fixed Wireless towers



Source: Diagram produced for the Committee by Anthony Goonan (Yless4U) using publicly available data

By August 2015, NBN Co had installed fixed wireless services in almost 50,000 homes and businesses in regional Australia, with nearly 270,000 premises ready for service.²³ Ultimately, NBN's fixed wireless network will provide coverage to up to 590,000 premises. Feedback indicates the rollout is being received very favourably by customers.

Recommendation 3 – To give the best possible outcome for regional users, NBN Co should where practicable extend the boundaries of its Fixed Wireless footprint as a substitute for satellite.

Mobile

Valuable gains in mobile coverage have been achieved, and are likely to continue, as carriers increase their investment in mobile networks. Coverage will be further augmented as a result of the success of investment stimulus schemes such as the MBSP, which has attracted mobile carrier investment in new base stations in conjunction with Commonwealth, state and local governments.

Despite these gains, and the fact that Australians enjoy among the highest penetration of mobile broadband in the world, the low population density over the remaining geography means that new approaches are needed to assess the priorities of those in the 70 per cent of Australia's land mass that has no mobile coverage, and to improve poor coverage elsewhere. As discussed in Chapter 1, this geography is economically challenging for the extension of existing high speed mobile networks.

How to continue the work of the Mobile Black Spot Programme?

There was considerable interest in submissions to the Review that the MBSP's coinvestment framework be preserved in any successor scheme to extend coverage.

Notwithstanding the ongoing investment in improving coverage as a result of the MBSP, the commercial case for extending coverage becomes increasingly marginal as one moves into the less densely populated areas of Australia. A more sophisticated approach to cost-benefit analysis in the future would help to optimise community benefits when deploying public funds to fill remaining market gaps.

Improved coverage in targeted geographies which yield social and economic benefits to a town or to a community are not easily measured under the current model of the MBSP. The current MBSP evaluation criteria could give higher weight to social and economic benefits that would accrue by extending mobile coverage to an area. Benefits might include economic returns associated with state priorities for regional development, or the deployment of mobiles in Indigenous communities to make Commonwealth and state outlays on existing programs, such as health, more immediate and relevant, or coverage of major roads and highways carrying significant traffic volumes.

State governments are developing regional development planning tools to be harnessed in any future Australian Government co-investment scheme or industry fund. For example, the Western Australian Government has undertaken a State Telecommunications Needs Assessment aimed at identifying and prioritising locations for future investment and the level of funding required. The study developed a quantitative, weighted measure of social and economic value for 600 locations based on the number of students, the number of dwellings and the total resident population.



Communications tower with microwave dishes

In the future, the Committee recognises that addressing the mobile coverage problem requires a range of targeted responses. Considerable scope continues to exist for co-investment, as discussed below. In uneconomic areas where there are demonstrable benefits that may also require funding support for both capital and operational expenditure, this could be undertaken through a consumer safeguard fund (discussed further in Chapter 4) which could have the flexibility to offer capital or demand side subsidies.

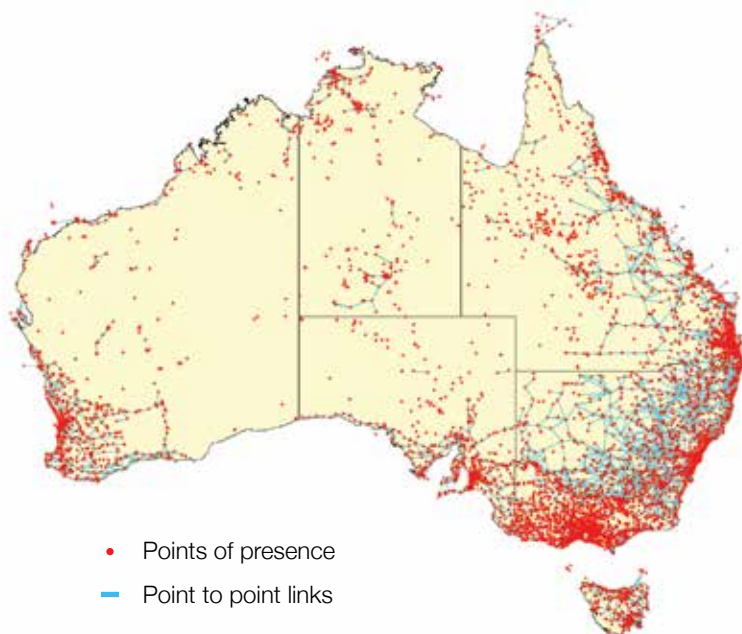
Leveraging existing public safety infrastructure

The Productivity Commission is currently undertaking a study into the best way to secure a mobile broadband capability to meet the long term needs of Australia's PSAs – the police, fire, ambulance and emergency services. The Productivity Commission's report is due to be published in December 2015.

For technical and economic reasons, a different approach towards leveraging existing public safety infrastructure may be required for remote areas than for metro and metro fringe areas. In a large part of the land mass in remote Australia, roaming onto an LTE network is not an option – instead ultra-high frequency (UHF) and very high frequency (VHF) land mobile networks are providing emergency services capability. These very wide area networks appear to be on a different upgrade path to those areas where emergency services can roam onto a carrier's LTE network.

The following map identifies the telecommunications infrastructure sites for PSAs and other government networks in regional Australia.

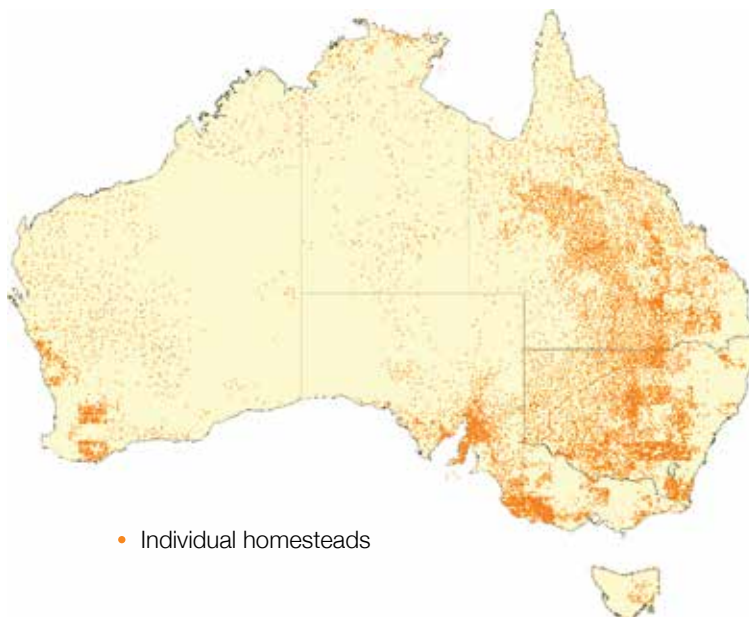
Figure 5: Public Safety Agency Points of Presence and Point-to-Point Links



Source: Diagram produced for the Committee by Anthony Goonan (Yless4U) using Australian Communications and Media Authority data as at 15 June 2015

Importantly, each PSA site is a location requiring physical access, a support structure (tower) of some sort, power and backhaul. These are potentially valuable assets that could support mobile coverage extensions benefiting those living in regional Australia. This potential is demonstrated by comparing the location of this infrastructure to that of remote Australian homesteads.

Figure 4: Homesteads



Source: Diagram produced for the Committee by Anthony Goonan (Yless4U) using publicly available data

Upgrade to remote sites could, where appropriate:

- ensure that the links between these networks are interoperable
- deliver mobile or fixed wireless coverage improvements while also doing the upgrade
- improve resilience where there is sole reliance on one carrier's mobile network.

A new approach to co-investment to the upgrade of these radio networks could unlock investment from other infrastructure owners, such as carriers, mining companies and utilities. Where it proved feasible to extend mobile coverage in conjunction with the upgrade, public access to emergency services would be improved.

Recommendation 4 – The Australian Government should consider co-investing with state governments and carriers to support upgrades to regional state-based public safety wireless networks that could also deliver mobile coverage improvements.

Leveraging future infrastructure investments

Substantial investment is currently going into regional infrastructure developments, and this presents an opportunity to ‘piggy-back’ major works to offer communications improvements at marginal cost. This might occur during roadbuilding, laying a pipeline, or providing power for a building.

For example, particularly given that highway coverage will be an ongoing issue on main road corridors, it is desirable that when the Australian Government funds new Northern Australian road or freight corridors, it also require funding recipients to commit to a telecommunications deployment or upgrade plan as a precondition of the loan.

Infrastructure Australia undertook an Australian Infrastructure Audit (released in May 2015) which highlighted that demand for telecommunications infrastructure will continue growing rapidly across the nation. The Audit also indicated that infrastructure operators will need to develop systems to make better use of networks to improve asset management. Noting the substantial level of existing telecommunications infrastructure – whether it is held by PSAs, mobile operators, NBN Co, or other government networks – the Committee proposes that Infrastructure Australia collect and make available public data and information about any infrastructure that might be of assistance to investors in telecommunications.

Recommendation 5 – To make the most efficient use of Australian Government funding of major public infrastructure in regional Australia (such as transport corridors and utility facilities), there should be a requirement to incorporate a telecommunications deployment or upgrade plan as a precondition of that funding.

Recommendation 6 – Given the lack of information on underutilised regional assets, Infrastructure Australia is encouraged to collect and make available public data and information about any infrastructure that might be of assistance to investors in telecommunications. This might include dark fibre or towers with a power source in other sectors such as gas and electricity.

New technologies

The deployment of sensors, analytics and control technologies presents significant new opportunities to boost productivity and efficiency in the rural sector. This will generally require wireless connectivity to collect data. Often these involve low bandwidth applications that can be adequately supported on wide area narrow band narrowband networks – for example, using the LoRa wireless standard (see Chapter 2). In general, there are many of these types of applications in the market and being developed, some of which need connection to a carrier or the NBN to transport information to a management or control point.

The Committee notes that NBN Co can play an important role in this process, given the remit to do so. It encourages NBN Co to leverage its infrastructure to support and accelerate the deployment of such services where appropriate.

Backhaul and Roaming

Approximately one third of the NBN's POIs are in regional areas where there is more limited backhaul competition. This can adversely impact regional customers. For instance, the number of RSPs willing to operate in regional areas may be reduced by higher costs. Additionally, regional RSPs may purchase inadequate backhaul and degrade the performance of services for end users.

Cost of backhaul was also nominated as the main constraint by carriers wanting to extend mobile coverage in regional Australia.

The Committee acknowledges that this is a matter requiring ongoing review.

The Australian Competition and Consumer Commission (ACCC) indicated in its submission to the Review that it is "aware of impediments to mobile competition in regional, rural and remote areas" and that the cost of backhaul could potentially be a barrier to entry for competitive mobile services in some regional areas. The ACCC noted that it has set regulated prices for backhaul in areas where the supply of backhaul services has not been competitive since 2011. It is currently undertaking a public inquiry to set new regulated prices for the regulated backhaul service and expects to release a final decision later in 2015.

Roaming arrangements between operators (at least in areas where only one network was offering coverage) would similarly capture additional traffic and thereby improve the revenue opportunities at any given site. However, the Committee recognises that this may not be welcomed by mobile network operators who have invested in non-urban coverage to enhance their competitive advantage.

Broadening NBN Co's role as a carrier of wholesale services

During the course of the Review, the Committee received representations from parties interested in the potential for NBN Co to provide a range of wholesale products that would allow other carriers to improve outcomes for regional Australians.

There was interest in the re-use of NBN fixed wireless assets, but on the proviso that early discussions would be needed to co-invest or consider assets in longer range planning.

Examples offered to the Committee included:

- **Backhaul for mobile networks.** A high-capacity wholesale service that provides backhaul from a mobile network operator's infrastructure to the relevant NBN POI, or possibly all the way to central office locations designated by the mobile network operator. Such a service could be offered at any NBN location connected (or connectable) by NBN fibre.

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- **Tower sharing and backhaul.** Similar to the above, but with early coordination of planning to ensure that towers, site access and powering are all designed to facilitate co-location of other carrier equipment and NBN Co's own equipment. The other carrier equipment may comprise mobile network base station equipment (antennae, etc) or microwave dishes for point-to-point links.
 - **Fixed wireless extension service.** Smaller wireless operators have demonstrated an appetite for deploying fixed wireless infrastructure in areas beyond those that NBN Co considers viable. In so doing, they are able to offer some regional Australians a fixed wireless alternative with higher performance characteristics than a satellite service, at the same time alleviating pressure on the satellite capacity. One of the carriers the Committee met with suggested a wholesale offering that would allow private fixed wireless operators to 'hand off' their customer connections to the NBN at a point where it has fibre backhaul to the relevant POI.
 - **WiFi reticulation in small communities.** Another example is typified by caravan parks (or other such communities located around a fixed premises) where there is a significant aggregation of users requiring network access. Local area reticulation of services via WiFi would be appropriate, but the backhaul requirements (typically fixed wireless or satellite) are significantly more demanding than for an individual user premises. This example could be satisfied by either a commercial grade NBN product, or a wholesale product if the local infrastructure needs to be managed by a carrier.

In summary, opportunities do exist for NBN Co to leverage its satellite and fixed wireless infrastructure in regional Australia:

- by engaging with state and local governments and related stakeholders who wish to co-invest and optimise to get the right total infrastructure plan for their area
- partnering with carriers which want to use new towers or other facilities and extend their coverage footprint (recognising that this requires sufficient time to adjust planning and provisioning on both sides)
- developing carrier-to-carrier wholesale products such as backhaul from their own infrastructure as a separate business line
- supporting new entrants such as those offering new services such as IoT over upgraded narrowband networks.

The Committee believe these opportunities constitute a new line of business for NBN Co. This business could focus on those parts of regional Australia which are demonstrably underserved and where there is limited competition and therefore minimal distortion in the wholesale market. An internal process could be put in place to identify high value, high impact projects of this type.

The Committee recognises that extending the wholesale lines of business for a defined group of projects will require a dedicated focus and particular skill set in order to execute these opportunities, while the core business of NBN Co is to roll out standardised wholesale products on a national scale. It is mindful that providing additional support to regional Australia should not distract from, or be subordinate to, the overriding goal in NBN Co's Corporate Plan of meeting Australia-wide connection targets.

Recommendation 7 – The Australian Government should leverage its investment in the NBN by enabling NBN Co to make better use of its infrastructure in regional Australia. NBN Co should be permitted, and resourced, to provide carrier-to-carrier products that could include satellite backhaul, terrestrial backhaul for mobile carriers, and options to support new and niche infrastructure providers.

CHAPTER FOUR: Consumer safeguards and the Universal Service Obligation

The rollout of the NBN as a ubiquitous broadband network is fundamentally changing the telecommunications environment. Historically Telstra, as the incumbent access network operator, has borne the Universal Service Obligation (USO) to provide the Standard Telephone Service (STS). Increasingly in the future, the NBN will provide all Australians with broadband using fixed line, wireless or satellite technologies. Consumers will have access to broadband, not just voice services, and voice services will increasingly be delivered via VoIP technology, rather than the current PSTN.

As set out in Chapter 2, for many Australians with mobile coverage their mobile phone service is their most critical telecommunications service.

In addition, a growing number of Australians are abandoning their STS in favour of voice and other related services that are built on top of broadband connectivity.

Consumer safeguards that are primarily based around the STS have failed to keep pace with these changes and are in need of significant renovation and renewal.

What are the current safeguards?

There are a range of consumer safeguards in place to protect Australian consumers in relation to their telecommunications services. These protections are particularly relevant for those living in regional Australia where communication services are vital, but where market conditions make some services uneconomic.

Safeguards are currently contained in legislation, regulations and co-regulatory codes of practice. They are mainly directed at ensuring equitable and reliable access to voice telephony.

The Telecommunications Consumer Protection Code and the *Australian Consumer Law 2011* provide safeguards in relation to customer sales and service.

The Customer Service Guarantee (CSG) Standard protects residential and small business consumers by requiring providers to meet performance standards in relation to connection, repair and appointment attendance of an STS. It provides for compensation when standards are not met.

While the CSG Standard applies to all telecommunication service providers, it only covers the supply of the STS and will only apply where a provider offers a CSG service at a customer's location. It does not cover mobile phone services, internet services, customer equipment, disconnection of services, or pre-selection delays. There are also a range of other exemptions to the CSG, such as where services are affected by mass service disruptions, and customers may agree to waive their rights under the CSG. The CSG is discussed in more detail at Appendix C.

Separately, the National Relay Service (NRS) supports access for people who are deaf or have a hearing or speech impairment.

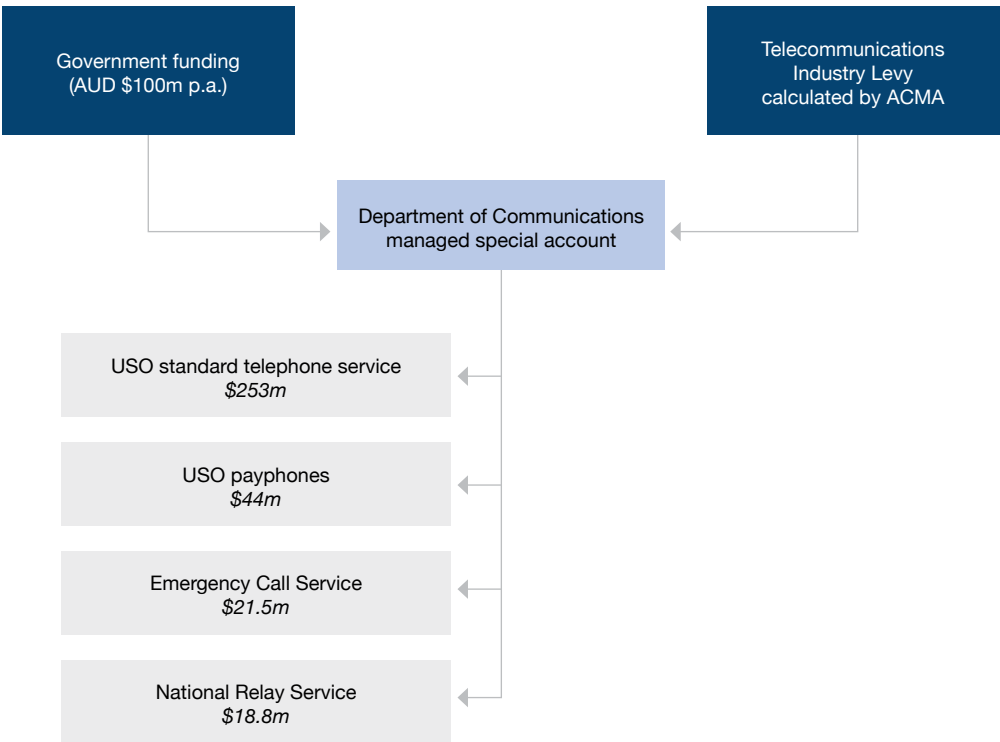
Priority Assistance is a special customer status offered to anyone diagnosed with life-threatening medical conditions who depends on a reliable, fixed-line home telephone service to be able to

call for assistance at any time. Priority Assistance customers are entitled to priority connection and fault repair of their telephone service. Telstra is the only carrier required to provide Priority Assistance services to its customers as a condition of its operating licence.

The USO provides funding to meet the social obligation to provide for an STS and payphones to all Australians on an equitable basis wherever they work or live. The USO costs are met in part by Australian Government funding and in part by an industry levy known as the Telecommunications Industry Levy (TIL) which is paid by telecommunications carriers with eligible revenue of \$25 million or more.*

The obligations of Telstra as the designated universal service provider are included in a range of instruments and are set out in Appendix D.

Figure 7: Funding of USO and other public interest services†



* Under the TIL, telecommunication carriers are required to lodge eligible revenue returns with the ACMA. The ACMA makes a written assessment of each carrier's eligible revenue for that return period. Carrier contributions to the TIL occur on a financial year basis, and are proportional based on the total pool of industry eligible revenue for the relevant period.

† Figures from the Telecommunications Universal Service Management Agency Annual Report 2013-14. Stated contract expenses are GST inclusive. Not shown are smaller expenses (\$1.7m for untimed local calls in extended zones and \$0.4m to support migration of voice-only and public interest services).

Telstra is also bound under contract with the Australian Government until 2032 to deliver the USO on the assumption there will always be some uneconomic telecommunications services where competition alone will not deliver the required outcome. Meeting the CSG Standard timeframes and benchmarks are a condition of that contract.

Separately, and contained within Telstra's licence conditions, is the Network Reliability Framework (NRF). This safeguard complements the CSG in that it requires Telstra to identify and remediate its copper network to ensure reliability of fixed telephone services. The NRF has three levels of operation. The first level examines the general reliability of fixed telephone services in different regions of Australia, while the other two levels are concerned with identifying specific areas and individual services that do not meet minimum levels of reliability.

What is the problem?

As it rolls out its network infrastructure, NBN Co will displace Telstra as the historic and predominant access network operator. NBN Co will effectively become the new universal broadband infrastructure provider. The Government has announced its intention to codify the role and performance standards which NBN Co must meet for its services. There is no retail carrier of last resort for broadband or data services, and broadband access is not covered by current consumer safeguards.

The USO, in providing a funding source to maintain equitable access to an STS, by default supports the maintenance of copper.

However these existing arrangements are rapidly becoming obsolete.

For consumers:

- The present STS is of rapidly declining relevance. Within the next few years the majority of consumers, including those in regional Australia, will not be using voice calls over the PSTN, but will be using mobiles, VoIP and other social media applications, as primary communication methods.
- As the NBN rolls out, the universal fixed access network infrastructure will be fundamentally broadband, not Telstra's traditional copper network. As a result, voice calls will largely migrate away from Telstra's network, especially in fibre areas.
- Moreover, the historic nature of the STS and the accompanying USO funding arrangements means it fails to target the areas of greatest need or deal adequately with inequality of outcomes in regional Australia.

For industry:

- The cost effectiveness of the USO agreement between the Australian Government and Telstra has been questioned. The long term contract locks onto an STS of declining relevance.

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- Carriers are contributing to a levy that largely relates to these declining services and face the prospect of a further and separate levy to support the losses associated with NBN Co's non-commercial Fixed Wireless and Satellite services under arrangements currently under review by the Bureau of Communications Research (BCR).*
 - Ideally the loss-making services in regional Australia and the losses associated with safety net services would be dealt with in one scheme – reflecting contemporary requirements and providing visible trade-offs in terms of the services that need to be funded.

Consumer Communication Standard – a new consumer safeguard model

Supported overwhelmingly by submissions to the Review, the Committee is of the opinion that the development of a contemporary consumer safeguard model should commence now.

The development of a new Standard would provide the appropriate context for a thorough renovation of existing consumer safeguards and instruments. It would ensure infrastructure investors, including Telstra as the current USO provider, are able to make longer term technology decisions against a future Standard. An overarching and more forward-looking regulatory architecture would allow time for transition of the existing arrangements. It would also avoid piecemeal and short term regulatory adjustments by putting a more relevant and comprehensive framework in place.

In considering international models, the Committee is of the view that the Standard be technology neutral.

International trends

The Committee has reviewed consumer safeguards and universal service models in overseas telecommunications markets.

In Finland for example, the Finnish Communications Regulatory Authority mandates that permanent residences and places of business must be able to access communications services including a reasonable priced broadband service with minimum speeds and designates an operator to ensure that this is met in all areas. By the end of 2015, the minimum broadband downstream speed is expected to be 100 Mbps with the provision of these services funded by both industry, the Finnish Government and the European Union Regional Development Fund.

* In December 2014, the Government tasked the Bureau of Communications Research in the Department of the Communications with providing advice on the amount of non-commercial service funding required to provide for NBN satellite and fixed wireless services. The intention is that new funding arrangements will be put in place that are competitively neutral across telecommunications carriers.

In Canada, the Canadian Radio-television and Telecommunications Commission imposes an Obligation to Serve and a Basic Service Offering upon incumbent local exchange carriers. The Basic Service Offering requires access to an individual line touch-tone service, low-speed internet at local rates, emergency services and voice message relay services. By the end of 2015, Canadians should expect to have access to a basic broadband speed of at least 5 Mbps download and 1 Mbps upload.

In New Zealand, the Government has committed to the rollout of ultra-fast broadband and has established a dedicated co-investment fund to ensure delivery to rural communities at a cost and service level comparable to urban areas.

Consumer safeguard models

Finland

Since its amendment in October 2009 the Finnish *Communications Market Act* mandates that all permanent residences and places of business must be able to access communications services, including a reasonably priced broadband service with minimum speeds. Universal service is defined as technology-independent, meaning that broadband may be fixed line or wireless. Operators are designated by the Finnish Communications Regulatory Authority to ensure that this obligation is met in all areas.

This revised USO increases the guaranteed downstream internet speed from the previous 30–50 Kbps to 1 Mbps. However, the Finnish program aims to achieve a universal 100 Mbps broadband service by the end of 2015.

The provision of these services is funded by industry, the Finnish Government and the European Union Regional Development Fund. The Government intends that universal broadband be paid for by operators with no public funds used, except for where the regulator deems the costs to be excessive and requiring of state compensation.

New Zealand

The New Zealand Telecommunications Service Obligations (TSO) regulatory framework is established under the *Telecommunications Act 2001*. A TSO consists of an agreement under the Act between the Crown and a TSO provider.

The two current TSOs are subsidised through the Telecommunications Development Levy (TDL). This levy is collected from the telecommunications industry, and is determined by the Commerce Commission on the basis of the annual cost incurred to the Crown. Revenue that qualifies for the TDL is defined as being revenue received for supplying telecommunications services either by means of the Public Telephony Network, and is only payable by those corporations that earned in excess of \$10 million in telecommunications revenue in the preceding year.

New Zealand has committed to improving its broadband infrastructure through comprehensive plans to roll out high-speed fibre broadband to businesses and homes throughout New Zealand. In 2011, the New Zealand Government introduced two components of the rollout plan:

- Ultra-Fast Broadband (UFB) Initiative for the rollout in urban areas to businesses and homes
- Rural Broadband Initiative (RBI) for the delivery of broadband internet to rural communities at a cost and service level comparable to urban areas.

The UFB is being overseen by a government company formed for the purpose, which monitors UFB deployment and contracts with local fibre companies. The technology used will be fibre optic with target speeds of 100 Mbps downlink and 50 Mbps uplink in homes, schools, hospitals, marae (traditional Maori community meeting places) and businesses. Government funding by way of a grant (\$1.5 billion) is paid to fund the UFB rollout in conjunction with private co-investment from the UFB partners.

The RBI is funded through a combination of allocations from an industry levy and a government grant. The Government accepts tenders for service providers for the RBI through a Request for Registrations of Interest process to build and provide the infrastructure in certain areas. The RBI currently has four service providers which are responsible for delivering the broadband initiative in certain regions. The target speed of broadband for these areas is 5 Mbps/500 Kbps.

The registration process begins with the allocation of geographic zones and then seeks registrations of interest for each of the zones. Details of the numbers of schools, hospitals, health care centres and libraries in the area, and how much funding the successful supplier will receive if they win the tender, are provided.

In these case studies, the Government or industry supports delivery to unprofitable areas through a model which relies on competitive tendering, securing broadband access as well as access to voice services. In Australia, where the Australian Government is already funding a universal broadband infrastructure, the new Standard would correspondingly update basic safeguards, and funding should be directed where needed against that updated standard.

Submissions to the Review outlined a number of areas where improvements to consumer safeguards should be made, specifically in terms of availability, affordability, performance/reliability and most importantly, service type.

Affordability

Submissions to the Review particularly raised the issue of affordability and comparability between regional consumers and their urban counterparts. This largely related to data charges and data volume.

Apart from untimed local calls provided over standard voice services, the retail prices of other phone/voice services and data are not regulated. Further, a number of broadband providers now bundle a VoIP service with their broadband offerings and include unlimited free calls to landlines throughout Australia.

The NBN will be moving from uniform wholesale prices to price caps. Increased retail competition is a key factor in improving affordability and will alter retail providers' willingness to reduce prices or introduce price innovation.

As set out in Chapter 2, uniform pricing at the retail level can mask inequality of outcomes for regional consumers who are naturally heavy data users, with more limited choice of technologies.

One option the Committee considered is social tariffs as a highly targeted policy mechanism to address particular inequalities. This could include:

- exempting downloads from designated sources (e.g. gov.au or edu.gov sites) from download quotas
- support for those on low incomes (e.g. the current Telephone Allowance)
- support for vulnerable and disability groups
- targeted Indigenous requirements.

The case for tariff exemptions is strengthened by the fact that both state and Commonwealth services are moving online. In 2015, the Australian Government set up the Digital Transformation Office, a dedicated body which will coordinate and develop online access to Commonwealth-provided services such as taxation, Centrelink and Medicare. This will, in time, replace some face to face or phone-based interactions. The ability to go online will be a basic requirement for accessing those services.

These services and related state government sites are identifiable by their .gov and .edu domain names and could be exempted from download quotas in any new social tariff scheme.

In the future, monitoring will be required to understand the causes of rural and urban price inequalities and affordability issues. This will require sampling of a range of typical users across urban and regional locations, to get a better understanding of market outcomes. The need for further data and a sound evidence base to inform future policy development is discussed in Chapter 6.

The table below presents an outline of a new consumer safeguard providing a comparison of provisions as they currently exist, and where improvements are proposed.

Table 6: Comparison of current consumer safeguards to proposed new safeguards

	Current safeguard	Consumer Communication Standard
Service type	Standard telephone service (voice) Accessibility measures such as the National Relay Service	Broadband data and voice (retail) Accessibility measures including the National Relay Service
Availability	Retail connection timeframes to a standard telephone service.	Retail connection timeframes to any broadband data/voice service.
Affordability	Untimed local calls Low income measures	Recognising that NBN Co wholesale price caps exist, social tariffs could be a highly targeted retail policy mechanism to address the following: <ul style="list-style-type: none"> • reasonably comparable pricing between metropolitan and non-metropolitan areas • exempting selective content from download quotas (e.g. gov.au or edu.gov sites) • support for those on low incomes (e.g. the current Telephone Allowance and disability groups) • targeted Indigenous requirements
Performance/ Reliability	Customer Service Guarantee mandates connection and repair timeframes, however this is more categorised as an access issue rather than a performance standard.	Qualitative standards and an updated service reliability code.

Recommendation 8 – Current consumer safeguards as they relate to the STS are increasingly irrelevant. The Australian Government, in consultation with industry and consumer groups, should develop a new Consumer Communication Standard for voice and data which sets technology neutral standards in terms of availability, accessibility, affordability, performance and reliability.

Consumer Communication Fund – a new consumer safety net funding model

The development of new consumer safeguards through a new Standard would allow the Government to fundamentally reassess the conditions of the safety net – the services, locations and users to which it should apply and where funding should be directed.

The Committee recommends replacing the existing TIL with a new funding mechanism, the Consumer Communication Fund, which would support necessary loss-making regional infrastructure and services, and could also separately fund or co-fund priority services where there is a market gap in defined geographies.

Improvements could also be made to the existing industry fund arrangements by consolidating necessary existing outlays into a single scheme, including:

- the ability to import elements of the existing USO scheme that remain relevant
- adding the potential to include other social equity elements that merit funding under the proposed Consumer Communication Standard
- reserving the future ability to apply a subsidy to the non-commercial NBN Satellite and fixed wireless services. It is considered more effective to do this in the context of this broader scheme, where the potential to fund more relevant or efficient services in defined areas (e.g. the substitution of mobiles for satellite services) can first be market tested.

In considering the design of the Fund, the Committee recommends the following principles:

- **Technology neutrality** – a range of technologies, including mobile, could be used to deliver broadband data and voice in meeting the Consumer Communications Standard.
- **Contestability** – geographically disaggregated contestability creates an opportunity to more closely align local needs with the right infrastructure suppliers. It also offers opportunities to mitigate against the effects of technology lock-in especially in remote areas where new technologies could be made available to accommodate diverse needs.

-
- **Transparency** – government, industry and co-investment options should all be drawn down upon, but be clearly applied to a particular purpose. This may include a segregated rural fund to reduce market gaps in those underserved areas discussed in this report.
 - **Economic efficiency** – tendering out of service could focus on areas where existing Australian Government expenditures on infrastructure and services could be better targeted, where markets have failed to deliver an adequate response or where more efficient outcomes are available with changes in technology.
 - **Sustainability** – it is important that new funding arrangements can operate over the longer term.

Implementation

In addition to the development of a new Consumer Communications Standard and funding model, the current USO funding arrangements and instruments will need to be reviewed. This includes:

- the contract underpinning the current USO, which the Committee understands permits a cost review to occur
- a reassessment of what is presently funded by industry under the TIL
- an assessment of those matters that are directly or indirectly funded under the current arrangements that need to be exported to a new scheme.

Transition

There will need to be a careful transition of existing consumer safeguards and USO arrangements.

The existing arrangements could be grandfathered or progressively replaced as consumers are connected to the NBN in an area, enabling the new Standard to come into effect.

Phased introduction of a new Standard could involve a transition path over the next three years, consistent with the deployment schedule of the NBN and accompanying legislative and administrative arrangements.

A phased introduction of the Standard would also enable industry to respond to market experience, by starting to develop codes with light-handed regulation. It would also provide time for RSPs to put back-to-back supplier agreements in place with NBN Co to support their retail obligations.

The Committee considers that policy reform for the Consumer Communications Standard and a review on the broader design of the fund should begin immediately.

Recommendation 9 – The Australian Government should establish, in consultation with industry and consumer groups, a new funding mechanism, the Consumer Communication Fund. The Fund would replace the current levy and support loss-making regional infrastructure and services with scope to include subsidy arrangements for the non-commercial NBN services (Satellite and Fixed Wireless) as well as social equity elements that merit funding under the proposed Consumer Communication Standard. The design of the Fund should reflect the following principles:

- technology neutrality
 - contestability
 - transparency
 - economic efficiency
 - sustainability.
-

CHAPTER FIVE: Community engagement

As NBN Co introduces new broadband capabilities in regional Australia it is important that consumers be kept well informed about their options. Information will continue to be provided by RSPs and NBN Co, and rural consumers are very active on social media sites, which have become trusted sources of information. The Australian Communications Consumer Action Network (ACCAN) is also funded to support consumer awareness.

Regional consumers will experience a significant period of transition as many step up to improved levels of broadband capability.

Knowing when to expect an NBN service and what to expect when it arrives is important. Maintaining a flow of timely and reliable information, tailored to each local area, will be paramount.

The Australian Government's Statement of Expectations²⁴ for the delivery of the NBN is reflected in NBN Co's Corporate Plan for 2016.²⁵ While the Plan provides estimates of the number of premises to be passed by the network, it does not provide a detailed rollout schedule. NBN Co's website provides a mapping tool and information about the expected rollout in some areas for the next 18 months, and from time to time, NBN Co releases a media statement with details on additional areas being added to the rollout schedule. The Committee is also aware that immediately prior to the rollout of the fixed wireless network to an area, NBN Co undertakes a communications campaign to inform residents.

Within the rollout timeframe it is not clear to communities and businesses the precise timing that access to the network will become available, and beyond the current 18 month timeframe there is little information as to the timing of rollout and subsequent access. This makes it difficult, particularly for businesses, to plan ahead and decide whether to invest in telecommunications equipment or upgrade industry tools that require internet connectivity; or whether to maintain existing communications contracts in the short-to-medium term, or wait for a connection to the NBN to determine their future business plans. The uncertainty may also deter other carriers from investing in network infrastructure that could improve the options available in the lead-up to arrival of the NBN.

A number of submissions from individuals indicated that information about the NBN rollout, and the types of technologies being rolled out, is not readily available:

"...no definitive time frames exist. Currently less than 200m from my own home according to the NBN map – but when asked when we will get it, no one knows."

Gerry Piggot, NSW

"We have been told by Telstra that wireless NBN is available to us and a technician came out. Insufficient signal, so still on the copper wire. The NBN site when we look up our address still states we are in an area where it can be connected. Much angst and expense could be spared if this information were maintained properly."

Thomas Schuf, NSW

"I was advised by Telstra that we are unable to have ADSL connected due to the ongoing uncertainty about NBN in our area ... Some certainty about the service is essential, as for a community that is essentially an outlying suburb of a major Tasmanian town, we are being very poorly served."

Anne Layton-Bennett, TAS

"The NBN has been delivered to areas all around us, many of these areas having access to ADSL2 and good Mobile reception. ... I contacted NBN Co and the only answers I got was that it will be there but not sure if it will be sooner or later."

Jeremy Law, VIC

There is a need for ongoing education during the NBN transition, as the limited understanding of the relevant technologies and, in particular, the timing of the rollout, is influencing the community's views of the NBN and their choices. Despite NBN Co running an educational campaign, there is still confusion from regional consumers who are commonly seeking their information from trusted peers and neighbours, including via social media.

The Committee notes that ACCAN has a simple NBN Switch-over Tip Sheet intended to assist people with migrating their services to the NBN. However, the NBN continues to generate significant complaints in regional Australia.

In its submission to the Committee, the Telecommunications Industry Ombudsman states that it recorded around 1,870 NBN-related new complaints from consumers in regional Australia in 2013–14, or 46.9 per cent of all NBN-related new complaints. This is significantly higher than the proportion of new complaints from regional Australia about other types of services. The proportion of NBN-related new complaints from regional Australia has reduced to around 35.2 per cent in the first three quarters of 2014–15, however connection delays are the most common NBN complaints.²⁶

Despite having a consumer representative body, a dedicated ombudsman, and information provided by various service providers, a gap continues to exist in the provision of tailored advice to regional businesses and consumers on meeting their telecommunications needs.

Recommendation 10 – Recognising the significant changes in the regional telecommunications market, the Australian Communications Consumer Action Network should continue to make representations on the affordability and accessibility of services, including the promotion of tools to help consumers make more informed decisions regarding their services.

Recommendation 11 – NBN Co and the Department of Communications should examine ways of providing better information on the timing and the range of technologies being rolled out across Australia.

CHAPTER SIX: Future proofing

A Regional Telecommunications Independent Review is conducted every three years under Part 9B of the *Telecommunications (Consumer Protection and Service Standards) Act 1999* to review telecommunications services in regional, rural and remote parts of Australia. The Committee has considered whether there is a way to ensure ongoing monitoring and review of regional telecommunications that can complement, or even replace, a periodic review process.

In conducting the 2015 Review, the Committee noted the paucity of available data on regional telecommunications and the impact this has on gaining an accurate view of the regional market.

The Committee considers that significant improvements need to be made to both the collection and the reporting of data on regional telecommunications. The 2011-12 Regional Telecommunications Review identified a lack of information on availability, take-up, and usage of telecommunications in remote communities. Basic, accurate, and up-to-date data in this area remains unavailable.

Ensuring that the telecommunications needs of regional Australia are met is important. Service availability and performance should be monitored and reviewed to ensure that the desired outcomes are being achieved.

The ability to implement real, tangible improvements to regional telecommunications will require a deeper understanding of:

- infrastructure already in place, both public and private
- the suitability and impact of broadband in remote communities
- the ways in which regional communities are using emerging communications services, including VoIP, messaging, social networks, and video chat
- how different modes of access (mobile, household internet, WiFi, shared facilities) are shaping uptake and use
- the effectiveness of government-funded programs based on independent studies, and the identifiable success factors emerging from these programs.

The Committee considers that a new framework for monitoring and collecting data should be introduced to enable the following analysis:

- a progressive understanding of gaps in infrastructure provision in regional Australia, both in relation to the NBN and other technologies (such as mobile)
- USO performance indicators under current arrangements pending review
- affordability and service quality data, based on sampling the effective costs of rural versus urban consumers of broadband services.

Data on the NBN rollout could be gathered through the ACCC's proposed Record Keeping Rules, and cost studies to assess social impact can be performed and reported by research bodies such as the BCR in the Department of Communications.

A future Regional Telecommunications Independent Review Committee would benefit from having detailed information on the key issues emerging from ongoing monitoring and data collection.

If appropriate monitoring and policy responses are put in place during the NBN transition, the Committee considers that the next review under the Act, due to take place in 2018, could be postponed until after the completion of NBN Co's fixed wireless and satellite rollout in 2020, to enable the next Committee to conduct its review based upon that deployment.

Recommendation 12 – In order to improve the understanding of the changing circumstances of regional telecommunications, benchmark data on availability and affordability of broadband data and voice services (including mobile services) should be collected and reported annually. This may also enable future reviews to be undertaken less frequently, but on a more informed basis.

Appendix A – Committee membership



Ms Deena Shiff (Chair)

Ms Shiff has worked in the telecommunications industry for over 25 years. She served as a Group Managing Director at Telstra between 2005 and 2013, during which time she headed the Wholesale Division, established Telstra Business to support the needs of small business, and was the founding CEO of Telstra Ventures. Ms Shiff is currently a Non-Executive Director and is on Boards or Advisory Boards of a number of both publically listed and private companies operating in the areas of communications and technology. She was Deputy Chair of Efic, and has also served on the NSW Taskforce on the Digital Economy.



Mr Robin Eckermann

Mr Eckermann is the principal of Robin Eckermann & Associates Telecommunications Consultants, and an Adjunct Professor at the University of Canberra. In his previous role as TransACT's Chief Architect, Mr Eckermann pioneered open network principles that have since become widely adopted. He was Vice President at Smart Grid Australia and Federal Region Manager at Techway Limited. Mr Eckermann provides advisory services in the field of advanced broadband infrastructure and services to clients throughout Australia and overseas. He is also a Fellow in Engineers Australia.



Ms Su McCluskey

Ms McCluskey was the CEO of both the Regional Australia Institute and the Council of Rural Research and Development Corporations. She was Executive Director of the Office of Best Practice Regulation, was a Consultant Specialist Advisor to the Department of Industry, Tourism and Resources and held senior policy positions with the Business Council of Australia, the National Farmers' Federation and the Australian Taxation Office. Ms McCluskey was a Panel Member on the Competition Policy Review Panel (Harper Review) and is also a beef cattle farmer.



Ms Georgie Somerset

Ms Somerset is a beef farmer and rural leader with experience in agribusiness, rural tourism and regional development. She is non-Executive Director on several government, private and not for profit boards, and is Vice President of AgForce Queensland. Ms Somerset served as a member of the National Rural Advisory Council 2005-2012, and was President of the Queensland Rural, Regional and Remote Women's Network. Her life combines cattle yards and board rooms, boarding school parenting and committee chairing, and long drives for short meetings.

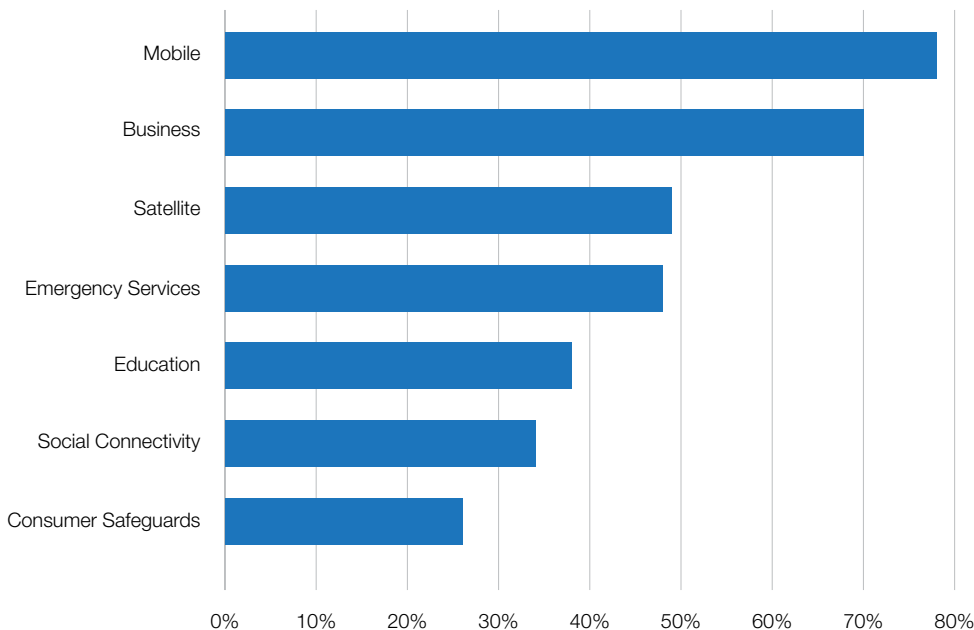
Appendix B – Summary of submissions

The Committee received 426 submissions in total. Of these, 104 submitters requested that their submission remain confidential. Submissions were received via email, online form and mail, with 60 per cent of submissions being received through the online form.

The submissions process was opened on 17 June 2015 with the release of an issues paper and closed on 15 July 2015.

The Committee received submissions from a broad range of interested parties, including individuals, industry, businesses and business groups, peak bodies and local, state and territory governments. Non-confidential submissions have been published on the 2015 Regional Telecommunications Review website.

The following diagram provides an overview of the main issues identified, and the percentage of submissions in which these issues were raised.



Appendix C – Customer Service Guarantee

The Customer Service Guarantee (CSG) protects residential and small business customers from poor telephone service. Under the CSG, carriage service providers (CSPs) are required to meet performance standards and provide customers with financial compensation when these standards are not met.

The CSG Standard specifies time frames for the connection of specified services, the repair of faults and the attendance of appointments by service providers. Customers are entitled to compensation if these time frames are not met.

CSPs are required to inform customers about their rights under the CSG Standard. New and existing customers must be provided with written information about their entitlements and the provider's obligations.

Table 7: Maximum time frames for connecting services readily accessible to existing telecommunications infrastructure

Connection type	Community location	Community size (no. of people)	Connection time (after receipt of customer's application)*
In-place connection	All	All	Within two working days
No in-place connection (close to available infrastructure)	Urban	Equal to or more than 10 000 people	Within five working days
	Major rural	Between 2 500 and 10 000 people	Within 10 working days
	Minor rural and remote	Up to 2 500 people	Within 15 working days

* If a customer and a phone company have entered into an arrangement to connect in less or more time than outlined in the above table, the alternative agreed timeframe becomes the connection time.

Table 8: Maximum time frames for repairing faults

Community	Community size (no. of people)	Repair time*
Urban	Equal to or more than 10,000 people	End of next working day after report
Rural	Between 200 and 10,000 people	End of second working day after report ⁺
Remote	Up to 200 people	End of third working day after report*

* If a customer and a phone company have entered into an arrangement to repair a fault in less or more time than outlined in the above table, the alternative agreed timeframe becomes the repair time.

+ In certain circumstances (for example, where the fault can be repaired by the phone company without attending the customer's premises), the fault repair period is the end of the next working day after report.

Table 9: Criteria for missing appointments

Appointment period	Definition of missed appointment
Four hours or less	Phone company does not attend within 15 minutes of the appointment period*
Between four and five hours	Phone company does not attend within the appointment period*

* An extra 45 minutes is allowed where the phone company must travel long distances for an appointment at a premises in a community of under 2,500 people.

Table 10: Compensation levels

Customer	Services delayed	Compensation for first 5 working days (per working day)	Compensation after first 5 working days (per working day)
Residential/ Charity	Connection or repair of standard telephone service	\$14.52	\$48.40
	Connection or repair of enhanced call handling features to an existing service	\$7.26	\$24.20
	Connection or repair of two or more enhanced call handling features to an existing service	\$14.52	\$48.40
	Not keeping an appointment	\$14.52 for each missed appointment	
Business	Connection or repair of the standard telephone service	\$24.20	\$48.40
	Connection or repair of enhanced call handling features to an existing service	\$7.26	\$24.20
	Connection or repair of two or more enhanced call handling features to an existing service	\$24.20	\$48.40
	Not keeping an appointment	\$24.20 for each missed appointment	

Please note: this document is intended as a guide only and should not be relied on as legal advice or regarded as a substitute for legal advice in individual cases.

Table 11: CSG retail performance benchmarks (covering financial years)

	Benchmark
New connections:	
Urban areas (national)	90%
Major rural areas (national)	90%
Minor rural areas (national)	90%
Remote areas (national)	90%
In-place connections:	
All areas (national)	90%
Fault rectifications:	
Urban areas (national)	90%
Rural areas (national)	90%
Remote areas (national)	90%
Appointment-keeping (national)	90%

Appendix D – Obligations that Telstra must meet when delivering a USO STS

Telstra has a Universal Service Obligation (USO) to ensure standard telephone services (STS) and payphones are reasonably accessible to all people in Australia on an equitable basis, wherever they work or live.

Standard telephone service

Telstra fulfils its obligation to provide an STS by giving customers access to a reliable telephone service that has good voice reception and ensures connections and faults associated with this service are undertaken and repaired within a reasonable time.

A USO STS includes the following features:

- access to local, national and international calls
- untimed local calls
- 24 hour free access to emergency service numbers
- priority assistance (for those with a life threatening medical condition)
- Customer Service Guarantee (connection and repair timeframes)
- a unique telephone number with a directory listing (unless silent line is requested by the customer)
- preselection (which allows the user to preselect another provider for long distance, fixed to mobile and international calls where the STS is provided over the copper network)
- calling line identification
- operator and directory assistance
- itemised billing.

A customer can ask Telstra to provide a standard telephone handset for an additional cost. Telstra also provides people with hearing, speech, vision, dexterity or mobility impairments with an alternative form of communication including equipment necessary to use this service.

Telstra's national pricing ensures that customers in remote areas pay the same price for an STS as customers in cities. While this service has traditionally been provided as a fixed line telephone service, Telstra's obligation is technology neutral meaning it can choose the technology over which they provide a customer with this service. For example, in some remote areas Telstra provides customers with an STS over satellite.

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