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Bureau of Communications Research

NBN non-commercial services funding options

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Contents

Useful terms and abbreviations

Term	Definition
ACCC	Australian Competition and Consumer Commission
Access network	The network or technology used to deliver broadband to end users
ACMA	Australian Communications and Media Authority
ADSL	Asymmetric digital subscriber line
ARPU	Average revenue per user
BBM	Building block model
BCR	Bureau of Communications Research
Capex	Capital expenditure
Carrier Licence Condition	Refers to the *Carrier Licence Conditions (Networks supplying Superfast Carriage Services to Residential Customers) Declaration 2014*
COAG	Coalition of Australian Governments
CSO	Community service obligation
CIR	Committed information rate
DCF	Discounted cash flow
ERR	Eligible revenue returns
FDC	Fully distributed cost
FTTB	Fibre to the building/basement
FTTN	Fibre to the node
FTTP	Fibre to the premises
FY	Financial year
GBE	Government business enterprise
Gbps	Gigabits per second
GPRS	General packet radio service

Term	Definition
GSMA	GSM Association
HSPA	High-speed packet access
HFC	Hybrid-fibre coaxial
ICRA	Initial cost recovery account
ICT	Information communication technology
IOP	nbn integrated operating plan (as at 27 March 2015)
IOT	Internet of things
IPOLR	Infrastructure provider of last resort
IRR	Internal rate of return
ISP	Internet service provider
ISS	nbn interim satellite service
LEO	Low earth orbit
LTE	Long-term evolution
LTE-A	Long-term evolution advanced
LTSS	nbn long-term satellite service
M2M	Machine-to-machine
Mbps	Megabits per second
MIMO	Multi-input, multi-output
MTM	NBN multi-technology mix, including the HFC, FTTP and FTTN fixed-line networks
NBN	national broadband network
nbn	NBN Co Limited ACN 136 533 741
NPV	Net present value
NRS	National relay service

Term	Definition
NSS	nbn satellite support scheme
Opex	Operational expenditure
OSS/BSS	Operational and business support systems
Policy paper	Refers to the 'Telecommunications Regulatory and Structural Reform' policy paper released by the Australian Government in December 2014
POTS	Plain old telephone service
RAB	Regulatory asset base
RIS	Regulation impact statement
RSP	Retail service provider
RTIRC	Regional Telecommunications Independent Review Committee
TDD	Time division duplex
TIL	Telecommunications Industry Levy, imposed under the *Telecommunications (Industry Levy) Act 2012*
SAC	Stand alone cost
SAU	Special access undertaking
SIO	Services in operation
USO	Universal service obligation
Vertigan Review	Collectively the 'Statutory Review under Section 152EOA of the *Consumer and Competition Act 2010*' (July 2014), 'NBN Cost Benefit Analysis' (August 2014) and 'NBN Market and Regulatory Report' (October 2014)
VDSL	Very-high-bit-rate digital subscriber line
VSAT	Very-small-aperture terminal
WACC	Weighted average cost of capital
WSA	Wireless service area

Executive summary

In December 2014, the Australian Government asked the Bureau of Communications Research (BCR) to consider economically efficient and transparent ways to fund the rollout of the national broadband network (NBN) to regional Australia, while promoting a more level playing field in the provision of wholesale fixed-line broadband services.

In addressing these requirements, the BCR assessed the non-commercial losses expected from building and operating satellite and fixed wireless services, and considered options for funding these losses via industry contributions. This report sets out the BCR's findings, which have been informed by submissions made by industry and interested parties following a two-stage consultation process between May and October 2015.

Costings and presentation of other financial information

The losses and funding amounts in this report are estimates based on the BCR's financial modelling. This modelling has used NBN Co Limited (nbn)[1] Corporate Plan 2016 data to 30 June 2018 and where available, nbn financial estimates to 2022. The BCR has projected costs and revenues forward to financial year ending (FY) 2040, and is responsible for the cost outputs and projections.

The BCR also acknowledges the report includes long-term assumptions that could be impacted by future developments, which would result in different estimates. These estimates are subject to change and do not represent budget costings, the Government's views or indicate a commitment to a particular course of action.

Drivers of NBN non-commercial service losses

An important starting point for this study is defining NBN non-commercial services. The relevant benchmark for determining the commerciality of a network is the extent to which its operator is able to recover its costs over time (including an appropriate cost of capital) through revenues. Where revenues fall short of costs, a network is non-commercial and the services offered by that network are non-commercial services. nbn's fixed wireless and satellite services meet this definition.

The fixed wireless and satellite NBN networks are non-commercial due largely to the high cost of achieving successive government requirements for high-speed broadband to be delivered across Australia. Meeting the required coverage and performance standards requires significant capital investment. Revenue opportunities are limited given the small number of customers served, current pricing arrangements and infrastructure competition.

nbn is working to optimise the services that can be provided over fixed wireless and satellite. This is particularly important to make sure satellite capacity is used in areas of greatest need. Optimisation may include possibly investing in more satellite capacity or shifting the coverage of some premises from the satellite to the fixed wireless network to preserve satellite capacity. Capacity management requirements may increase non-commercial service losses beyond current projections.

In the future, emerging technologies may change the competitive landscape and present new opportunities for broadband service delivery. Ongoing demand for capacity and the changing technology landscape mean it is essential the losses and funding arrangement settings of non-commercial services are periodically reassessed.

Quantifying losses

The BCR has modelled non-commercial services using a discounted cash flow (DCF) approach. Losses have been modelled at an aggregate network level, using a forecast period to FY2040 that aligns with the special access undertaking (SAU) and provides a sufficient timeframe to smooth losses. The BCR estimates the net present value (NPV) loss for fixed wireless and satellite services to FY2040 is approximately $9.8 billion, using a post-tax nominal discount rate of 6.46 per cent. In FY2015 real terms, this loss represents a per-month subsidy of approximately $110 for each satellite premises activated, and $105 for each fixed wireless premises activated.

Financial outcomes are sensitive to changes in expenditure assumptions. A 10 per cent increase in capital expenditure would increase non-commercial service losses by an estimated $560 million. Financial outcomes are less sensitive to revenue assumptions.

The BCR notes its estimate of losses is based on avoidable costs, in other words, those costs that would have otherwise been avoided had the fixed wireless or satellite service not been provided. This approach is consistent with government requirements for government business enterprises (GBEs), regulatory economics practice, and reflects the approach largely favoured by industry.

Determining eligibility

Submissions received following the initial consultation round were divided on whether eligibility should be limited to NBN equivalent industry participants (that is, high-speed fixed-line network operators) or include a broader range of industry participants, including mobile network operators.

While both an NBN equivalent and broader industry funding approach would achieve level playing field contestability objectives, with nbn and competing network operators equally sharing the burden of funding non-commercial services, the BCR considers an 'NBN equivalent' funding arrangement best achieves the Government's requirements when it comes to economic efficiency.

An NBN equivalent funding approach treats close substitutes equally, without imposing an unwarranted burden on operators of networks not considered to be close substitutes. This results in all high-speed fixed-line networks directly competing with nbn in the provision of its core requirements facing the same per service funding contribution as nbn. Mobile broadband services would not be included in these arrangements, as they are not considered by the BCR to be close substitutes to fixed-line services at this time.

An NBN equivalent approach also maintains important existing commercial incentives for nbn to control costs, determine appropriate service standards and innovate in the provision of broadband services to regional and remote Australia. This would occur because nbn would continue to recover the bulk of fixed wireless and satellite losses from its own fixed-line customer base where it faces long-term and declining price caps. This minimises the impact on the broader telecommunications industry and is a proportionate response to a modest level of expected competitive entry and cross-subsidy leakage.

Under an NBN equivalent approach, the BCR considers eligibility should be tightly focused on nbn and industry participants that resemble nbn, namely operators of high-speed fixed-line broadband access networks capable of delivering download speeds of at least 25 megabits per second (Mbps). The BCR considers networks transitioning to nbn under the Definitive Agreements should be exempted from the funding arrangement on the basis of administrative complexity and non-equivalence.

Further, the BCR considers an eligibility threshold based on services in operation (SIO) should be used to make sure the administrative costs of compliance and collection are not disproportionate to the amount collected. The BCR recommends a relatively low threshold of around 2,000 SIOs, which represents around half-a-per-cent of the projected competitive market in FY2022. This threshold would include most fixed-line network operators.

Importantly, an NBN equivalent funding approach raises a number of issues relating to the substitutability of mobile to fixed-line services. Market trends such as the introduction of 4G home broadband modems and downward movement in mobile broadband pricing suggest fixed to mobile substitution may increase beyond current levels. The introduction of an NBN equivalent funding arrangement may stimulate further mobile substitution if new funding arrangements cause non-NBN network operators to increase prices.

On balance, the BCR considers that based on current information, it is not clear mobile is a more than partial substitute for fixed-line services given the ever-increasing download volumes demanded by broadband customers. Future examination is recommended, particularly before or when 5G services start in Australia.

Calculating contributions

The BCR considers an NBN equivalent approach should be calculated according to the number of high-speed fixed-line SIOs. The BCR has calculated that each high-speed fixed-line SIO would contribute around $6.80 per month in FY2015 real terms. This is equivalent to around $7.30 per month in nominal terms in FY2018 (the first full financial year for which new funding arrangements could be calculated), and $8.00 per month nominal by FY2022, when the NBN is expected to be completed and operating in a relatively steady state of operations.[2]

Under this method, the total annual contribution across industry increases as the rollout of the NBN and other fixed-line networks progresses. This would see nbn continue to make the largest contribution towards fixed wireless and satellite losses, as it has the largest number of fixed-line SIOs (expected to be about 96 per cent of the overall market by FY2022). The BCR estimates this would generate maximum annual industry contributions (outside nbn) of around $37 million in nominal terms by FY2022. Relative to the annual costs of deploying non-commercial services, this represents a modest contribution, reflecting the expectation that infrastructure competitors will make up only four per cent of the high-speed fixed-line market by this time.

The following table provides estimated financial outcomes under an NBN equivalent funding arrangement.

Table 1: Financial outcomes under an NBN equivalent (high-speed fixed-line networks) funding base

	FY2018	FY2022
NBN equivalent fixed-line SIOs (cumulative)	240,000 (~5% market share)	380,000 (~4% market share)
NBN fixed-line SIOs (cumulative)	4.3 million (~95% market share)	8.1 million (~96% market share)
Total fixed-line SIOs (including NBN services)	4.5 million	8.5 million
Per fixed-line contribution monthly amount (nominal value of $6.80 FY2015 real value)	$7.30	$8.00
Per fixed-line contribution annual amount (nominal value)	$87.60	$96.00
Non-nbn annual contribution (nominal)	$21.0 million	$36.5 million
nbn annual contribution (nominal)	$376.7 million	$777.6 million
Approx total annual collection (nominal)	$397.7 million	$814.1 million

Note: Figures are rounded to one decimal place. NBN equivalent SIOs are based on BCR estimates of the number of premises ready for service and assumed take-up rates. NBN SIOs are based on nbn estimates with medium and large business, and government customers removed from the total. The nominal per SIO contribution collected each year was calculated by removing discounting from the FY2015 present value. Estimates of the number of SIOs included in this report were based on total high-speed fixed-line SIOs. The estimates presented are preliminary and do not represent budget costings.

While favouring a funding arrangement limited to NBN equivalent services, the BCR also explored financial outcomes under a broader industry funding approach, which could align to the existing Telecommunications Industry Levy (TIL) arrangement. This was for comparison purposes only, illustrating how different approaches would affect the share of fixed wireless and satellite losses borne by nbn. Under the preferred NBN equivalent option, nbn will fund 96 per cent of non-commercial services losses once it reaches a steady state of operations. Under a broader industry funding base, the BCR estimates nbn will fund only 13 per cent of losses by FY2022, largely as a result of including mobile networks in the funding base.

Impact on costs and pricing

Applying a monthly SIO contribution makes the cross subsidy that nbn fixed-line customers provide to NBN non-commercial services transparent. In today's money, a $6.80 monthly per-SIO contribution would constitute around 17 per cent of nbn's fixed-line wholesale average revenue per user (ARPU).

Costs for networks serving the remaining four to five per cent of the fixed-line market would increase. Any increase in end user pricing would reflect level playing field outcomes, whereby losses from non-commercial services are borne proportionately by equivalent network operators and nbn. The extent to which revised prices are greater or less than nbn's should reflect the efficiency of the competing network operator compared to nbn (noting the extent to which nbn's prices differ from those of other network operators may also reflect the impact of regulation and government policy).

Introducing NBN non-commercial service funding arrangements

The Telecommunications Regulatory and Structural Reform policy states the new NBN non-commercial services funding arrangements should be in place by the start of the new regulatory framework on 1 January 2017.[3] As a result, the BCR has assumed the legislative framework would be established by FY2017, with the first reporting period and collection in FY2018.

Administering non-commercial service funding arrangements

The BCR recommends the Australian Competition and Consumer Commission (ACCC) calculate the funding amount, and the Australian Communications and Media Authority (ACMA) collect it.

Achieving transparency

The BCR believes the appropriate transparency of funding arrangements would be achieved by publishing the process for determining the overall NBN non-commercial service loss, the estimated magnitude of the loss over the relevant time horizon, and the contribution paid by each eligible participant (while preserving commercial-in-confidence information requirements). In addition, nbn should account for cash outflows and inflows relating to the NBN non-commercial services funding arrangement as part of its accounting separation requirements. This would reflect a transfer of funds from the fixed-line networks to the fixed wireless and satellite networks.

Regulatory and policy review points

The BCR considers the funding requirement should be recalculated every five years, as part of ongoing regulatory review points. These regulatory review points would provide a mechanism to adjust forecasts to reflect the latest financial estimates as the NBN rollout progresses. In addition, the BCR recommends periodic policy reviews be carried out by the Department of Communications and the Arts every five to 10 years, to reflect changes in policy, technological or market developments (such as the introduction of 5G mobile technology), or take place ahead of significant investment decisions (for example, before nbn commissions replacement satellites).

1. Defining non-commercial services

The BCR considers that fixed wireless and satellite networks are non-commercial as they do not generate sufficient revenues to cover costs. A cost assessment shows the fixed wireless and satellite networks are subsidy recipients.

The BCR notes that while some areas of the NBN fixed-line networks may also be loss-making, at an aggregate level the networks are projected to be commercial. Accordingly, loss-making fixed-line areas are not considered. Further, identification and quantification of loss-making areas in the fixed-line is problematic given the early stages of the multi-technology mix (MTM) rollout, and is not the cross subsidy issue the Government has instructed the BCR to address.

1.1. Background

The Bureau of Communications Research (BCR) is an economic and statistical research unit within the Department of Communications and the Arts. Following the release of the Telecommunications Regulatory and Structural Reform policy paper in December 2014, the Australian Government commissioned the BCR to investigate and provide a report to the Minister for Communications, and the Minister for Finance, on options for the efficient and transparent funding of non-commercial services in the national broadband network (NBN), which would replace the existing cross-subsidy arrangements.[4]

An earlier version of this report was provided to government in December 2015 for its consideration. Information in this public version of the report is correct as at March 2016.

Terms of reference for this report are provided at Attachment A.

1.2. Definition of commerciality and the cross-subsidy test

An important starting point for this study is defining NBN non-commercial services. The relevant benchmark for determining the commerciality of a network is the extent to which its operator is able to recover its costs over time (including an appropriate cost of capital) through revenues. Where revenues fall short of costs, a network is inherently non-commercial, and the services offered by that network would be defined as non-commercial services.

nbn noted:

… as noted by the BCR and the Vertigan Review, revenues from the provision of NBN fixed wireless and satellite services will not recover this significant upfront investment (or ongoing operational costs (OPEX) associated with providing these services) over the life of these assets – for this reason the NBN fixed wireless and satellite services have been deemed to be non-commercial services.[5]

The BCR notes academic literature proposes a formal test for assessing whether a cross-subsidy between profitable and non-profitable business activities exists,[6] providing further guidance on how to assess commerciality within a multi-product firm.This involves a stand-alone test for whether a service is a source of cross-subsidy, and an incremental (or avoidable) cost test for whether a service is the recipient of a cross-subsidy. If the stand-alone test demonstrates a service is not the source of a cross-subsidy, and the incremental cost test indicates the service receives a cross-subsidy, the service is considered to be unambiguously non-commercial. The Australian Competition and Consumer

Commission (ACCC) applies this approach in testing for cross-subsidies in Australia Post. The BCR's modelling confirms the fixed wireless and satellite networks would be subsidy recipients under the incremental cost test as revenues fall short of direct costs.[7]

Box 1: Tests for cross-subsidies

The **stand-alone test** assesses whether a service is a source of subsidies:

> The lower bound of the stand-alone cost test is the service's fully distributed cost (FDC). Where the service's revenue exceeds FDC (that is, the sum of the service's direct, attributable and un-attributable costs), it may be a source of subsidy.

> The upper bound of the stand-alone cost test is the sum of the service's direct and attributable costs, and the total of a firm's un-attributable costs. Where the service's revenue is above this upper bound, it is a definite source of subsidy.

The **incremental cost test** assessed whether a service is a recipient of subsidies:

> Where revenue is less than direct costs, the service is a recipient of a subsidy. This is the lower bound of the incremental cost test.

> Where revenue is sufficient to cover the direct costs, but less than the sum of direct and attributable costs, the service group may be the recipient of a subsidy. This is the upper bound of the incremental cost test.

1.3. Treatment of non-commercial fixed-line NBN services

In its initial submission, nbn noted cross-subsidies are not just funding its fixed wireless and satellite services, but are likely to also be inherent within its fixed-line footprint due to geographic pockets of non-commerciality.[8] In other words, commercial fixed-line operations are cross-subsidising both loss-making fixed-line and non-fixed-line services.

The BCR appreciates at a disaggregated network level there will be different costs for providing services within the fixed-line footprint, and that some fixed-line services may be non-commercial. Nevertheless, the issue the Government has instructed the BCR to address is the cross-subsidisation of NBN fixed wireless and satellite networks by the fixed-line networks, as reflected in the Terms of Reference.

Further, from a practical perspective, it is currently not possible to accurately calculate fixed-line costs, and in particular, costs at a granular geographic level, given the MTM fixed-line networks have yet to deploy at scale. The fibre-to-the-node (FTTN) rollout is at the trial stage and the hybrid-fibre coaxial (HFC) deployment is yet to start. This contrasts with progress on the fixed wireless network (close to 50 per cent deployed) and the long-term satellite service (LTSS) network (first satellite launched and services to start in FY2016). In short, the extent of non-commercial services in the fixed-line networks is uncertain. Accordingly, the BCR has not considered commerciality in the fixed-line footprint as part of this study.

2. Drivers of non-commercial service losses in the fixed wireless and satellite networks

The fixed wireless and satellite NBN networks are non-commercial, largely as a result of the high cost needed to achieve successive government requirements for the delivery of high-speed broadband outside the fixed-line footprint. The fixed wireless and satellite programs are capital intensive and do not generate significant revenues.

nbn is working to optimise the services that can be provided over the fixed wireless and satellite networks. This is particularly important to make sure satellite capacity is used in areas of greatest need. Optimisation may include the possibility of shifting the coverage of some premises from the satellite to the fixed-wireless network to preserve satellite capacity.

Capacity management requirements may increase non-commercial service losses beyond current projections.

2.1. Government requirements

nbn has made its technology decisions in response to the requirements of successive governments to provide high-speed broadband to all Australian premises. The initial Statement of Expectations provided to nbn in December 2010 required all premises outside the fixed-line footprint would be:

… served by a combination of next-generation fixed wireless and satellite technologies providing peak speeds of at least 12 megabits per second.[9]

This Statement of Expectations was informed by the 'KPMG McKinsey Implementation Study' that noted the high costs associated with delivery of high-speed broadband to premises outside the fixed-line footprint, and which identified fixed wireless and satellite technologies as the most cost effective for serving the last seven to 10 per cent of Australian premises.[10]

As outlined below, nbn implemented a network design to meet these requirements. An independent assessment of the fixed wireless and satellite network design carried out as part of nbn's special access undertaking (SAU) process, found the NBN network design to be efficient and prudent in meeting these requirements.[11]

Box 2: NBN non-commercial services network design

The NBN fixed wireless network is designed based on fourth-generation time-division duplex (TDD) long-term evolution (LTE) technology. While this is the same technology used for 4G mobile broadband, the NBN fixed wireless platform has been configured to deliver peak broadband speeds that support government expectations. This is achieved using a line of sight between the base station and an outdoor antenna at the end user premises. Further, unlike mobile networks, nbn has designed each fixed wireless facility to serve a set number of premises. This supports greater consistency in the speed and quality of service that can be delivered to each home and business receiving the fixed wireless service.[12] nbn's spectrum acquisitions support the delivery of high-speed broadband services via the fixed wireless network.

The NBN satellite consists of two Ka band satellites configured for the delivery of high-speed broadband services. Each satellite will support 75 small and 26 large spot beams. This provides a predicted aggregate system capacity across the two satellites of 135 gigabits per second (Gbps), comprising 107 Gbps for downloads and 28 Gbps system capacity for uploads. nbn has commissioned 10 ground stations and entered into agreements for satellite launch and the provision of end user equipment and telemetry, tracking and control services.

On 6 February 2013, nbn announced a new 25 megabits per second (Mbps) speed tier for its fixed wireless and long-term satellite services.[13] In April 2014, the Government released a revised Statement of Expectations that required the NBN network design be guided by the Government's policy objective of providing data download rates of at least 25 Mbps to all premises.[14]

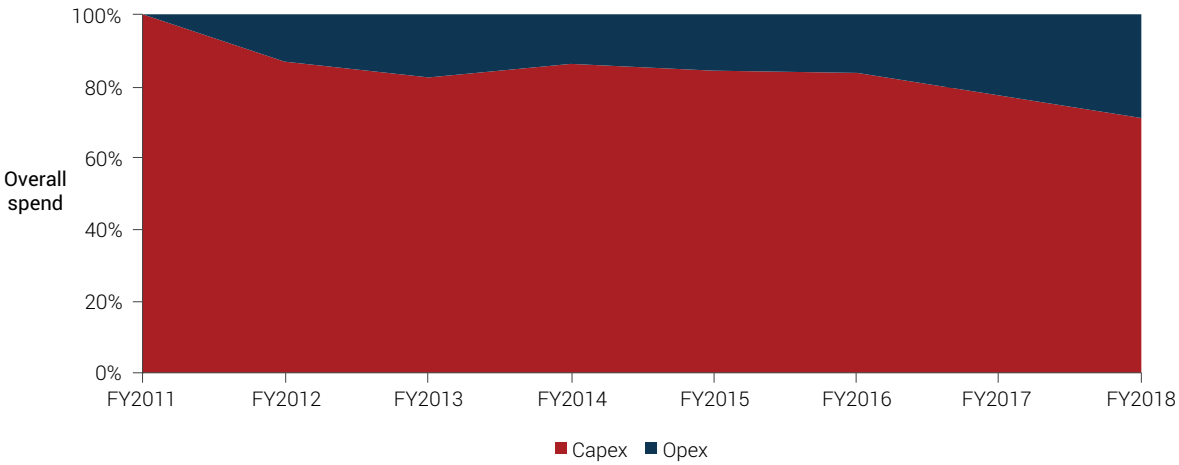
In May 2014, nbn released the 'Fixed Wireless and Satellite Review', which provided guidance on how these networks could operate under the revised Statement of Expectations.[15] This review assessed different options by which the fixed wireless and satellite networks could be deployed, including an assessment of partnering or divestment opportunities. It concluded that a deployment model where nbn is responsible for building and operating the networks was appropriate.[16]

2.2. Fixed wireless operational and commercial assessment

As of 4 February 2016, nbn had built enough fixed wireless base stations to pass 348,000 serviceable premises in regional Australia. Of these, around 88,000 premises had signed up to receive an NBN fixed wireless service.[17] By the end of FY2018, the fixed wireless tower build will be largely completed, with a projected 535,000 premises ready for service and a projected 220,000 activations.[18]

Fixed wireless operations are underpinned by commercial agreements confirming price and non-price terms. In 2011, Ericsson Australia was awarded a 10-year contract to design, build and manage the fixed wireless network deployment,[19] providing cost certainty over the rollout period. The fixed wireless network is characterised by high-capital expenditure (capex) during the initial build phase, with operating expenditure (opex) becoming an increasing proportion of expenditure over time.

Figure 1: Percentage of capex to opex funding for NBN fixed wireless services, FY2011-18

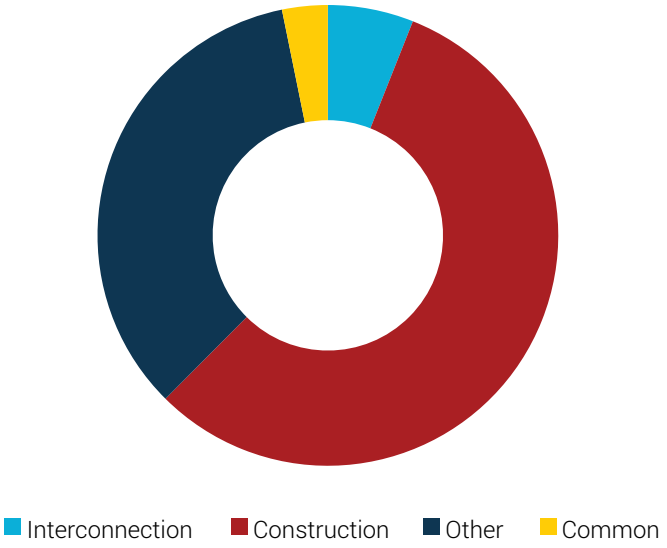


Note: Based on nominal figures, includes common costs.

Source: BCR (2015), based on nbn (2015) IOP data.

As shown in the figure below, expenditure to FY2018 is largely driven by constructions costs.

Figure 2: Fixed wireless capex breakdown, FY2011–18



Note: Construction costs include civil construction, premises covered and core network. Interconnection costs include fibre access nodes (FANs), point of interconnect (POI) and spectrum. Other costs include activations, base station design and acquisition, fibre spurs, capitalised labour and all remaining fixed wireless capex costs.

Source: BCR (2015), based on nbn (2015) IOP data.

As shown in Table 2 below, fixed wireless assets carry a useful life of between five to 16 years.

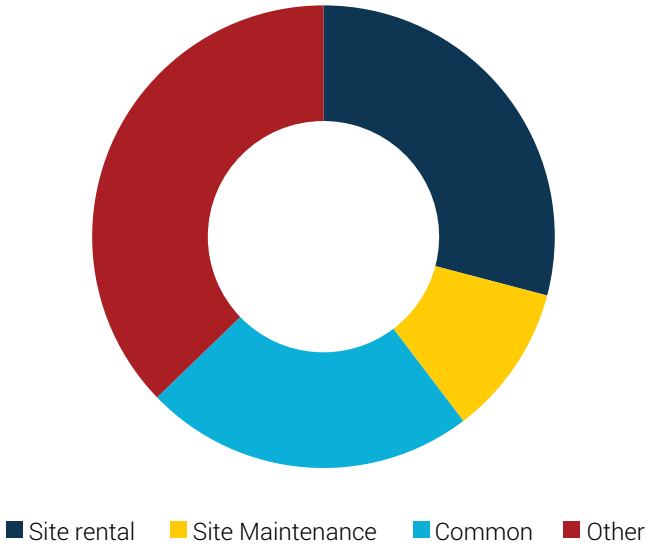
Table 2: Useful life of fixed wireless assets.

Description	Useful life in years
Customer premises equipment	5
Spectrum licenses	15
Base station—civil construction works	16
Base station—network and coverage upgrades	15
Core network	7

Source: nbn (2015), IOP data.

Following the completion of the capital-intensive fixed wireless build phase, operating costs contribute an increasing proportion of overall expenses, driven largely by site rental and maintenance costs.

Figure 3: Fixed wireless opex breakdown, FY2011–18



Note: Other includes power, managed services backhaul, spectrum and microwave licences.

Source: BCR (2015), based on nbn (2015) IOP data.

The NBN fixed wireless network originally offered a 12 Mbps download and 1 Mbps upload (12/1) service, and a 25 Mbps download and 5 Mbps (25/5) service, with consistent pricing to equivalent fixed-line services. In April 2015, nbn announced it would also trial a fixed wireless 25–50 Mbps download and 5–20 Mbps upload service. This upper speed tier launched commercially in December 2015.[20] From FY2015–18, fixed wireless revenues are expected to account for around five per cent of overall nbn telecommunications revenue.

In some regional areas, the NBN fixed wireless network competes with other broadband networks, including ADSL/ADSL2+. ADSL2+ in particular offers a comparable service to NBN fixed wireless as it provides comparable headline speeds and data download limits (although the headline ADSL2+ speed is dependent on the length of the copper from the exchange to the premises, with speeds falling over longer lengths). Many internet service providers (ISPs) offer equivalent pricing and data allowances between the NBN and ADSL products, including in regional or rural areas.

Table 3: NBN fixed wireless and ADSL2+ retail prices, August 2015

Carrier	Technology	Plan name	Plan cost ($/month)	Download capacity (GB/month)
Telstra	Fixed wireless	Basics Plan	$75	100 GB
Telstra	ADSL2+	Basics Plan	$75	100 GB
Optus	Fixed wireless	200GB Broadband with 'Fast' Speed Pack	$85	200 GB
Optus	ADSL2+	200GB Broadband	$80	200 GB
iiNet	Fixed wireless	nbn Wireless 2	$64.90	50 GB
iiNet	ADSL2+ (Off-Net)	ADSL2+ Home-1	$39.95	50 GB
Internode	Fixed wireless	nbn Wireless Silver	$54.95	30 GB
Internode	ADSL2+ (Off-Net)	Each Reach	$59.95	30 GB

Source: ISP websites accessed in August 2015. Excludes installation fees, telephony, user equipment, bundles or discount offers. Based on 24-month contracts, fixed wireless plans offering 25/5 Mbps, nationwide ADSL2+ plans.

Notably, unlike the fixed-line footprint, there is no migration event that needs a customer to transfer to the nbn fixed wireless network. Fixed wireless pricing is based on the same regulated price caps as equivalent fixed-line services. This places a ceiling on the amount nbn can charge and the extent to which it can cost recover.

The presence of ongoing infrastructure-based competition and the associated lack of specific migration incentives suggest there are limits on customer take-up of nbn fixed wireless and satellite services and subsequent revenues. Pricing arrangements further constrain revenue opportunities.

2.3. Satellite operational and commercial assessment

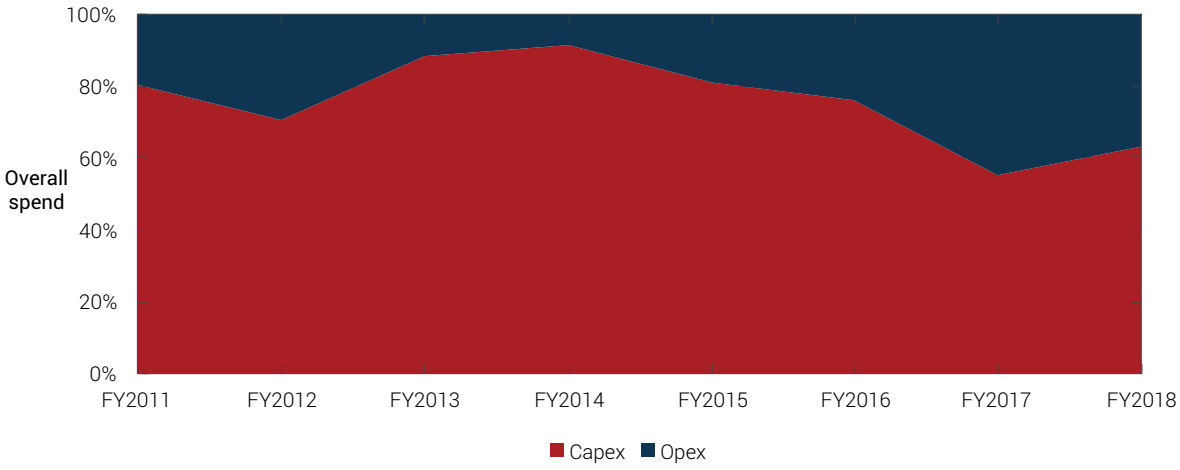
Ahead of the launch of the Long-Term Satellite Service (LTSS), nbn deployed the Interim Satellite Service (ISS) in 2011 using leased capacity from IPSTAR and Optus to support around 44,000 services. In June 2013, the ISS reached capacity and nbn stopped offering further services.[21] In July 2014, nbn announced the NBN Satellite Support Scheme (NSS) offering services for up to 9,000 additional premises. This service is delivered by IPSTAR and participating ISPs as opposed to nbn.[22]

The LTSS will be delivered by two Ka band multi-spot beam satellites designed to deliver high-capacity broadband. The first satellite, Sky Muster, launched on 1 October 2015 and the second satellite is scheduled to launch by mid-2016. Combined, both satellites are expected to serve a coverage footprint of approximately 412,000 premises that are outside the NBN fixed wireless or fixed-line footprint.[23] Services are expected to start during FY2016.[24]

Satellite operations are underpinned by commercial agreements. In July 2014, nbn announced Ericsson would manage ground station operations and handle the migration of interim satellite users to the LTSS. This complements the telemetry, tracking and control (satellite flight functions) contracted to Optus.[25]

As at 4 February 2016, nbn had just above 35,000 active satellite connections.[26] Following the start of services on the LTSS, this number is anticipated to grow to approximately 135,000 connections by FY2018.[27] The satellite programme is characterised by high capital costs leading up to the launch of the satellites.

Figure 4: Percentage of capex to opex funding for NBN satellite services, FY2011-18

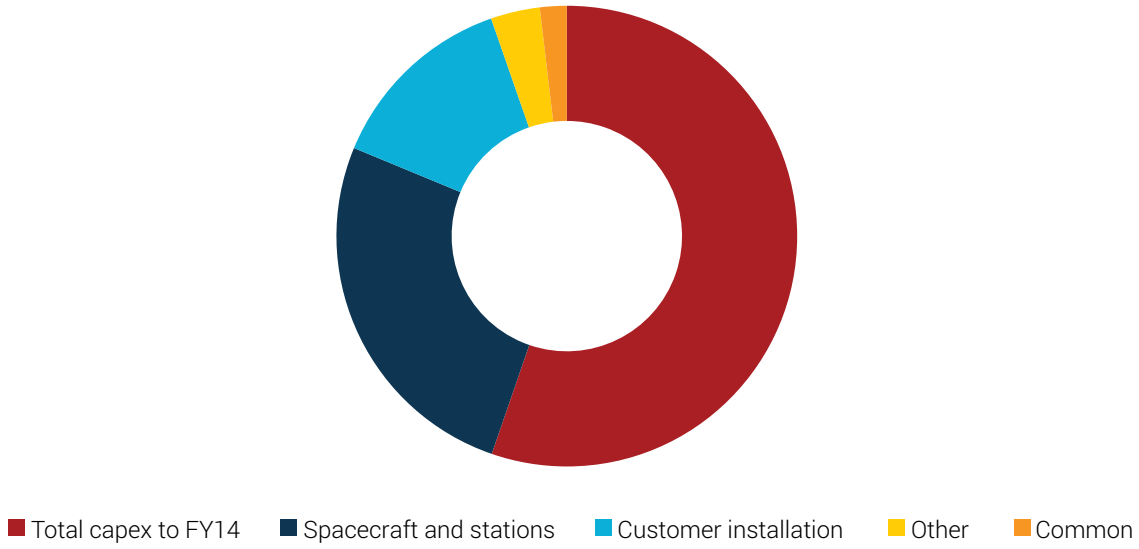


Note: Based on nominal figures, includes common costs.

Source: BCR 2016, based on nbn 2015 IOP data.

Capital expenditure is largely associated with spacecraft, launch and ground station costs. Following the launch of the satellites in FY2016, capital expenditure will be largely driven by customer connection and ground station costs.

Figure 5: Satellite capex breakdown, FY2011–18



Note: Total capex to FY14 includes ISS capex. Spacecraft and stations include launch costs. Other includes CSM and RFAT provision, routers and switches, and labour costs.

Source: BCR (2015), based on nbn (2015), IOP data.

As shown below, satellite assets carry a useful life of between seven and 15 years.

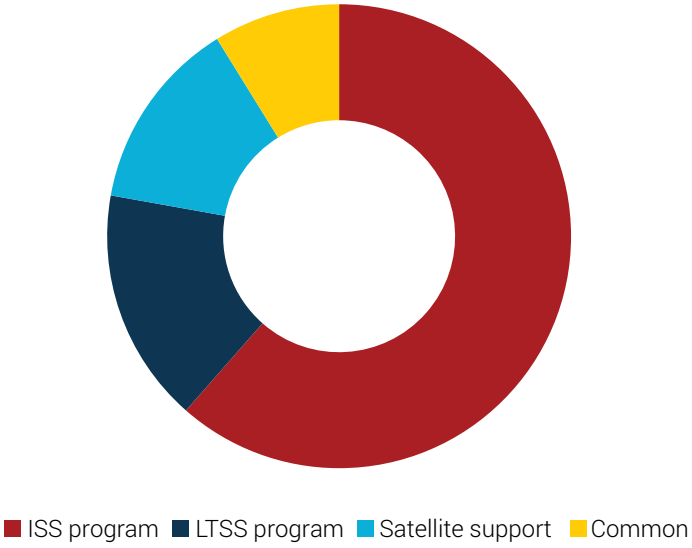
Table 4: Useful life for satellite assets

Description	Useful life in years
Customer premises equipment and installation (VSAT)	7
Infrastructure	15

Source: nbn 2015, IOP data.

Ongoing operating expenditure is largely driven by outsourced contracts providing support and assurance services.

Figure 6: Satellite opex breakdown, FY2011–18



Note: The Interim Satellite Service (ISS) includes managed services, transponder services and other costs. The Long-Term Satellite Service (LTSS) includes apparatus licences, ground stations and other costs.

Source: BCR (2015), based on nbn (2015), IOP data.

From FY2015–18, satellite revenues are expected to account for around 2.5 per cent of overall nbn telecommunications revenue. While the BCR understands nbn is considering additional services that could be offered over the satellite network, it is currently unclear the extent to which new services might increase revenues to offset satellite programme losses.

2.4. Capacity considerations

For both the fixed wireless and satellite networks, there is a relationship between speeds, data usage and network investment. The greater the speeds provided over the network, the greater the data usage. Increasing network data traffic is a key driver of network upgrades, especially to support peak period requirements.

Capacity is an important consideration for the satellite program. The LTSS has finite capacity and there are limited options available once this capacity has been reached. Importantly, while recent trends suggest increasing demand for data usage, capacity constraints are unlikely in the short term, given the significant increase in capacity offered by the LTSS compared to current service offerings. Capacity constraints are more likely a longer-term consideration and given the LTSS is offered on a spot-beam basis, capacity shortfalls will likely be limited to beams serving large population centres.[28]

The Fixed Wireless and Satellite Review identified a number of measures to conserve capacity, including developing a standard product based on pre-determined committed information rate (CIR), implementing service level agreements that define customer experience and putting in place tools to monitor and control usage.[29] The 2015 Regional Telecommunications Review (RTIRC) also considered a number of strategies to optimise LTSS capacity. It recommended nbn actively manage demand by, for example, supporting the caching of content using satellite management best practice and innovative software, and prioritising certain traffic, particularly for services with high social value such as those delivered to schools and hospitals.[30]

Ultimately, such capacity management techniques optimise the services that can be provided over fixed wireless and satellite. This is particularly important in the satellite footprint, to make sure capacity is preserved over the asset life of the satellites.

In the event that satellite capacity constraints are reached, nbn could implement further controls to manage peak network usage, invest in more satellite capacity or limit satellite take-up and instead extend fixed wireless infrastructure. As identified in the Fixed Wireless and Satellite Review, a number of options exist to upgrade capacity on the fixed wireless network, including site sector splitting, adding new base stations or deploying new technologies such as carrier aggregation.[31] Network upgrades have cost and revenue implications.

These issues highlight the sensitivity of non-commercial service losses to capacity constraints. For example, a greater than expected shifting of end users from the satellite to the fixed wireless network will increase the extent of non-commercial service losses and industry funding contributions.

New technologies may emerge that increase capacity on the fixed wireless and satellite networks or support options for alternative delivery of high-speed broadband services.

2.5. Future technology considerations

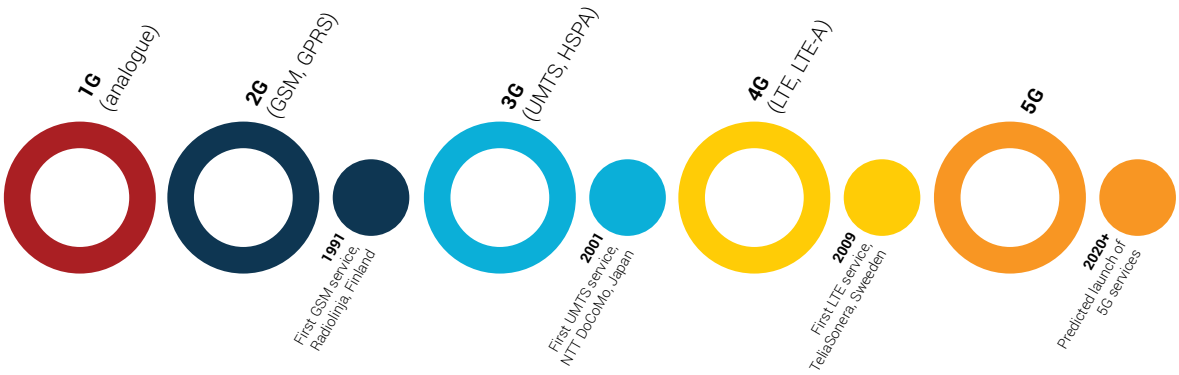
5G and the evolution of high-capacity satellites indicate significant improvements will be available for the fixed wireless and satellite networks.

Emerging technologies may change the competitive landscape and present new and potentially alternate opportunities for broadband service delivery. Over the next 10–20 years, the BCR expects there will be new technologies that can enable greater performance across both the fixed wireless and satellite networks.

2.5.1. 5G technology

Historically, new generations of mobile technology have come to market roughly once a decade (see Figure 7 below). Despite the fact 4G standards are still being developed, work is already being carried out to scope the initial standards for 5G technologies.

Figure 7: Timeline for the introduction of cellular technology



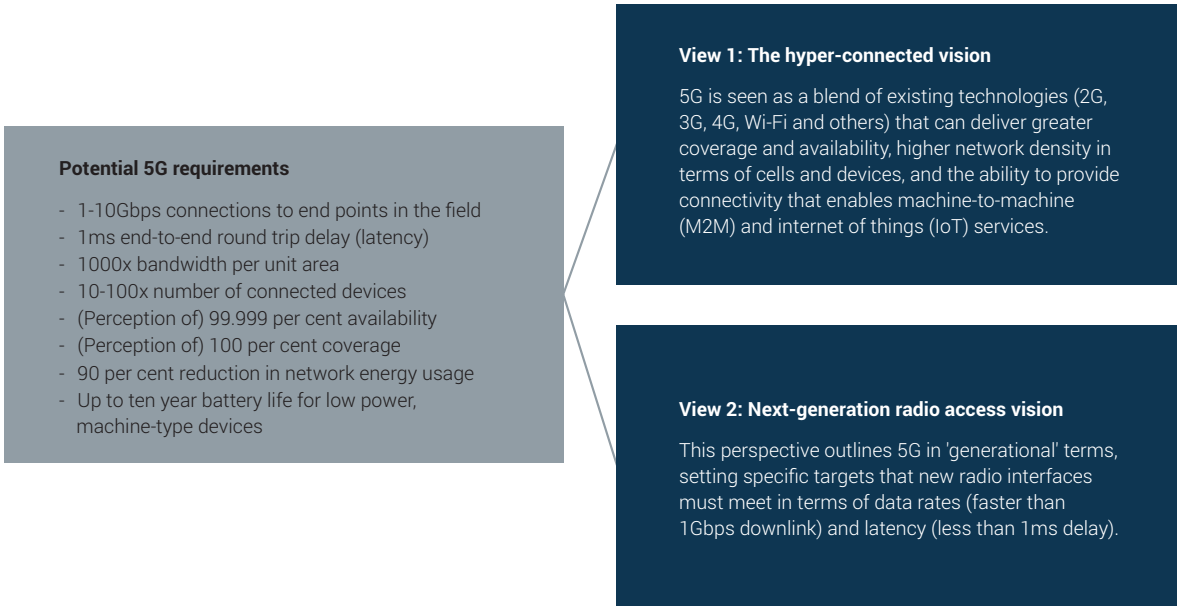
Note: 2G technology: Global System for Mobile communications (GSM), General Packet Radio Service (GPRS); 3G technology: Universal Mobile Telecommunications System (UMTS); High Speed Packet Access (HPSA); 4G technology: Long-Term Evolution (LTE); Long-Term Evolution Advanced (LTE-A).

Source: Analysys Mason, 2015.

Agreement is yet to be reached on what 5G technology should be aiming to deliver, and whether it should be an evolution of 4G standards or a complete break with the past. Different groups of potential users want 5G to deliver ultra-fast connectivity in urban areas with much higher device density than current networks, pervasive coverage to support low power machine-to-machine (M2M) and internet of things (IoT) applications, and high-reliability services to support the needs of critical communications users, for example, emergency services.

In a recent paper, the industry trade association GSMA set out two views of 5G and listed eight requirements (see Figure 8), noting it may be impossible to satisfy all of these requirements simultaneously and that only the first two represent true technical requirements, the rest being either economic objectives or aspirations applicable to all network technologies.[32]

Figure 8: Perspectives on 5G and potential requirements



Source: Analysys Mason, adapted from GSMA, 2014.

Technical proposals for 5G are expected to be considered from late 2017, with final specifications likely to be agreed in 2020. Some countries are hoping to begin 5G deployments immediately after this. The complexity of the task could see deployment delayed.

Given the spectral efficiency of 4G networks is already quite close to theoretical limits, the BCR does not expect that a transition to 5G technology will, in itself, lead to a step-change performance improvement for the nbn fixed wireless network. The 2015 World Radiocommunication Conference considered whether additional spectrum bands below 6 gigahertz (GHz) might be used for 5G services. The subsequent 2019 World Radiocommunication conference will consider whether additional bands above 6 GHz should be used for 5G services.

The BCR considers the coverage range of bands above 6 GHz is likely to be too short to enable significant improvements in nbn's fixed wireless service. However, if nbn could secure additional spectrum below 6 GHz then improvements to the performance of the fixed wireless network would be expected, enabling greater speeds and data capacity.

nbn's long-term financial planning allows for further investment in the fixed wireless network, which could support an increase in the required service standards over time. Less certain is whether the introduction of 5G technology by mobile operators may see an increase in the level of substitution from the fixed wireless and satellite networks to mobile. 5G mobile networks may emerge as a viable alternative for the delivery of high-speed broadband outside the NBN fixed-line footprint.

2.5.2. Evolution of high-throughput satellites

Research and development activities are taking place to increase the total throughput currently available via high-throughput Ka band satellites. The principal areas of activity are:

- **Use of larger antennas to create a larger number of smaller spot beams.** It is expected it should be possible to build Ka band satellites with 200–300 spot beams by 2020. This would improve frequency re-use and increase capacity.
- **Use of high frequencies for feeder links to and from satellite gateways.** At present the feeder links for most Ka band high-throughput satellites also operate in the Ka band. This reduces the amount of spectrum that is available to support end users and also places some limitations on where the gateways can be sited. Future satellites may be able to use spectrum in the Q/V bands (around 40–50 GHz) or free-space optical links to overcome these limitations.

In addition to these technical developments, it may be possible to make more Ka band spectrum available in the future via the LTSS.

Allowing for these two technical developments, the BCR recognises that by the time nbn's first two satellites need to be replaced around 2031, it may be possible for nbn to deploy Ka band high-throughput satellites with greater capacity than is currently available.

2.5.3. Potential for low-earth orbit broadband satellites

Over the last couple of years, a number of new proposals have been announced to deliver global broadband connectivity using large constellations of satellites in low-earth orbit (LEO). The below table provides information about three such proposals.

Table 5: Overview of selected LEO broadband satellite projects

	OneWeb	SpaceX	LeoSat
Champion	Greg Wyler, ex-CEO of O3b Networks (pioneer of MEO satcomms)	Elon Musk, founder of SpaceX	Vern Fotheringham, ex-CEO of Kymeta (solid-state satellite antenna company)
Partners and backers	Virgin Galactic, Qualcomm. Airbus, Bharti Enterprises, coca cola, Intelsat, Totalplay Telecommunications	Google	None announced
Number of satellites	650	4,000	80–140
Proposed operating band	Ku band	Ku or Ka band	Ka band
Satellite manufacturer	Airbus	SpaceX (in new factory)	Not yet announced

Table 5 (cont.)

	OneWeb	SpaceX	LeoSat
Other details	Aiming to procure satellites for US$400,000 each; mass-market fixed terminals for US$250. Press reports indicate system cost of US$2–6 billion. Also planning specialised terminals for aeronautical and first responder markets	Appears to be aiming at mass market. Press reports indicate system cost of US$10 billion–US$15 billion	Aiming at high end users, 'top 3,000 rather than other 3 billion'. Will use high-speed inter-satellite links to provide fixed point-to-point connections at up to 1.2 Gbps. System cost stated to be US$2.5 billion–US$3 billion

Source: Analysys Mason, 2015.

LEO satellites are typically much smaller than geostationary satellites, including those used to deliver NBN services via the ISS and NSS programs. They are also mass-manufactured and launched in much lower orbits and so cost less. The systems described above could potentially deliver much more capacity over Australia than the two LTSS satellites. However, while the user antenna for a geostationary satellite can be a simple fixed dish, the antenna for a LEO satellite needs to be able to track a satellite across the sky and quickly pick up the next satellite when the first dips below the horizon.

Bi-directional antennas capable of doing this currently cost tens of thousands of dollars. Although companies are developing low-cost solid-state alternatives, it is uncertain whether price points in the low hundreds of dollars are achievable. There will also be challenges in coordinating the use of Ku and Ka band spectrum by both geostationary and LEO satellites.

Nevertheless, OneWeb, SpaceX and LeoSat are led by successful space industry entrepreneurs and OneWeb and SpaceX have announced some well-financed backers, including Airbus, Virgin Galactic, Intelsat and Qualcomm in the case of OneWeb, and Google in the case of SpaceX. If these projects eventuate it is possible the LEO systems could build their own gateways and sell directly to nbn's downstream service providers. Alternatively, nbn could be their partner of choice based on its existing infrastructure and downstream distribution network in Australia.[33]

nbn will launch its first two satellites well before any future LEO system becomes available. LEO systems could emerge as a possible, cheaper alternative for providing a satellite service compared to nbn replacing the first two satellites when they reach end-of-life around 2031.

2.6. BCR assessment of technology developments

While it is impossible to predict the exact implications that new technologies will have, these developments suggest the delivery model for non-commercial services will need to evolve over time. Consideration must be given to how funding arrangements could be adjusted over time to accommodate changing circumstances. For example, new technologies may present opportunities to increase services standards and revenues across the fixed wireless and satellite networks or for more efficient delivery of non-commercial services.

Further, long-term modelling will need to consider potential outcomes arising from technology change, and reflect costs associated with network upgrades, availability of higher throughput services, and changes in customer take-up profiles.

3. Quantifying non-commercial service losses

In developing this report, a number of cost measurement issues were considered:

- use of nbn cost and revenue data
- adopting an appropriate cost measurement framework
- network assessment at a granular level, and
- forecast period for assessment.

The BCR's position on each issue is discussed below.

3.1. Use of nbn cost and revenue data

As discussed in the initial consultation paper, the BCR quantified non-commercial service losses using nbn historical cost and revenue data, as well as the latest company corporate plan projections as the best available estimates. The BCR used this data as the basis for longer-term modelling that disaggregates fixed wireless and satellite financial outcomes.

While the submissions were supportive of the BCR using nbn data for this purpose, Telstra, Optus and nbn all noted the inherent uncertainty in long-term projections, and the need to make sure projections in the model are replaced with actual cost and revenue data in a timely manner.[34]

3.2. Adopting an appropriate cost measurement framework

The BCR considers an avoidable (or incremental) cost approach is appropriate for measuring NBN non-commercial service losses, though notes concerns raised by nbn around the effectiveness and practicality of such an approach.

Avoidable costs are measured as directly attributable costs and a share of common costs that would be avoided if the fixed wireless and satellite networks were not rolled out. The BCR acknowledges the possible administrative burden of implementing an auditable avoidable cost approach. The BCR considers the nbn and the ACCC would need to give careful consideration of the practicalities of implementing an avoidable cost approach

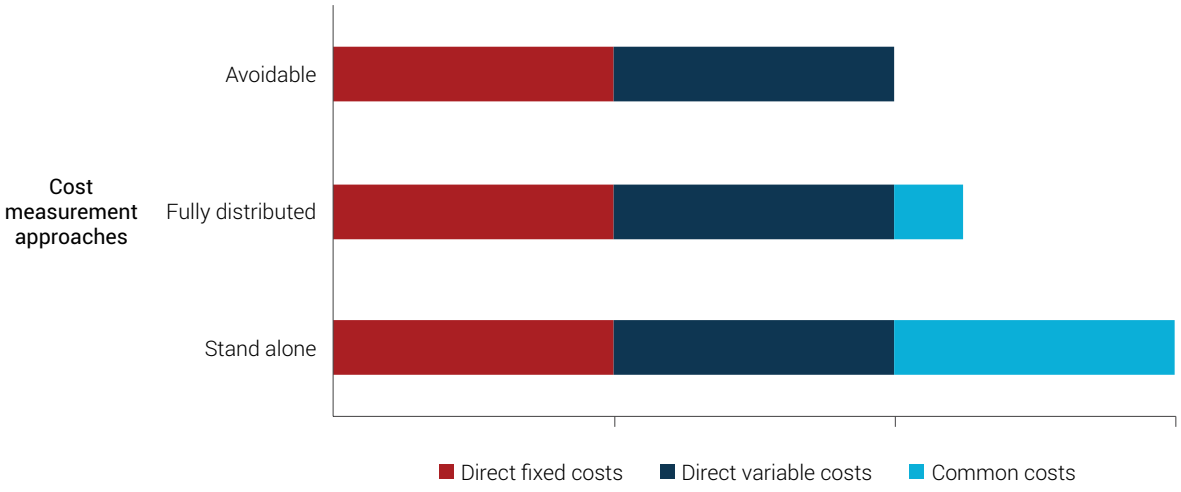
In order to quantify the costs of the construction, maintenance and operation of the fixed wireless and satellite networks, the BCR must determine the most appropriate cost measurement approach. The initial consultation paper outlined three commonly used approaches in regulatory contexts, as shown in the below table.

Table 6: Cost measurement approaches

Cost measurement	Description
Avoidable (or incremental) cost	Totals all costs (including capital costs) which would have otherwise been 'avoided' had the product or service not been provided.[35]
Fully distributed cost	Totals the costs of an enterprise, allocated to all the different activities it undertakes, including those not directly attributable to particular activities.[36]
Stand-alone cost	Totals the costs associated with providing a product or service in isolation.[37]

The BCR recognises cost measurement is contentious when trying to quantify NBN non-commercial service losses. The cost measurement approach affects the quantum of losses to be funded by industry contributions, to the extent that common costs are allocated between nbn's fixed-line and fixed wireless and satellite businesses.[38] Figure 9 illustrates how different cost measurement approaches consider common cost allocations.

Figure 9: Cost methodologies and associated cost types



Notes: Direct variable costs are the costs of some inputs that vary with the level of output. Direct fixed costs are the assets and operating costs which are fixed with respect to the level of output but which are service specific. Common costs are costs associated with two or more services. Description of common cost allocation under an avoidable cost approach is based on different long-run incremental cost approaches. Costing sizes are indicative.

Source: Conceptual approach based on International Telecommunications Union, Telecommunications Regulation Handbook, 2000.

The BCR notes cost measurement is a consideration in the context of costing Community Service Obligations (CSOs). In 1994, the Steering Committee on National Performance Monitoring of Government Trading Enterprises proposed the following, now widely adopted, definition of a CSO:

A Community Service Obligation arises when a government specifically requires a public enterprise to carry out activities relating to outputs or inputs which it would not elect to do on a commercial basis, and which the Government does not require other businesses in the public or private sectors to generally undertake, or which it would only do commercially at higher prices.[39]

The BCR considers the delivery of fixed wireless and satellite services on a non-commercial basis is consistent with this definition.

When considering funding arrangements, government guidelines favour an avoidable cost approach to valuing CSOs, as it provides the best approximation of the additional costs associated with delivering a specific service. An avoidable cost approach to measuring the cost of the CSO supports competitive neutrality and economic efficiency by making sure CSO funding does not contribute to the funding of the GBE's commercial operations.

By comparison, a fully distributed cost (FDC) approach and a stand-alone cost approach result in overestimating the extent of cost increases caused by the supply of non-commercial services, and favour GBEs when competing in commercial sectors, contrary to competitive neutrality and economic efficiency.[40] The preference for an avoidable cost approach when determining CSOs is reiterated in the Government's Competitive Neutrality Guidelines.[41]

The BCR notes concerns from a number of stakeholder submissions that using the FDC approach may lead to overestimating the loss. Again, this method is consistent with the Government's Competitive Neutrality Guidelines, which note a FDC approach can inappropriately inflate common cost allocation.[42]

In considering government literature and industry concerns, the BCR favours an avoidable cost approach as it aligns with the Government's preference for GBE quantification of CSOs. Further, the BCR is mindful that a cost measurement approach that risks over allocation may unnecessarily burden infrastructure-based competitors in the high-speed wholesale broadband market. The December 2014 policy paper makes it clear the Government is seeking to make sure market and regulatory outcomes should not unnecessarily restrict competition and should allow it at both the retail and wholesale/infrastructure levels.[43]

Box 3: Identifying avoidable costs

The BCR has adopted the following approach to identifying the avoidable costs of the satellite and fixed-wireless services.

Step 1. Categorise all nbn costs into either:

> Costs that are directly attributable to providing satellite and fixed-wireless services, for example, satellite costs and fixed wireless tower costs,

> Costs that are directly attributable to the provision of fixed-line services, for example, cost of pit and pipe, or

> Common and indirect costs from assets and activities shared by fixed wireless, satellite and fixed-line services, for example, transit and labour costs.

Step 2. Identify whether the common and indirect costs are:

> Unavoidable because they do not vary irrespective of the deployment of the satellite and fixed-wireless networks, or

> Partly avoidable because they would be less if the satellite and fixed-wireless networks were not deployed.

For those common and indirect costs that are partly avoidable, the BCR has allocated costs between the fixed-line, fixed wireless and satellite networks based on the percentage of SIOs in a given financial year.

This approach results in around 1.2 per cent of all indirect or common costs being allocated to the fixed wireless and satellite networks from FY2011–22.[44] By comparison, the fixed wireless and satellite networks are expected to account for around eight per cent of all premises covered by the NBN. The sensitivity of the BCR's estimate of fixed wireless and satellite losses to the allocation of common costs is explored in Chapter 3.4.

In its final submission, nbn argued the BCR has been selective in its interpretation of government papers on CSOs, noting these do not advocate for an avoidable cost approach in all circumstances. Following this, nbn raised a number of concerns with the use of an avoidable cost approach for measuring NBN non-commercial services, including:

- New studies have emerged that criticise an avoidable cost approach, with some studies proposing levy arrangements that include contributions to the incumbent's fixed and common costs that are displaced by competitive entry.
- nbn's CSO arrangement differs from other examples, given the regulation of its assumed commercial activities, such as its fixed-line coverage obligations, which include providing services to unprofitable areas as well as price and revenue regulation.
- nbn's coverage obligations in its fixed-line network drives the magnitude of common costs.
- nbn considers any fixed-line competitors seeking to cherry pick will have an enduring cost advantage. As such, concerns regarding an avoidable cost approach placing competitors at a disadvantage are overstated.

- nbn's fixed wireless and satellite services face competition and do not enjoy any protections from future market entry or competition.
- nbn also raised concerns regarding the interpretation of Australia Post's application of an avoidable cost framework and state the costs of implementing this approach would outweigh the benefits.

In responding to nbn's concerns, the BCR affirms it has not sought to be selective in the choice of a cost measurement approach, and acknowledges government literature regarding cost measurement and how it relates to CSOs provides many examples where alternatives or variations to the avoidable cost approach have been taken.

Nonetheless, the BCR maintains the underlying principle of the avoidable cost approach is to recognise efficient expenditure:

…a more appropriate methodology for determining the allocation of costs for shared resources is the avoidable cost (AC) method. The correct application of the AC method aims to ensure more efficient asset usage.[45]

A cost measurement approach that best recognises efficient asset usage and expenditure is most suitable for determining industry-based funding contributions.

The BCR notes nbn concerns with its broader obligations, including that it must fund loss-making fixed-line services that impact its competitive position. Consistent with discussions in Chapter 1.3, the BCR considers such issues should be the focus of a separate study.

Finally, with regards to the usage of an avoidable cost framework by Australia Post, the BCR considers this to be an example of a GBE being able to accommodate different cost measurement frameworks to address different requirements. In other words, the administrative complexity has not precluded Australia Post from implementing an avoidable cost approach.

The BCR acknowledges the possible administrative burden of implementing an auditable avoidable cost approach, recognising this may require allocating costs and assembling accounts solely for this purpose. The BCR notes this approach has been successfully implemented in other regulatory contexts, and considers that nbn and the ACCC would need to carefully consider the practicalities of implementing an acceptable avoidable cost approach that was objective, transparent and not burdensome.

The BCR has not carried out a formal cost-benefit analysis of an avoidable cost approach compared to other approaches, noting that, if considered controversial, this could be done when developing new legislation that underpins an nbn non-commercial service funding arrangement, for example through a regulation impact statement. Importantly, such an exercise should consider the impact of implementing alternative costing approaches on all eligible network operators, not just nbn.

3.3. Network assessment at a granular level

The BCR considers that the commerciality of fixed wireless and satellite networks should be considered at an aggregate level, rather than at a granular network cluster level.

The BCR has considered the level of network granularity needed to assess non-commercial service outcomes. In particular, it was concerned about whether within the fixed wireless network there might be some areas that are commercial or become commercial over time. By assessing commerciality at a granular level, for example, at the wireless service area (WSA) level,[46] this would provide a better understanding of the economic cost of providing non-commercial services.

A granular analysis could be helpful if there were significant areas of commerciality in the fixed wireless footprint, such that an aggregate analysis materially underestimated losses in the loss-making segments of the fixed wireless business. This is demonstrated in Table 7 and the subsequent discussion.

Table 7: Hypothetical example of granular network assessment in the fixed wireless footprint

Wireless service area	Indicative operating profit/(loss) ($ million)
WSA #1	(10)
WSA #2	(5)
WSA #3	(5)
WSA #4	2
WSA #5	3

At an aggregate level, the hypothetical example above shows a wireless network comprising these wireless service areas results in a total loss of $15 million. Alternatively, a granular level assessment indicates that if a provider were not required to serve non-commercial areas, the delivery of fixed wireless services would result in a profit of $5 million. Further, excluding the commercial areas indicates the true cost for delivering non-commercial services is $20 million.

A granular analysis could also be useful if the funding scheme was to be contestable and different subsidies were payable for serving different areas, reflecting differences in the costs of service provision. However, both these scenarios are currently considered to be unlikely.

nbn raised concerns that considering costs at a granular level would not provide meaningful data regarding fixed wireless and satellite commerciality:

An analysis based on network clusters is likely to require arbitrary assumptions and allocations that would distort the identification of non-commercial services. The interwoven nature of fixed wireless and satellite services outside of the fixed-line footprint means that both of these networks should be identified as non-commercial for the purpose of establishing the funding arrangements.[47]

The BCR agrees that an assessment that introduces significant modelling uncertainty will not support useful outcomes. This is consistent with Ian Martin's submission:

Modelling inherently involves a trade-off between capturing as much useful information and analysis as possible to guide decision making without adding so much complexity as to make the analysis impractical. As well the commerciality model shouldn't itself be a substitute for management decisions. But it does need to be sufficiently close to inform the commerciality assessment and given the nature of NBN FW&S resource decision-making that is unlikely to be achieved by simply considering network clusters.[48]

For the purpose of assessing NBN non-commercial services, the BCR will not consider commerciality at a granular level and agrees with nbn's assessment that both fixed wireless and satellite should be identified as non-commercial for the purpose of funding arrangements.

3.4. Period for loss assessment

The BCR considers it appropriate to quantify NBN non-commercial service losses to FY2040. This provides a sufficient timeframe to average the losses incurred during the initial build phase while allowing reasonable operating and replacement capital costs to be considered.

The BCR considers that asset life does not provide a definitive timeframe for considering non-commercial service losses given the different useful life of assets in the fixed wireless and satellite networks. The BCR agrees with industry submissions that it is not appropriate to include a terminal value in calculating losses.

The BCR has modelled non-commercial losses to FY2040. This approach provides consistency between non-commercial service forecasts and the business case period considered under the SAU. While some submissions supported this approach,[49] a number of respondents suggested the BCR should instead adopt useful asset life as the more appropriate timeframe for measuring losses.[50] Vodafone, for example, said:

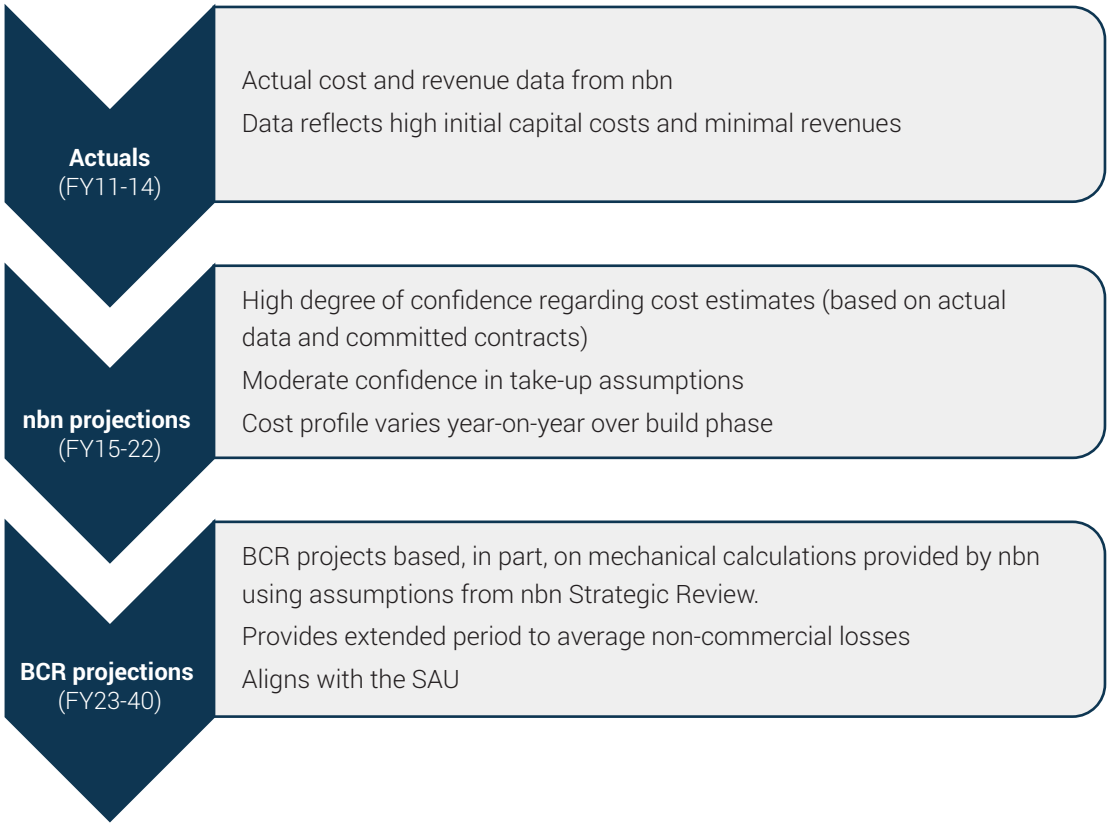
Surprisingly, the BCR does not raise the possibility of aligning the modelling with the expected asset lives. In principle, this approach seems better than aligning with the SAU timing as the relevant non-commercial assets will have expired asset lives (with the useful life of satellites between 15 to 18 years and the fixed wireless network possibly having a similar life). The advantage of this approach is while we have very little idea of what replacement assets will cost in 15 years, there is far more certainty about what costs have already been incurred.[51]

In considering a useful asset life approach, the BCR notes the satellite asset life of 15 years potentially provides a point for financial analysis. Given the satellite service start date of FY2016, this would see forecasts extending to around FY2030, noting that capital expenses relating to new satellite deployment typically occur two to three years before its launch, reflecting progressive commissioning and build payment milestones. Satellite ground stations also typically have a 15-year life cycle. This differs to the asset life for the fixed wireless core network, which has a seven-year life cycle.

Noting the fixed wireless network rollout began in 2011 and is expected to be largely completed by FY2018, modelling will need to account for replacement costs associated with initial infrastructure deployments and assume investment in replacement assets. In practice, the rolling deployment of the fixed wireless network suggests there is no clear cut-off point that aligns with expected asset lives across both the fixed wireless and satellite networks.

Beyond asset lifecycle, the BCR recognises there are varying levels of confidence over a forecast period to FY2040. As illustrated in Figure 10, actual data is available from FY2011–14, and nbn projections that separate fixed wireless and satellite costs and revenues from those for the fixed-line platform are available over the build phase and initial operating phase to FY2022. From FY2023 onwards, fixed wireless and satellite costs and revenues are based on BCR modelling (informed by detailed discussions with nbn). This consideration argues in favour of using a relatively sahort timeframe. Conversely, an advantage of forecasting over longer periods is that this provides a greater period to average non-commercial losses.

Figure 10: Information over different projection periods



Source: BCR (2015).

On balance, FY2040 is considered a sufficient timeframe to smooth the losses incurred during the initial build phase while allowing reasonable replacement of capital costs to be considered. This approach also provides consistency between non-commercial service calculations and the long-term nbn business case, which is used for the purpose of the SAU. Forecasting to FY2040 also provides a sufficient estimate of long-term steady state operations. Further, increased uncertainty from using this longer timeframe can be ameliorated by the proposed regulatory review approach proposed in Chapter 7.3.

Including a post-FY2040 terminal value would project losses into perpetuity. The BCR notes submissions raised concerns a terminal value would be highly speculative and inappropriately bring forward the implied estimate of all future losses for payment now. The BCR concurs with this assessment and as a result has not included a terminal value as part of its financial modelling. Importantly, quantified losses will include actual costs incurred from the start of the fixed wireless and satellite service in FY2011–15. This includes costs associated with the ISS and the subsequent NSS. Interested parties raised no issues with this approach after the second and final consultation round.

4. Model approach and outcomes

In addition to the cost measurement issues discussed earlier, the following concepts were considered in modelling NBN non-commercial service losses:

- financial analysis methodology
- discount rate, and
- long-term forecasts.

4.1. Financial analysis methodology

The BCR has modelled NBN non-commercial service losses using a discounted cash flow methodology rather than the building block model, which is often favoured by regulators.

This approach can be transitioned to a building block model in the future without material shifts in the estimate of the FY2011–40 loss pool, if desirable for regulatory purposes.

In considering NBN non-commercial service financial outcomes, the BCR sought views on the appropriateness of using a discounted cash flow (DCF) analysis compared to a building block model (BBM), which is often favoured by regulators. Typically, a DCF analysis involves estimating the future cash inflows and outflows, and applying an appropriate discount rate to those future cash flows.[52] It is commonly used to value firms and projects, an exercise closely aligned with the loss identification required by the Terms of reference.

A BBM is commonly used for estimating the optimal, annually efficient cost-recovery revenue for regulated industries. The ACCC states that to implement a BBM, an initial regulatory asset base (RAB) value is established and then locked in and rolled forward year-by-year by actual changes in the value of the asset base, as determined by annual capex and depreciation. The BBM accounts explicitly for each cost category or building block faced by the regulated business, including opex, return on capital, which reflects a cost of capital and depreciation, and tax liabilities. Each of the building blocks is added together to determine the business's optimal revenue requirement.[53]

While the majority of submissions supported the use of a DCF approach, Optus and John de Ridder argued a BBM should be used for quantifying non-commercial services.[54] The ACCC noted that while a DCF analysis is appropriate to quantify losses expected between now and 2040, a BBM is:

…well suited to periodic updating of forecast information and updating for actual information. Although the building block approach is more typically used for setting regulated prices, the ACCC considers that it could potentially be adopted in a funding model for NBN non-commercial services.[55]

Optus raised concerns there should be consistency between non-commercial service funding arrangements and the SAU, particularly to ensure that:

…any change to the approach of cross subsidies must be reflected in changes to the SAU modelling—and hence may change the price regulation of nbn.[56]

The BCR considers a DCF analysis is a suitable model for quantifying non-commercial services losses. This approach directly and transparently aligns with financial projections and can readily accommodate future updates as new forecasts are estimated. In response to the concerns raised in the submissions, the BCR considers:

- **A DCF approach can readily and transparently accommodate periodic updating of forecast information and revision of past forecasts in light of actual information.** The model contemplated by the BCR adds actual and forecast data to quantify an overall loss amount. The BCR considers this approach could be carried out periodically to provide revised loss estimates. A DCF approach aligns with nbn Corporate Plan forecasts and can directly and transparently accommodate revised figures to calculate losses. The BCR notes a BBM can also readily accommodate periodic updating of information.
- **A DCF approach supports consistent outcomes to a BBM.** The BBM aims to make sure a firm earns a revenue stream with an equal present value to its expenditure stream. Put another way, the BBM makes sure that over the life of the project, the net present value is equal to zero, allowing only for the minimum required return on capital invested. With consistent cost forecasts and key parameter assumptions, the present value of costs and losses over time calculated using the BBM approach will in general equate to the outcomes from a DCF approach. Given the two costing approaches rely on the same cost inputs, the BCR considers a DCF approach does not preclude the future use of a BBM and the funding arrangement calculation could be transitioned to a BBM if required without material change in the estimated losses.
- **A DCF approach aligns with the operation of the SAU.** The BCR considers any extra cash inflows provided to nbn as a result of the NBN non-commercial services funding arrangement would offset any initial unrecovered costs that would otherwise accumulate into the SAU initial cost recovery account. In effect, the DCF is used for calculation purposes, while the mechanics of the SAU support regulated price outcomes.

Following the final round of consultation, no issues were raised with the DCF modelling approach.

4.2. Discount rate

The discount rate is an adjustment for the lower value of a payment (received or incurred) in the future, relative to a payment now—a payment received now could earn a return by investing it elsewhere. It reflects risk and uncertainty, which increases over the timeline of the project. Applying a discount rate means the later a payment, the less weight is placed on it.

Discounting is a step in arriving at the expected value of a project or firm, which may ultimately be profit making or loss making. Where a project is profit making at the beginning and loss making at the end, discounting will place more weight on the profits because they arise earlier. Similarly, where a project is loss making at the beginning and profit making at the end, discounting will place more weight on the losses because they arise earlier.

In the context of non-commercial services, which are characterised by negative cash flows throughout the life of the project, the discount rate decreases net present value losses. In other words, the greater the discount rate, the smaller the overall loss.

The BCR considers the most appropriate discount rate for quantifying non-commercial losses is the weighted average cost of capital (WACC) calculated by the method approved by the ACCC for nbn's SAU—the risk-free rate (10-year Commonwealth Government Bond spot rate) plus 350 basis points. This would achieve regulatory alignment between price and revenue regulation on nbn and any NBN non-commercial service funding arrangement.

The WACC contemplated in the SAU is consistent with the Government's competitive neutrality guidelines for determining a target rate of return. A risk-based approach allows for the application of a benchmark base cost of capital such as the Commonwealth long-term bond rate and the addition of a risk premium.[57]

For the purposes of the current exercise, BCR has used this approach to calculate the WACC value, and has used a discount rate of 6.46 per cent to give indicative NPV loss estimates.[58]

Following the final round of consultation, no issues were raised with the proposed discount rate.

4.3. Long-term forecasts

The BCR has taken nbn actual data to FY2015 and estimates to FY2022 as the basis to develop longer-term financial projections from FY2023–40. Assumptions regarding long-term trends are included for transparency purposes.

Loss estimates are subject to change based on a range of factors.

The model is based on actual cost and revenue data to FY2015. nbn has provided projections for the fixed wireless and satellite networks to FY2022. This reflects the nbn submission:

…the BCR will need to develop its own projections of revenues and costs arising from the provision of nbn fixed wireless and satellite service for the period beyond 2022.[59]

To this end, the BCR model uses NBN projections to FY2022 as an anchor to calibrate the modelling approach and assumptions for driving revenues and costs from FY2023 onwards. This approach best reflects a steady state or continuation of past trends, rather than any step changes in operational, cost or revenue assumptions. Reflecting this approach, the BCR model assumes the following for FY2023 and beyond:

- **Premises ready for service growth.** Assumes growth in the fixed wireless footprint of 1.3 per cent in line with new premises growth in outer metro and regional Australia. No growth is assumed in the satellite footprint as the satellite program is assumed to be fully subscribed from FY2023 onwards.
- **Take-up.** As a base case, the BCR takes NBN's residential take-up growth rate to FY2022 and applies this to new premises beyond FY2023. In the fixed wireless footprint, take-up grows from 51 per cent in FY2023 to 56 per cent by FY2040. In the satellite footprint, take-up is assumed to peak at around 69 per cent.
- **Inflation.** The BCR assumes inflation of 2.5 per cent. This rate has been selected to maintain the real value of nominal capex and opex over time.
- **Revenue growth.** Driven mostly by premises activated growth, which is a product of take-up and premises ready-for-service growth. Consistent with the SAU, prices for the 12/1 and 25/5 Mbps services are assumed to grow slightly in nominal terms but fall in real terms. The model assumes nbn does not discount prices in the fixed wireless and satellite business below the SAU price caps. The model reflects all nbn revenue from the fixed wireless and satellite networks, as proposed in submissions from the Australian Communications Consumer Action Network (ACCAN) and Telstra.
- **Capex.** Mix of fixed costs that remain stable, for example, a launched satellite, and variable costs that increase in proportion to premises growth and recur at the end of useful asset lives. Assumes two replacement high-capacity satellites are deployed in FY2031.
- **Opex.** Mix of fixed costs that do not grow, for example, satellite telemetry, tracking, and command costs as well as variable costs that increase in line with premises activations.
- **Working capital.** Working capital is allocated to each network by their share of operating income (revenue minus opex).
- **Contingency.** 10 per cent of capex from FY2023 onwards, consistent with nbn's assumption for steady state operations in FY2022.
- **Common/indirect cost allocation.** Avoidable costs grow from FY2023 consistent with the avoidable cost framework discussed in Chapter 3.2. Under this approach, only directly attributable and avoidable indirect and common costs are considered.
- **Capacity constraints.** Committed information rates are applied to the fixed wireless and satellite networks based on nbn estimates. Under this approach, capacity constraints are not reached.
- **Competition.** The competitive environment from FY2023–40 is consistent with FY2022. This assumes no new investment in competing copper-based infrastructure and mobile substitution rates remain within nbn long-term business case estimates.
- **Technology upgrades.** Upgrades from 4G to 5G are included in capacity upgrade projections and do not incur a step-change in investment.
- **Wireless-only and vacant/unoccupied premises.** nbn long-term assumptions are used for wireless-only and vacant homes.[60]

The BCR's estimates of losses are indicative only, as it is likely that over the period to 2040 there will be step changes in products and technology that will vary outcomes. For example, the following scenarios could lead to the BCR's model overestimating the net losses:

- As nbn gains experience, it discovers lower cost ways of operating.
- New sources of revenue increase fixed wireless and satellite revenue, reducing losses.
- Further deployment of demand management tools, such as peak hour pricing or slower speeds in the peak hour, could reduce the need for capacity augmentation.

Conversely, the following factors could be expected to lead to the model underestimating the net losses:

- Customers demand greater monthly downloads than expected, requiring additional upgrades to fixed wireless and satellite capacity and increasing costs and losses.
- If the Government requires nbn to provide a significantly higher level of service, then this may require additional investment.

The BCR considers reforecasting should be carried out to allow for changing conditions. This is discussed in the implementation arrangements in Chapter 7.

4.4. Model outcomes

The NPV loss to FY2040 is estimated at $9.8 billion based on a discount rate of 6.46 per cent.[61] This loss represents a per-month subsidy as follows:

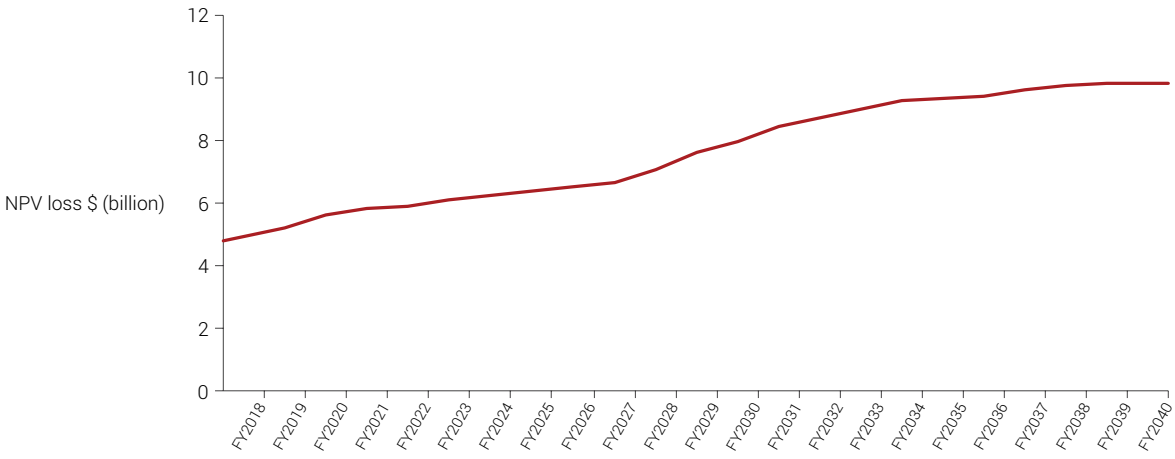
Table 8: Subsidy to each fixed wireless and satellite premises activated, 2015 real value

	Fixed wireless (estimate)	Satellite (estimate)
Subsidy per premises, per month	$105	$110

Note: The estimates presented are preliminary and do not represent budget costings. The final contributions and collections may vary as details are finalised.

Figure 11 below illustrates the profile of losses over time.

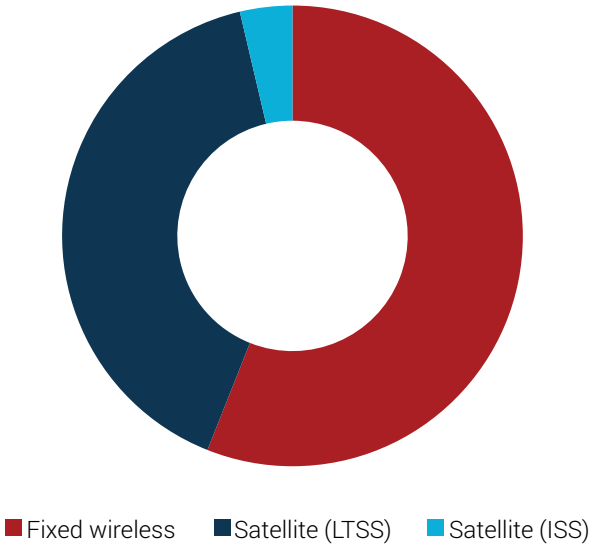
Figure 11: Cumulative NPV loss, by final year of funding period, 2015 present value



Source: BCR 2016.

The fixed wireless and satellite (inclusive of the ISS) are estimated to contribute 55 per cent and 45 per cent losses respectively.

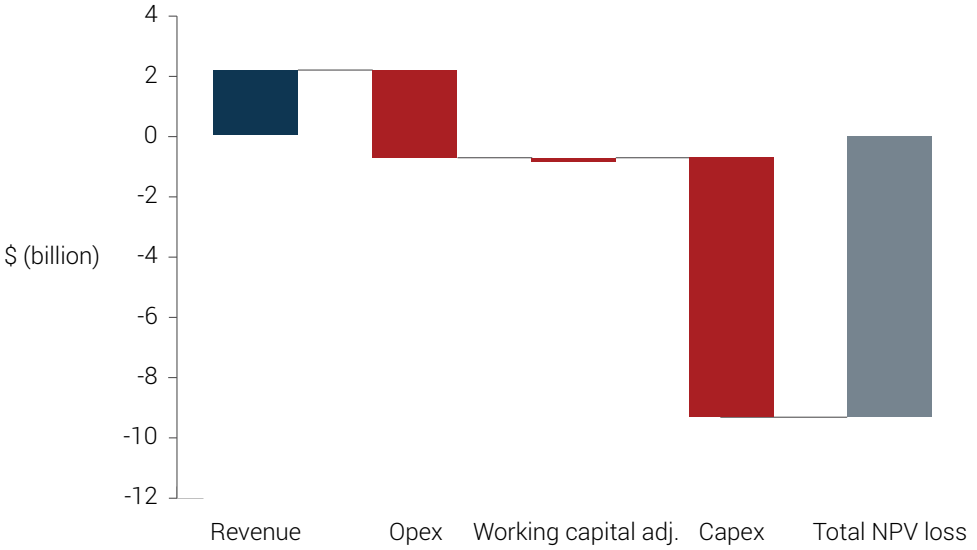
Figure 12: NPV loss, breakdown by network



Source: BCR (2015), based on nbn (2015) IOP data, BCR projections.

For both the fixed wireless and satellite networks, capex is the most significant driver of non-commercial service losses (figure 13).

Figure 13: Total NBN non-commercial NPV loss, breakdown by financial item



Source: BCR (2015).

As a result, the loss is sensitive to changes in capex, followed by opex, common costs and revenue. These sensitivities show the effect of changing only one factor at a time. It does not reflect any changes to other factors that may result. For example, the capex sensitivity does not reflect the higher opex that could be associated with a larger capital asset base.

Figure 14: NPV loss sensitivity by opex

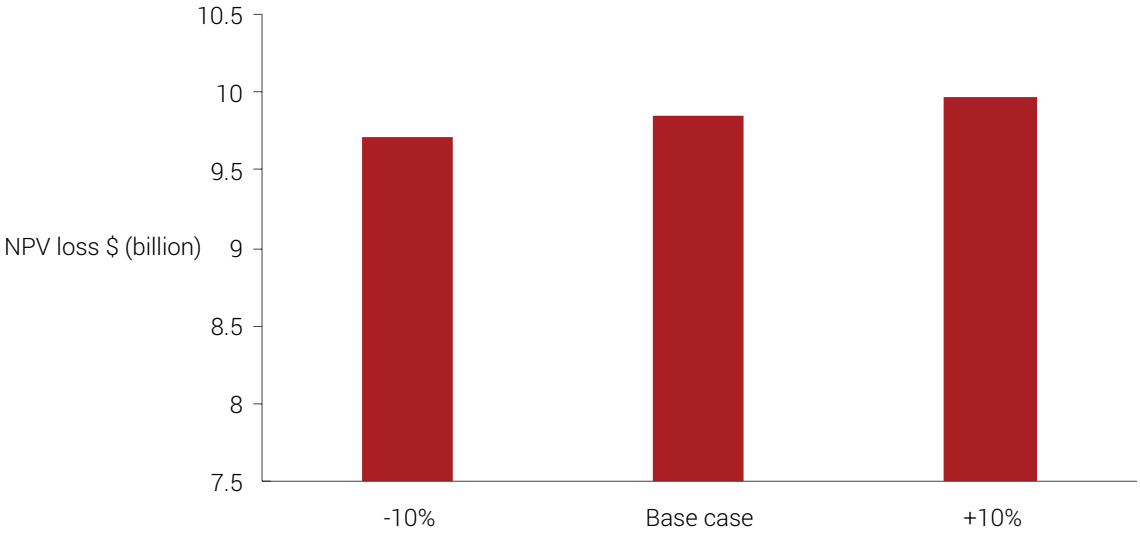


Figure 15: NPV loss sensitivity by capex

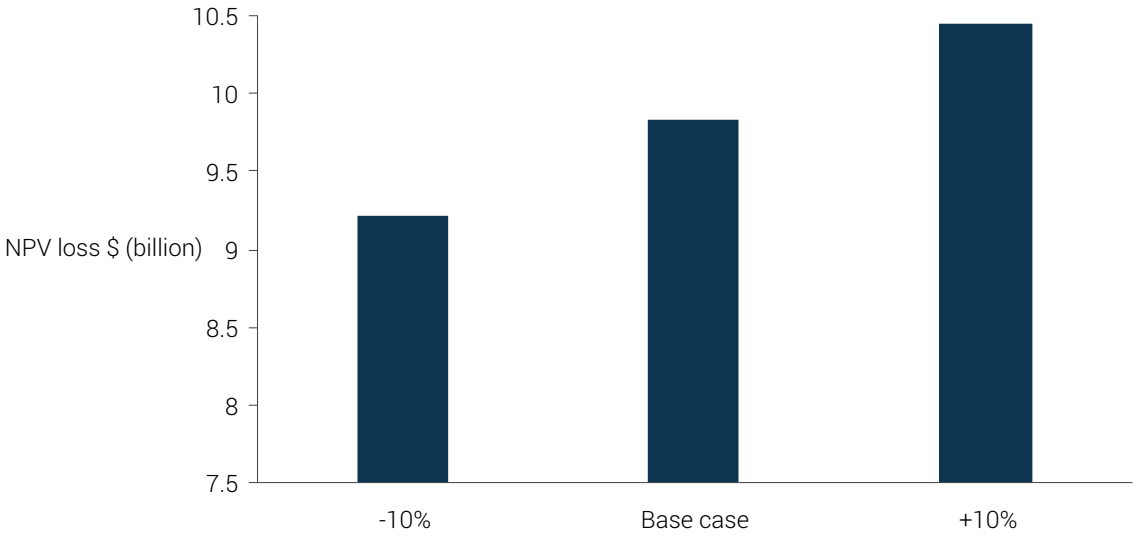


Figure 16: NPV loss sensitivity by common cost

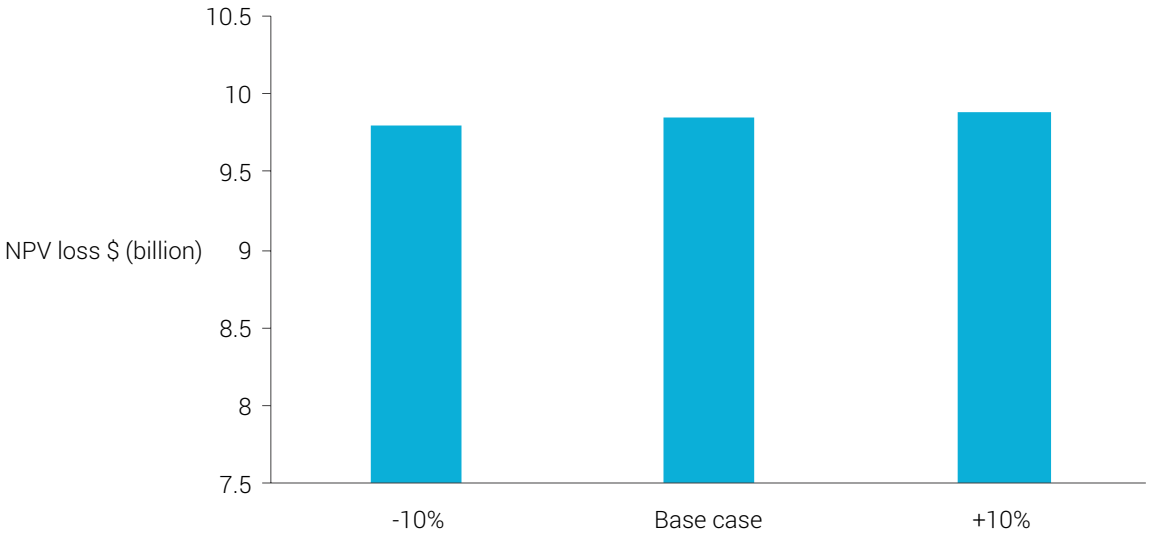
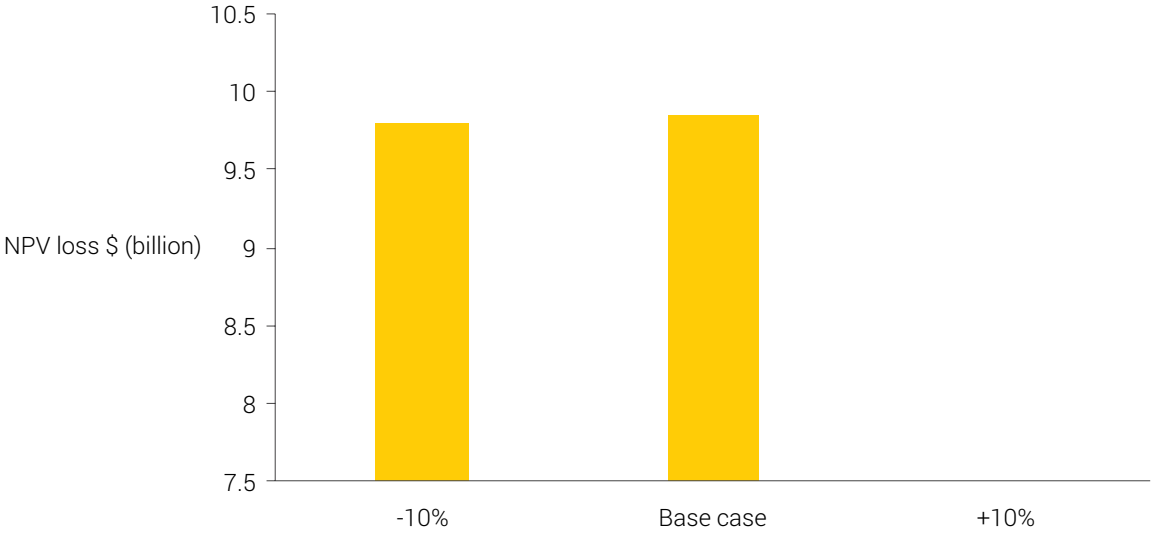


Figure 17: NPV loss sensitivity by AVC average revenue per use (ARPU)

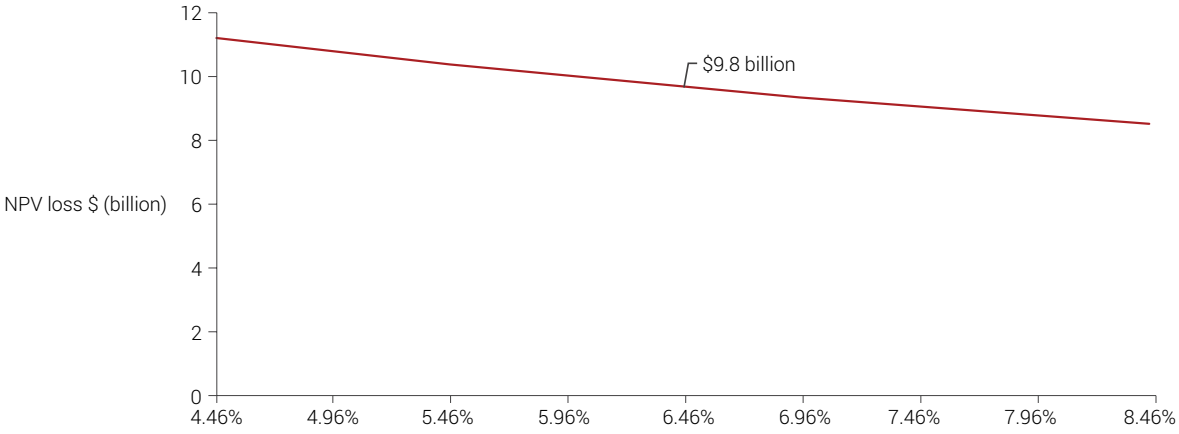


Note: Higher AVC average revenue per user sensitivity not modelled due to price cap constraints.

Source: BCR (2015).

Because the loss is calculated in NPV terms, the loss is also sensitive to the discount rate chosen.

Figure 18: NPV loss, sensitivity by discount rate



Source: BCR (2015).

These sensitivities highlight the need to carry out periodic forecasting of non-commercial service losses, particularly to reflect updated cost estimates.

Formulae used to calculate NBN non-commercial service losses and per-subscriber subsidy amounts are provided at Attachment C.

4.5. Review of model assumptions and outcomes

A number of submissions noted there were limitations on the extent to which model outcomes could be reviewed and recommended greater access to model inputs and assumptions.

Optus noted:

Optus recommends that, consistent with the approach taken to modelling costs for other regulatory decisions, the BCR should make its modelling available for industry consultation prior to finalising any funding mechanism. Optus recognises that much of the data may be commercially sensitive—although forecasts for FY2021 have been released publically—but access could be provided under appropriate confidentiality agreements, as is the case with other regulatory pricing decisions. Such consultation will be important in testing the validity of the assumptions and accuracy of the calculations used in the modelling. It will also help to ensure that forecasts of costs used in the model remain consistent with prudency and efficiency principles.[62]

Telstra noted:

Additional detail on how the BCR has calculated the $9 billion figure would be welcome. In particular, the BCR's analysis is largely silent on which specific costs and revenues are included, and does not comment on the approach to instances of any NBN self-service or future product offerings which may use the infrastructure funded by the levy.[63]

The BCR notes industry views, and suggests that additional, targeted consultation on the financial model itself could be considered as part of implementation arrangements. This process could also be used to capture more accurate information from providers about their services, and to test BCR assumptions about take-up rates and other market behaviours. Industry consultation on the financial modelling should not result in the inappropriate disclosure of nbn's commercially sensitive information.

Importantly, any consultation processes should start as early as possible to make sure there is adequate industry consideration ahead of the scheme's introduction and first reporting period in 2018.

5. A principles-based approach to designing funding arrangements

The BCR has considered funding arrangements against the principles of transparency, contestability, sustainability, economic efficiency and equity. Following consideration of industry submissions, the BCR has included competitive neutrality as a principle.

The principles are identified to provide a framework for developing and assessing non-commercial service funding arrangements and show where trade-offs occur.

The initial consultation paper proposed a number of overarching principles to help guide the development of appropriate funding arrangements. While the submissions largely supported the proposed principles, a number of respondents highlighted that competitive neutrality should be included as a core principle.[64]

Ian Martin noted:

The Government's telecommunications policy paper says that the purpose of this assessment and consideration of funding options is to ensure competitive neutrality. However, neither of the terms 'competitive neutrality' nor 'net competitive advantage' are mentioned in the BCR's consultation paper. They are central to the purpose of the costing exercise and the most appropriate point of reference when considering the range of issues raised in the consultation paper.[65]

The BCR agrees funding arrangements should be assessed against competitive neutrality requirements as described in government policy. This is discussed in Chapter 5.3 below.

Further, a number of respondents suggested simplicity should be an additional principle.[66] The BCR considers simplicity to be a core element of achieving sustainable funding arrangements, and it has therefore not been included as its own principle. Similarly, the BCR considers ACCAN's suggestion of 'bypassability' also relates to the existing principle of sustainability.[67]

A number of submissions recommended that particular principles be prioritised. For example, nbn suggested transparency and sustainability are the key principles that should guide consideration of alternative funding models.[68] The BCR considers the principles provide a framework for designing and assessing non-commercial services and that all principles should be considered equally. However, the BCR recognises it may not be possible to meet the requirements of all principles at all times. A principles-based framework should therefore identify where trade-offs occur.

Table 9 below describes NBN non-commercial services funding principles.

Table 9: Principles for designing funding arrangements

Principle	Description
Transparency	• The design, implementation and costs of a non-commercial obligation should facilitate scrutiny and evaluation. • Transparency allows the Government to monitor performance of funding arrangement outcomes, and cost information supports decisions to improve arrangements as appropriate.
Contestability	• The funding arrangements should minimise barriers to entry or other impediments in both commercial and non-commercial sectors. • The design of non-commercial service funding arrangements should not advantage any market participants.
Competitive neutrality	• The funding arrangements should not provide government-owned entities any advantages (or disadvantages) over private sector participants. This includes rate of return requirements, tax neutrality, debt neutrality and regulatory neutrality.
Sustainability	• The mechanism used to fund the non commercial service should be viable for the anticipated period the non commercial obligation will be in effect. • The mechanism should be secure and reasonable in the face of changing social, political, technological and economic circumstances to fund fixed wireless and satellite losses over the longer term. • The mechanism should provide certainty to industry stakeholders of any obligations. • The design of the non-commercial funding arrangement should not conflict with or undermine other regulatory objectives. • The funding schemes should be simple. The more complex the scheme is to administer, monitor and implement, the less likely it is that its objective will be achieved and the costlier it will be to administer. • Sustainability does not relate to identifying new sources of revenue to reduce the impost of NBN non-commercial services.
Economic efficiency	• Non-commercial funding models should be assessed by whether they support or constrain productive, allocative or dynamic efficiency. Allocative efficiency includes consideration of the distortionary impact of taxes and levies on demand for goods and services.
Equity	• Non-commercial service obligations should consider how any funding arrangement would fall across society. Equitable outcomes for beneficiaries and funders of non-commercial services should also be considered.

5.1. Transparency

A lack of transparency makes it difficult to determine the actual cost and benefits of providing non commercial services, and the performance of the non-commercial service provider. It makes it difficult to determine if the non-commercial service arrangements continue to meet the Government's policy, social or technological objectives. Transparency allows the provider's performance to be monitored and improved as appropriate, based on established and agreed metrics. This allows the administration and performance of non-commercial services arrangements to be regularly and objectively assessed, and areas of improvement identified and addressed.

A transparent funding arrangement makes clear to industry participants, government and the public the full cost of non-commercial services now and in the future, the level of funding required now and in the future, how contributions are spent, who contributes to funding and why, and how the contribution of industry participants is determined. The information used to determine the non-commercial service arrangements—including cost, eligibility and contributions—should be made freely available for public scrutiny. Governments should make better choices when the costs are transparent to all.[69] In the BCR's consultation process, industry stakeholders recognised the importance of this principle and supported the move to a more transparent funding arrangement.

The non-commercial services funding arrangement should make transparent:

- The losses associated with the deployment, maintenance and operation of NBN non commercial services and how these losses have been calculated.
- The eligibility criteria to determine participation, the amount that each participant is required to contribute, and the process for calculating funding contributions.

The BCR notes submissions largely did not see benefit in the development of transparency arrangements that reflect how government equity and third party debt contribute towards non-commercial services. The nbn submission said:

nbn does not consider it appropriate for equity and debt to be allocated amongst network platforms. It is expected that such allocations would not be economically meaningful as nbn operates as a single corporate entity and equity and debt holder's interests will be in nbn as a whole (i.e. not in a separate business unit or network platforms).[70]

The BCR agrees that developing measures that attribute debt and equity to non-commercial services will not improve transparency outcomes.

5.2. Contestability

Competition is an important economic force that improves the welfare and living standards of Australians as it drives economic efficiencies through better productivity, lower costs and prices, new products and innovation. A funding mechanism for a ubiquitous nationwide service should minimise distortions to competition in relevant markets by removing any barriers to contestability.

The Government's obligation to deliver high-speed broadband to all parts of Australia represents a cost burden on nbn that other industry participants are not required to meet, and puts nbn at a commercial disadvantage in fixed-line areas relative to competing infrastructure providers.

An industry-based funding arrangement that levels the playing field in areas that can be commercially serviced would be more likely to promote economic efficiency. Eligible participants assume a proportional share of non-commercial costs and new providers are not deterred to enter the market. In the BCR's consultation process, most stakeholders emphasised the requirement that any funding arrangement support contestability in low-cost areas and not present any onerous barriers to enter and perform in those markets. Funding arrangements should also be designed to support contestability of non-commercial services so consumers in these areas can also benefit from competition.

5.3. Competitive neutrality

A number of submissions identified the significance of the Government's competitive neutrality policy.[71] Competitive neutrality requires that government-owned entities should not be provided any advantages (or disadvantages) over their private sector competitors simply by virtue of public sector ownership. The BCR recognises a competitively neutral funding arrangement is one of the objectives of this exercise.

In 1995, in response to the Hilmer Report, the Coalition of Australian Governments (COAG) entered into a competitive neutrality agreement, aiming to eliminate resource allocation distortions by ensuring no government businesses enjoyed a net competitive advantage in the marketplace.[72] In June 1996, the Commonwealth released a competitive neutrality policy statement.[73] A number of competitive neutrality elements discussed in this statement related to GBEs, including nbn, and are therefore relevant for NBN non-commercial service funding arrangements. These include:

- **Rate of return requirements.** Over time, GBEs are specifically required to achieve—as a minimum benchmark—economic rates of return on assets for their commercial operations equivalent to the long-term bond rate plus an appropriate margin for risk.[74] The rate of return for GBEs is settled by the Finance Minister and responsible portfolio Minister.
- **Debt neutrality**. Debt neutrality will be achieved by subjecting identified organisations to similar borrowing costs to those faced by private sector businesses.
- **Regulatory neutrality.** Regulatory neutrality will be achieved by subjecting, where appropriate, all identified organisations to the same regulatory environment as private sector businesses.

Issues around corporatisation and tax neutrality are not considered directly relevant to NBN non-commercial service funding arrangements.

Further, the policy statement says competitive neutrality does not require governments to remove CSOs from their government business. Where CSOs exist, competitive neutrality and other competition policy reforms may limit the ability for these CSOs to be financed through cross subsidies within the business. Transparent, non-discriminatory funding of CSOs through budget funding or specific charges is thereby encouraged.[75] For the purpose of NBN non-commercial services, consideration is given to the COAG Competition Principles Agreement and the Commonwealth competitive neutrality policy statement.

5.4. Sustainability

A sustainable funding arrangement consists of a number of key attributes:

- **Certainty.** Funds will be available in the face of changing social, political, technological and economic circumstances to sustainably fund fixed wireless and satellite losses over the longer term. Industry contributors would further benefit from a certain and sustainable arrangement by being able to incorporate any contributions and associated administration costs into their forecasts.
- **Minimal complexity.** The more complex the scheme is to administer, monitor and implement, the less likely it is that its objective will be achieved and the more costly it will be to administer. The administration time and costs incurred by industry contributors to comply with the new funding arrangement must be considered along with their other regulatory obligations. nbn supported this view in its initial submission by saying '… funding options should not impose undue administrative burden on parties or duplicate existing arrangements'.[76] John de Ridder also supported the view by saying the funding arrangement should be kept simple.[77]
- **Consistency with overall regulatory framework.** The industry-based funding arrangement might be only one component of regulation that affects participants within an industry. If so, the potential for conflict between the objectives or design of the funding arrangement and other regulations needs to be explored.

A number of the submissions raised the principle of sustainability as grounds for exploring enduring sources of funding for NBN non-commercial service losses. OptiComm, for example, stated:

BCR's proposed recovery model appears to be based on tenuous data that places the ongoing sustainability of non-nbn contributions at risk as the BCR quite clearly does not know how many eligible SIOs exist now and there is considerable uncertainty regarding how many non-NBN SIOs will exist at any future time…. Recovery of the very large sums needed to fund the NBN non-commercial services must be absolutely certain for decades and basing decisions on data that is simply not credible and is easily shown to be materially incorrect is a recipe for failure and under-recovery that will result in the Government enduring the embarrassment and expense of having to find alternate means to fund broadband services in regional areas.

Similarly, Vocus noted:

A large collection base also provides greater certainty that sufficient amounts will be collected for the levy from non-nbn sources.

The BCR considers the objective of this study is not to identify new sources of funding that reduce the impost of non-commercial services on nbn or the Government. In other words, securing additional sources of funding is not an underlying principle of the BCR study.

5.5. Economic efficiency

The design of a non-commercial funding arrangement should minimise the extent to which it diverts resources away from more highly valued uses. It should also encourage cost-based service provision and provide incentives for investment and innovation. The economic welfare of society is typically maximised when the following three components of economic efficiency are achieved:

- **Productive efficiency.** A funding mechanism does not distort a provider's incentives to adopt the best mix of technologies and exploit economies of scale, thus delivering services at the lowest possible cost. It is important the funding mechanism does not lead the service provider to be more concerned about devoting resources to protect their subsidy rather than investing in more economical and innovative delivery solutions.
- **Allocative efficiency.** Economic resources can move freely towards their most highly valued uses. That is, as far as possible the design of the non-commercial service arrangement minimises the additional costs imposed on society due to the diversion of resources away from their more highly valued uses.[78] If resources are diverted into activities that are less highly valued from a national perspective, then the community will be worse off.[79]
- **Dynamic efficiency.** A funding arrangement does not deter a provider from investing in and innovating its service delivery approach. A funding arrangement may create dynamic inefficiencies if it undermines incentives to innovate to contain costs over time, or to provide new services. Flexibility also supports dynamic efficiency. If the delivery mechanism for funding non-commercial services is locked in, it could create market distortions if changing technologies and consumer preference generate potentially cheaper ways of achieving the objective of the non-commercial service arrangement. ACCAN, in its submission to the BCR's consultation process, said that funding arrangements *'… should be sufficiently flexible so that they can be updated over time. An issue with the Universal Services Obligation has been that it is fixed on the one service, even though consumers' needs and requirements have changed over time'.*[80]

5.6. Equity

Equity is the concept of fairness and can be applied to the end users of a service. There are two criteria that are often employed when assessing the fairness of a policy:

- **Horizontal equity.** A fairness concept that compares individuals facing similar circumstances. The idea behind the concept is that different individuals who face similar circumstances should be treated similarly.[81]
- **Vertical equity.** A fairness concept that compares individuals who have different levels of income or wealth. The idea behind the concept is that more wealthy individuals should receive less of the net benefits from a policy than those who are not as wealthy.[82]

Consumers should not be disproportionately affected as a result of the introduction of NBN non-commercial service arrangements. The BCR notes the Government's policy in response to the Vertigan Review seeks to make sure the introduction of non-commercial funding arrangements does not increase total NBN end-user costs compared to current forecasts.[83]

A number of submissions to the BCR's consultation process said equity should be a key consideration in developing a funding arrangement. ACCAN, for example, argued that equity is 'a priority principle … the BCR needs to consider the end users' services to ensure that there are equitable outcomes'.[84]

Further, temporal equity is an additional consideration, whereby funding arrangements should not unfairly treat industry participants or consumers at different points in time. For example, eligible industry participants that make funding contributions at the start of the scheme should not make disproportionately higher or lower contributions compared to participants that enter later.

6. NBN non-commercial service funding options

Over the course of the study, the BCR consulted with industry regarding appropriate funding options. A key concern is the basis for inclusion in proposed funding arrangements, given that such inclusion creates a financial liability for eligible parties.

This chapter discusses industry concerns regarding funding options, eligibility and BCR analysis and findings.

6.1. Industry submissions

Submissions remained consistently divided on whether eligibility should be limited to nbn and NBN equivalent industry participants, or should include a broader range of participants, including mobile network operators.

BCR analysis through the initial round of consultation found that both an NBN equivalent and broader industry funding approach achieve level playing field contestability objectives, with nbn and competing networks equally sharing the burden of funding non-commercial services. However, the BCR considers an NBN equivalent funding arrangement best achieves government requirements on the basis of economic efficiency.

The BCR considers a funding arrangement limited to nbn and NBN equivalent industry participants best addresses the Government's underlying level playing field contestability objectives, while maintaining important existing commercial incentives for nbn to control costs, determine appropriate service standards and innovate in the provision of non-commercial services.

Sections of industry remained concerned that an NBN equivalent funding arrangement would place a material impost on affected network operators, would deter future fixed-line investment and did not adequately comprehend mobile as a substitute for fixed-line services.

The BCR maintains that an NBN equivalent funding approach is economically efficient and appropriate given current market intelligence.

6.1.1. Industry views on initial consultation

A material issue raised through submissions was whether an industry funding arrangement should apply to the operators of high-speed broadband fixed-line access networks (that is, an NBN equivalent funding approach), or whether it should be spread more broadly to include the whole telecommunications industry (that is, a broader industry funding approach).

The BCR's initial consultation paper took the view that funding arrangements should only apply to operators of high-speed broadband fixed-line access networks serving residential and small business customers.[85] This view was shared by Optus and Telstra, which argued that funding arrangements should be confined to fixed-line networks. Optus, in its supplementary submission, said:

Optus reiterates that the policy intent of the explicit subsidy arrangement is to ensure that every superfast access fixed-line in metro areas contributes to the rural cross-subsidy; to ensure parity across nbn and non-nbn fixed networks. Even if it was within the scope of this Inquiry to consider including mobile networks, there is no legitimate policy reason to do so.[86]

However iiNet, nbn, Vodafone and ACCAN disagreed with this position, calling for funding arrangements to apply to a broader industry base. nbn listed the benefits of a broader industry-based funding approach as:

First, a revenue-based levy will, in contrast to alternative mechanisms (such as a network-based levy), ensure that the funding arrangements do not fall disproportionally on network owners and therefore do not unduly affect entry decisions. Second, as the effect of sourcing funds from particular operators or end-users is to raise the price of the services that are consumed, broadening the basis will minimise the effect of those higher prices on consumption choices. Third, funding options that are restricted to services above 25 Mbps are likely to create competitive distortions by creating a wedge between prices above and below this threshold.[87]

iiNet submitted that a broader funding base was within the scope of this review:

The fact that the Terms of Reference refer only to 'industry contributions' clearly allows (and iiNet would say requires) the BCR to consider the merits of models that source contributions from the industry more broadly.[88]

Accordingly, the BCR's analysis focuses on two options: funding arrangement only applying to the operators of high-speed broadband fixed-line access networks, and funding arrangements applying more broadly across the telecommunications industry. While a broader base could be defined in a number of ways, for the purpose of its analysis, the BCR focused on the funding base captured by the Telecommunications Industry Levy (see Chapter 8.1 for background).

6.1.2. BCR assessment following initial consultation

Analysis of the funding options against the principles discussed in the previous chapter are provided at Attachment D. Key findings include:

- Both NBN equivalent and broader industry funding approaches make sure equivalent contributions by nbn or private fixed-line competitors towards non-commercial services allowing all industry participants to compete equally. In this regard, both funding approaches support the overarching competitive neutrality requirements that government entities such as nbn should not be advantaged (or disadvantaged) over private sector competitors by virtue of public sector ownership (and in this case, as a result of nbn's obligation to make sure all Australians have access to very fast broadband at affordable prices).
- While both an NBN equivalent and broader industry funding approach achieve level playing field contestability objectives, a funding arrangement limited to nbn and NBN equivalent industry participants maintains important existing commercial incentives for nbn to control costs, determine appropriate service standards and innovate.
- The BCR considers the choice between the funding options turns on their impact on economic efficiency. The two options have a similar impact on competitive neutrality. On the remaining criteria of transparency, sustainability and equity, the two options are broadly comparable.

The BCR's assessment shows limiting eligibility to NBN equivalent services is the most economically efficient way of achieving competitively neutral funding of fixed wireless and satellite losses, while freeing up infrastructure competition.

6.1.3. Industry views on final consultation

Telstra and Optus broadly supported the BCR's draft funding proposal. TPG, OptiComm and Vocus strongly opposed it, with nbn calling for significant modification of levy eligibility. The key issue dividing parties was whether the funding arrangement should only apply to the operators of high-speed broadband fixed-line access networks (that is, an NBN equivalent funding approach), or whether it should be spread more broadly to include mobiles and/or the whole telecommunications industry (that is, a broader industry funding approach).

An NBN equivalent levy was supported by Telstra and Optus on the basis it would provide strong incentives for the nbn board to minimise fixed wireless and satellite losses,[89] and because the alternative of a broad based levy would constitute 'an nbn-tax on mobile and corporate end-users'.[90] The ACCC agreed that an NBN equivalent funding approach would maintain existing cost incentives:

The ACCC agrees with the BCR's assessment regarding economic efficiency and incentives. The ACCC considers that if the BCR was to move from the nbn equivalent funding arrangement to a broader industry-based arrangement, the incentives for economic efficiency would be diminished.[91]

However, an NBN equivalent levy was opposed by TPG, OptiComm and Vocus because it would induce inefficient substitution to mobile networks and undermine network competition and investment, while noting there are alternative ways of controlling nbn's costs beyond an NBN equivalent funding arrangement. TPG argued:

…the cost of social objectives should be met from social resources, that is, general government revenue which is collected to meet the objectives of Australian society.[92]

Vocus also noted the BCR's draft proposal contrasted with the recommendations of the Regional Telecommunications Review 2015, which recommended a broad recovery base to subsidise regional telecommunications services.[93]

nbn called for liability for the levy to be substantially broadened to include:

- Mobile networks that directly compete with nbn for high-speed data services to premises (such as 5G networks) at a set point in the future.
- Networks serving medium and large businesses and government enterprises.

6.2. Supplementary analysis and response to industry concerns

In addition to the analysis provided at Attachment D, and noting industry concerns, the BCR considers the following are key considerations in assessing options for structuring the funding arrangements:

- The terms of reference provided to the BCR call for direct funding arrangements based on industry contributions.
- The importance of strong incentives for nbn to minimise fixed wireless and satellite losses, and implications for funding options.
- Technology neutrality—the issue of fixed to mobile substitution.
- The impact of funding options on network competition, investment certainty and competitive neutrality.

Each of these are examined in turn and in the context of evidence presented in final submissions.

6.2.1. Terms of reference call for industry funding options

A number of industry submissions call for consideration of funding arrangements that go beyond traditional industry funding schemes. For example, iiNet argued 'the BCR should consider going beyond the USO approach',[94] Vodafone proposed that losses should be funded from spectrum licence fees,[95] and ACCAN noted funding services through general taxation would be more equitable.[96]

OptiComm considered losses should be funded from the budget or government should accept a lower rate of return on its investment to reflect non-commercial service subsidy payments.[97] TPG argued the cost of social objectives should be met from social resources with expenditure oversight achieved by the budgetary process, fed by political and media oversight.[98]

The BCR maintains funding non-commercial services' losses from spectrum licence fees or general taxation, is outside the Terms of Reference. While industry pays spectrum licence fees, hypothecation of these fees would have a market and budgetary impact, and in the BCR's view not meet the Terms of Reference of 'direct funding arrangements based on industry contributions'.

Beyond calls for funding to be sourced from general revenues or spectrum, TPG also argues the BCR should reconsider its definition of 'industry' to include content providers, on the basis they benefit directly from the rollout of the NBN:

Indeed, TPG considers that the BCR could and should have considered the 'industry' to have a wider definition than pure carriers and carriage service providers. A big proportion of the TPG group's cost of supplying NBN services is incurred carrying the traffic of significant over the top providers like Netflix and Stan. It has been said that the main outcome of the NBN will be the distribution of video content to residential customers. Netflix and Stan (and other organisations supplying OTT services) are contributing nothing to the cost of the national broadband network but will be significant beneficiaries of the increased market that will become available to them. TPG considers that a broadening of the payers for non commercial services should include those types of providers.[99]

The BCR notes video is the most common high capacity use of broadband, with video streaming services largely driving download capacity demand.[100] The month after Netflix launched in Australia, for example, iiNet reported that service accounted for over 25 per cent of its total traffic, and was causing significant network performance issues due to traffic congestion as a result.[101] While recognising the pressures these services are putting on networks, demand for streaming is also driving take-up of high-speed fixed-line services. These over-the-top services often provide the rationale for users to upgrade to faster, higher margin broadband plans.

If the Government were to contemplate a broader definition of industry, the BCR would have strong reservations about expanding collection beyond the commonly accepted definition of the telecommunications industry, as per the TIL. Content providers are not part of the telecommunications supply chain, but are nevertheless dependent on users being able to access broadband services. Levying all high-bandwidth over-the-top services would capture a growing range of online applications beyond video streaming including cloud storage, gaming and video chat. The BCR expects this would affect and potentially distort digital investment and innovation decisions.

6.2.2. The importance of incentives, and implications for funding options and alternatives

In designing a levy, the overriding consideration was maintaining incentives for the Government and nbn to minimise fixed wireless and satellite losses. The BCR also considered it desirable to have a low and stable levy rate, which led to estimating fixed wireless and satellite losses and the levy rate over a long period, to 2040. However, given the substantial uncertainty about the level of losses over this period, the BCR considered the levy rate should be re-estimated every five years, creating a risk that the re-estimation process could reduce cost control incentives.

The BCR favoured an NBN equivalent levy as it could be periodically updated, while retaining incentives for nbn to minimise losses. This meant the combination of the imperative of maintaining cost control pressures, the uncertainty about fixed wireless and satellite losses over the long term, and the desire to maintain competitive neutrality over time through a cost reflective levy, led the BCR to favour an NBN equivalent levy.

Stakeholders who supported broader industry funding argued there were other mechanisms to achieve cost control than an NBN equivalent levy. nbn noted its Statement of Expectations requires it to minimise peak funding, optimise economic returns and enhance the company's viability, and the prudency and price-cap provisions in its special access undertaking ensure efficiency of expenditures.[102] TPG suggested:

…the motivation to manage the expenditure on non commercial services [is] best achieved by the budgetary process, fed by political and media oversight.[103]

OptiComm's Frontier Economics paper argued cost control could be achieved through other means, such as a fixed forecast five-year subsidy to meet the efficient costs of delivering non-commercial services, with nbn bearing the cost of over spending and the benefit from under spending.[104] Against this, the ACCC supported the BCR's assessment that a narrow-based levy would be more effective at maintaining incentives for cost control in the context of nbn's regulatory settings, than a broad-based levy.[105]

The BCR notes it is a complex and difficult task to estimate the requirements for providing high-speed broadband in regional and remote Australia. Beyond capacity issues associated with the Interim Satellite Service, the Fixed Wireless and Satellite Review identified a number of network deployment issues, necessitating changes in the number of base stations needed and in the long-term satellite design.[106] The review also found that service take-up is expected to be two to three times greater than originally projected in the 2012–15 nbn Corporate Plan.[107]

The 2015 Regional Telecommunications Independent Review Committee (RTIRC) report recommended that to give the best possible outcome for regional users, nbn should, where practicable, extend the boundaries of its fixed wireless footprint as a substitute for satellite.[108] The BCR's modelling suggests this would increase non-commercial service funding requirements given the expense associated with deploying base stations and other infrastructure in remote locations.

The RTIRC recommendation highlights an ongoing demand for improved regional telecommunications services. There are concerns satellite capacity constraints could be reached earlier than anticipated, driven by increased take up of online services, and a growing population in remote Australia.[109] In a scenario where end users increasingly demand greater data allowances and improved speeds, there will be pressure on nbn to extend the reach and capability of the fixed wireless and satellite networks. Put another way, nbn will continue to face upwards cost-pressure on its fixed wireless and satellite programme while having limited ability to cost recover through subscriber revenues under existing price cap arrangements.

nbn has faced similar pressures in the past to increase network investment in order to improve service quality and meet higher consumer demand. As discussed in Chapter 2, in April 2014 the Government increased the service standard for regional customers from 12/1 Mbps to 25/5 Mbps. The BCR notes the additional costs that flowed from these decisions was not precluded by the provisions of the SAU, highlighting the limits of these mechanisms for checking cost increases arising from higher service expectations, or consumer take-up of services.

The BCR notes the alternative cost control mechanism proposed by Frontier Economics and which is favoured in utility regulation. However, there are a number of critical differences between nbn's fixed wireless and satellite networks and other utilities. The dimensioning of these networks has been the subject of major revisions. Pressures for improved service and additional investment remain, community expectations are increasing, and the networks are government owned. In the BCR's view, the partial cost control incentives provided by the Frontier Economics proposal would be inadequate to guard against the increase in costs for nbn, due to service expectations from consumers.

In conclusion, the BCR remains of the view the funding arrangement must make sure the nbn board and the Government remain accountable for both investment in the fixed wireless and satellite network, and paying for that investment. Any funding arrangement where a large share of the cost of investments can be transferred to another party, such as the broader telecommunications industry, breaks this nexus and risks increased losses.

6.2.3. Funding options and technology neutrality—the issue of fixed to mobile substitution

The second consideration underpinning the BCR's draft funding option was that price-driven substitution from high-speed fixed-lines to mobile was not so great as to make an NBN equivalent levy highly distortionary. On this issue, the BCR took an 'on-balance' position. It recognised a technology specific levy would drive some substitution from fixed-line to mobile, but considered any allocative distortion to be secondary to maintaining strong cost disciplines. This reflected the low rate of cost recovery of fixed wireless and satellite services was itself a very large allocative distortion, especially given substitutability with ADSL services, which will remain connected in regional areas. If costs were to escalate leading to a lower cost recovery rate, then this allocative distortion would be exacerbated.

The information that influenced the BCR on this issue included:

- nbn assumptions on the projected level of mobile substitution.
- Data on total internet traffic in Australia, which shows that while there is a very high penetration of mobile devices in Australia, 92 per cent of data is downloaded over fixed-line networks.[110] Research on mobile substitution, which shows that 21 per cent (3.9 million) of adult Australians are currently electing for mobile-only services for internet usage,[111] with lower income households more likely to substitute.

The BCR considered that the high proportion of data downloaded over fixed-lines compared to mobile reflected market and technological characteristics that limited the substitutability between the services. These included that the price of mobile broadband plans were generally (and certainly historically) higher than the price of fixed-line broadband plans, the data usage allowances available under fixed-line broadband were substantially higher in a world of ever-increasing demand for download volumes by consumers, and that the 'experienced' speed (as opposed to the theoretically capable speed) of high-speed fixed-line broadband, was generally higher and less variable than that of mobile, leading to a higher quality service for consumers.

nbn disagreed with the BCR's conclusions, arguing both mobile and fixed-line offers the same basic functionality, and are therefore direct substitutes:

Accordingly, even though they have different functionalities and product attributes which in turn is reflected in the usage data, this does not negate the fact that they are substitutes in the sense that they provide consumers with alternative means to access telephone and internet services.[112]

OptiComm also challenged the BCR's conclusions by presenting evidence of market developments, noting the high download speeds available over mobile networks in capital cities, and new mobile broadband plans providing large data allowances at prices comparable with NBN access.[113] Its supporting Frontier Economics report concluded:

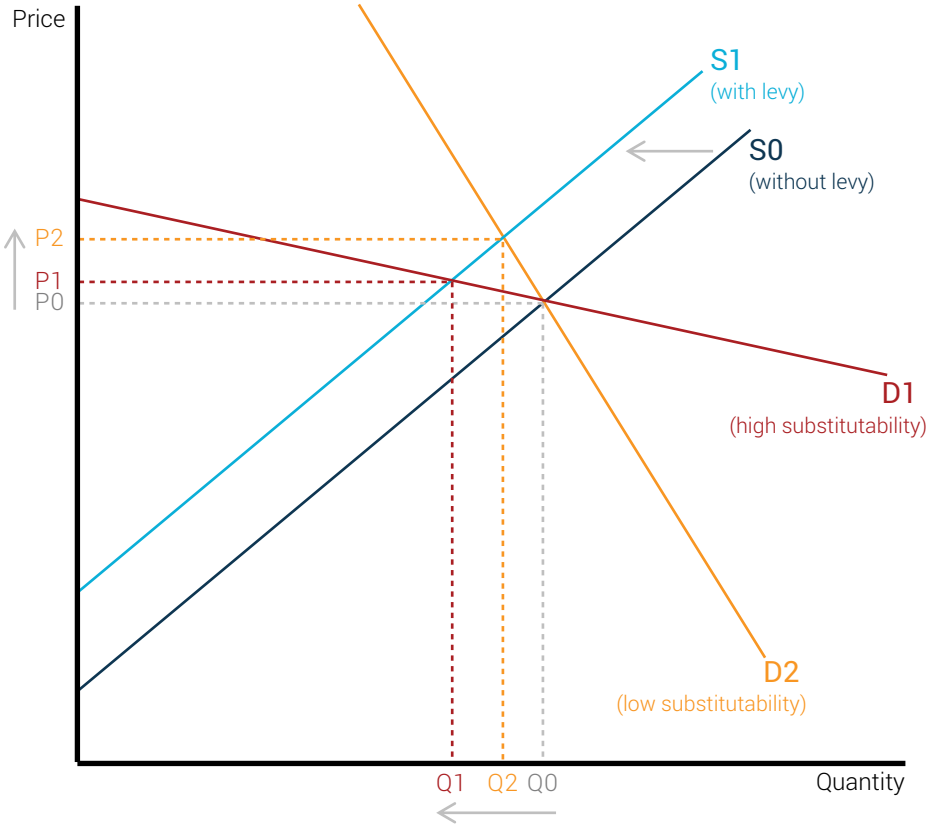
…given the thin evidence, and with a five year forward-looking timeframe, it seems an extremely brave decision to conclude that substitution to mobile networks is not likely as a result of the levy.[114]

The BCR notes substitutability between fixed-line and mobile networks is particularly pertinent given the size of the levy, and the amount by which mobile prices have been falling, leading to large changes in relative prices.

If there is significant substitutability between fixed-line broadband and mobile broadband, then the imposition of an NBN equivalent levy would lead to a reduction in service take up in competitors' networks, and would restrict their ability to pass on the levy, both of which would adversely affect network profitability. The reduction in service take up would also mean the levy would raise less revenue to fund fixed wireless and satellite losses.

A theoretical illustration of the distorting effect of a levy if there were significant substitutability between fixed-line and mobile broadband is depicted in Figure 19 below.

Figure 19: Fixed-to-mobile substitution, illustrative example



Source: BCR 2016.

High substitutability is depicted by the demand curve D1, where the imposition of a levy, leading to nbn competitors' supply shifting from SO to S1, would lead to quantity demanded falling from Q0 to Q1. Alternatively, if there were less substitutability between mobiles and fixed-lines, then demand could look more like D2, in which case introducing the levy would lead to only a small reduction in demand for fixed-line services from Q0 to Q2.

The BCR's support for an NBN equivalent levy reflects its view the price elasticity of demand is more like D2 than D1, suggesting an NBN equivalent levy would not be highly distortionary, and that networks would be able to pass on most of the cost increase to retailers and final consumers (subject to adjustment in regulatory settings). This means the incidence of the levy would fall on consumers, rather than significantly affecting industry profitability and investment.

As discussed later, the BCR considers that the extent of mobile substitution as a possible determinant for eligibility could be considered through periodic policy review points. The introduction of 5G on a commercial basis in Australia should require such a policy review, given the likelihood this technology will feature many similar characteristics to fixed-line services.

A further consideration raised in submissions was whether including mobile networks would affect the requirement for the delivery of non-commercial services. Optus noted this issue, stating there is no requirement for cross-subsidy if mobile broadband is a substitute:

If the BCR was to accept the proposition put by nbn, that mobile broadband was a substitute for nbn's products across the market, there would be little, if any, requirement for a cross-subsidy for non-economic areas.[115]

In the event that mobile broadband services are found to be a more than partial substitute for NBN fixed-line services, this would suggest those Australian premises that can access a mobile broadband service are adequately served by an NBN equivalent service. Given mobile operator plans to cover 99 per cent of the Australian population with 4G or enhanced 4G services by 2017,[116] and noting that mobile operators typically offer uniform national prices, it could be considered that the vast majority of Australians will be able to access high-speed NBN equivalent services within the next two years with regional pricing equivalent to the cities. If this is the case, the Government could reconsider the requirement for further investment in NBN non-commercial services beyond the initial build and deployment of the fixed wireless and satellite networks. In this scenario, industry contributions and nbn funding towards non-commercial services would be expected to fall significantly as the need for ongoing capital reinvestment would be limited.

Ultimately, the BCR considers inefficient substitution to mobile networks is a risk and disadvantage of an NBN equivalent funding approach, and challenges the underlying requirement for delivery of fixed wireless and satellite services at a significant commercial loss. Recognising this is a rapidly changing area, the BCR proposed that eligibility could be reconsidered at the five-to-ten year policy review points, or sooner as circumstances require.

6.2.4. Impact of funding options on network competition, investment certainty and competitive neutrality

The third consideration underpinning the BCR's draft funding option was that the imposition of a levy would enhance competitive neutrality, and in this way further infrastructure competition and efficient outcomes, such that the lowest cost networks ultimately supplied the market.

However, TPG, Vocus and OptiComm argued an NBN equivalent levy would have serious, adverse effects on network competition and private investment. For example, TPG said:

It is an important tenet of government in Australia that the economic signals are supportive of economic investment. The implementation of a tax on a network the investment case for which was built many years prior to the implementation of the NBN will act as a deterrent to investors of capital in Australia.[117]

Frontier Economics also raised questions around competitive neutrality, noting that nbn's latest corporate plan provided for an internal rate of return of 2.7–3.5 per cent, based on a financial outlook to FY2040:

On our rough calculations, an IRR consistent with nbn's WACC would take at least another 10 years to earn (i.e. until FY2050) and must be considered aspirational at this time. In these circumstances, we consider that the BCR should be particularly cautious in seeking a narrow levy that is targeted at commercial firms that are already facing a reasonable probability of competing with a non-commercial entity.[118]

Maximum network prices have been set according to nbn's SAU. For example, the price cap included in the 2015 Carrier Licence Condition and in the final access determination for the local bit stream access declaration for a 25/5 Mbps wholesale service, were both benchmarked against nbn's price for these services. This raises a potential risk that if and when competing networks become subject to the levy, these price caps may prevent networks from passing on the levy, and lead to private networks earning a low, non-commercial rate of return deterring private investment in the industry. The BCR considers these price caps should be reassessed if a levy is introduced.

6.3. Defining NBN equivalent and exempted networks

The BCR recommends an NBN equivalent approach, with eligibility applying to nbn and industry participants that resemble nbn.

Under this approach, eligibility is based on network operators of high-speed fixed-line broadband access networks capable of delivering download speeds of at least 25 Mbps to residential and small business customers. The Government could consider extending eligibility to all high-speed networks serving addressable premises, to also encompass fixed-wireless networks in the fixed-line footprint.

The BCR considers networks serving government and medium and large businesses should not be required to contribute to the funding of fixed wireless and satellite losses.

The BCR considers Telstra and Optus should be exempted from the funding arrangement for their copper access, HFC and fibre networks that are being transferred to nbn under the definitive agreements. However, networks established before 2011, and those declared adequately served should be included in the funding base.

Under an NBN equivalent approach, the BCR considers eligibility should be tightly focused on nbn and industry participants that resemble nbn, namely operators of high-speed fixed-line broadband access networks capable of delivering download speeds of at least 25 Mbps to residential and small business customers. This definition is consistent with that of a superfast carriage service under Parts 7 and 8 of the Telecommunications Act 1997 (the Act). These funding arrangements would apply to all networks with lines serving small business and residential customers, with contributions reflecting the number of eligible services in operation.

6.3.1. Networks serving medium-sized business, large business and government customers

The Government's Statement of Expectations requires nbn to serve all Australian premises,[119] and does not delineate between residential and business segments, suggesting nbn is required to serve all markets. In meeting this obligation, nbn's Corporate Plan 2016 discusses the company's plan to introduce products and services aimed at all business segments, with medium business and enterprise products scheduled for release over the Corporate Plan period to FY2017.[120]

Under these circumstances, it seems reasonable that nbn should contest these markets on a level playing field basis, suggesting grounds for introducing funding arrangements that ensure equal contributions towards NBN non-commercial services. Beyond this, extending the funding base to government and business customers would allow the funding rate to be lower, reducing the economic losses from inflating prices above costs. This would support allocative efficiency outcomes. This argument was raised by nbn:

To the extent that a fixed network seeks to compete with NBN in the provision of services to government, medium and large business customers, the principles of a level regulatory playing field, competitive neutrality and contestability dictates that NBN and such a provider should be treated equally. Such a network provider should contribute proportionally to the cost of NBN's fixed wireless and satellite networks and face the same regulatory obligations. Failure to create these conditions will only serve to promote inefficient market entry, resulting in inefficient and wasteful investment in network infrastructure leading to a reduction in allocative efficiency.[121]

Against this, however, the BCR also had consideration of the policy rationale underpinning Parts 7 and 8 of the Act. These level playing field provisions apply only to fixed-line networks supplying NBN-like

services to residential and small business premises, and mandate open access and structural separation to support retail competition. These provisions do not apply to networks serving government and medium and large business markets, reflecting that there is infrastructure competition in these markets. The Vertigan Review also arrived at this position:

On the basis that high-speed networks servicing business customers are not subject to special regulation under Parts 7 or 8, the panel has not concerned itself with these networks. Telecommunications service providers have generally been responsive to the needs of larger business customers and can have every incentive to remain so. Consistent with this observation, no special intervention in support of those customers should be considered.[122]

Vertigan further noted that the Explanatory Memorandum for Parts 7 and 8 indicated the objective of these provisions was to support nbn's ability to cross-subsidise services in regional, rural and remote areas.[123] This suggests that the Government intended for nbn to cross-subsidise non-commercial services exclusively from product lines that were not subject to infrastructure competition (for example, services to residential and small business customers), but not from product lines which were subject to infrastructure competition (for example, services to medium, enterprise and government customers).

Further, while access lines to the medium and large business and government customers are potentially high-value, they are expected to be relatively small in number compared to residential and small business customers.[124] Subsequently, on balance, the BCR favours an approach which excludes networks serving government and medium and large business customers from the funding base. This would ensure regulatory alignment with existing provisions under the Act.

6.3.2. Networks transitioning under the definitive agreements

The BCR's position on migrating networks is they should be exempt from levy contributions, given the complexity and cost involved for capturing services that will not be in operation beyond 2020.

OptiComm disagreed with this position, arguing ADSL services in particular should be included:

…there is no cogent reason to exclude ADSL services from eligibility to contribute to the levy. For years consumers in cities and towns have enjoyed high quality ADSL broadband services that consumers in regional areas have longed for but been unable to obtain. The speeds that are currently available on ADSL are comparable to and very frequently faster than the speeds that will be available on NBN fixed wireless and satellite services...

We consider that there is no reasonable explanation that the people who have had the long term benefit of good quality services on ADSL networks and will soon have access to even better technology on the NBN should not have to contribute a small amount to the provision of services in Australia's vast noncommercial areas. At present that narrowly targeted levy will result in the Government collecting a relatively small amount, which will not increase until the NBN rollout ramps up considerably. The inclusion of ADSL services in the levy base will provide access to immediate funding for NBN's non-commercial services, which will be gradually replaced by nbn's contribution as the NBN is rolled out and ADSL is replaced. We expect that this is an attractive proposition to a Government that must be looking at how it can reduce the costs of the NBN.

While the BCR recognises ADSL can provide good quality services with relatively fast speeds in many metropolitan areas, one of the principles underpinning the preferred funding approach is alignment to the existing level playing field provisions under the Act. This legislation makes it clear ADSL services are not considered high-speed, and are therefore not comparable or equivalent to the NBN. There are also a number of commercial elements that need to be considered, including the treatment of migration payments under the Definitive Agreements.

Arguing in favour of the exemption, Telstra noted its Velocity fibre networks are also covered under the Definitive Agreements:

The Velocity networks should be excluded because they have the same attributes as legacy copper and HFC networks – under the Definitive Agreements they will be switched off as they are overbuilt by NBN, therefore they are neither competing with NBN nor a source of NBN revenue leakage.[125]

The BCR recognises these fibre networks are subject to migration provisions under the Definitive Agreements, and therefore agrees with Telstra's conclusion. Subsequently, the BCR recommends exempting the Telstra and Optus copper access, HFC and passive optical fibre networks that will be progressively migrated across to the NBN between now and the completion of the rollout in 2020. The BCR believes including these transitioning services would add significant administrative complexity and burden for at best a transient benefit, requiring providers to establish new systems (and possibly pricing structures) over a short interim period.

6.3.3. Networks established prior to, or not competing with, the NBN

Telstra, in its final submission, reiterated its earlier view that high-speed networks that existed at the same time the NBN business case was developed should be excluded from levy contributions. This is based on the rationale that nbn already accounted for these networks when developing its business case, and they are therefore not contributing to the cross-subsidy leakage:

Fibre-based, superfast legacy networks which pre-date the NBN should not be included in the levy arrangement. As they were not in the original NBN rollout plan they do not compete with NBN and are not a source of revenue leakage for NBN. It would be unreasonable, and somewhat arbitrary, for the levy to be imposed on end-users in areas where NBN is neither operating nor intending to operate. These networks are clearly distinct from networks which directly compete with NBN in FTTB areas.[126]

The legislative level playing field provisions also give weight to this argument. Both Part 8 of the Act and the Carrier Licence Conditions (Networks supplying Superfast Carriage Services to Residential Customers) Declaration 2014, exempt high-speed networks that came into existence before January 2011, and the Government's policy paper indicates this will remain the case after Part 8 is amended.[127]

These discussions led the BCR to explore the possibility of a competition test for eligibility, that is, limit eligibility to networks that are in direct competition with nbn. This would exclude all pre-2011 networks, all networks declared as 'adequately served', networks where a non-NBN infrastructure provider of last resort has been declared, and all other existing high-speed networks that nbn has chosen not to overbuild. This competition test would specifically target cherry-picking activities, and make sure only cross-subsidy leakage was captured under the funding arrangements.

The BCR notes concerns from Telstra that failing to link the levy to sources of revenue leakage may create incentives for nbn to defer the rollout:

Liability to pay the levy should be confined to NBN equivalent networks that are a source of revenue leakage for NBN. This approach allows the levy to be precisely targeted at the revenue leakage problem and equitably give effect to the level playing field objective, while also providing incentives for NBN to be efficient and innovative in the roll-out of its networks. At present the eligibility criteria fail to capture important nuances between different networks that are in operation (or planned), and their relationship with the problem at hand (i.e. revenue leakage).[128]

Against this, the arguments for requiring pre-2011 networks to contribute to the funding arrangement include:

- **Equity in incidence of the levy.** All small business and residential customers in the fixed-line footprint will contribute to the cross subsidy of residents in the fixed wireless and satellite footprint.
- **Contestability.** Given the potential for more network competition to emerge in the future, the inclusion of pre-2011 networks would ensure all networks faced the same costs for funding non-commercial services, rather than pre-2011 networks being favoured over new entrants.
- **Weaker case for levy exemption.** The exemptions in the Act relate to a much more onerous regulatory provision—the requirement to structurally separate—than the funding arrangement. As such, there is a weaker case for exempting the levy for these networks.

Similar arguments also apply to the issue of whether networks declared adequately served should be required to contribute to the funding of non-commercial services.[129] On balance, the BCR considers networks established before 2011 and declared adequately served should be required to contribute to the funding of non-commercial services.

The BCR acknowledges this approach does not support the notion that only networks causing cross-subsidy revenue leakage should contribute towards new funding arrangements, and is mindful the Government may wish to focus funding arrangements to address displaced cross-subsidy revenues. It would be available to government to consider excluding networks on the basis that they are not causing cross-subsidy leakage.

6.3.4. Introduction of an industry threshold

Under the preferred funding arrangements, high-speed fixed-line broadband providers would be subject to a number of administrative and compliance costs, including those associated with the making, keeping and provision of records relating to eligible SIOs. To make sure the administrative burden of compliance is not disproportionate to the amount collected, the BCR recommends the funding arrangements include an eligibility threshold for all providers, based on a set number of eligible SIOs.

The BCR initially considered aligning with the TIL threshold, where carriers are eligible once they have generated $25 million in annual eligible telecommunication revenue. This threshold was introduced in 2009 as a red tape reduction measure, with the threshold amount based on the definition of a small proprietary company under s45A of the *Corporations Act 2001*. Notably, no greenfield operators currently contribute towards the TIL,[130] indicating alignment to this threshold may exclude a number of non-nbn high-speed fixed-line networks, undermining the level playing field objectives of the levy.

Instead, the BCR considers a threshold based on eligible SIOs per carrier licence (and therefore across all of a licensee's eligible networks) to be the more appropriate threshold measurement. This is because levy payments would be made on a per-SIO basis and would be easier for all parties to administer. Firms would already be required to report on SIOs for calculation purposes, and alignment to the ACMA's existing eligible revenue submission process would avoid duplicating reporting requirements.

Trading off administrative and compliance costs against level playing field objectives is a qualitative judgement. In striking this balance, the BCR favours erring on the side of a lower threshold as its introduction would provide exempted smaller networks with a cost advantage, potentially distorting competition. Given the levy is an impost, a high threshold would also create additional avoidance incentives, such as operators trying to avoid liability by splitting up their networks or corporate structures.

Subsequently, the BCR recommends a relatively low threshold of 2,000 SIOs, which represents around half-a-per-cent of the projected competitive market in 2022. With the threshold set at this level, most fixed-line operators would be subject to the levy. If the Government wished to provide levy relief for small networks, a higher, but potentially more distortionary threshold could be set.

6.3.5. Market size

Under an NBN equivalent eligibility approach, the following table provides BCR estimates regarding network operators that may meet the eligibility criteria. Importantly, these estimates are based on publically available data on the number of premises these networks pass, which may not reflect actual market conditions and do not indicate the number of activations or services in operation. Requirements for the collection of accurate data prior to the introduction of funding arrangements are discussed in Chapter 7.1. The BCR proposes this work would be undertaken by the ACMA, as the proposed collection agency.

Table 10: Potentially eligible networks under an NBN equivalent funding arrangement, August 2015

Network operator	Network technology	Premises ready for service (2015)	Notes
nbn	FTTP	897,000[131]	This figure comprises premises declared ready for service in existing (brownfields) and new developments (greenfields).
Telstra	FTTP	18,000[132]	Telstra's South Brisbane Exchange network. If this network was transferred to nbn it would qualify for exemption from the levy.
OptiComm	FTTP	147,000[133]	OptiComm is the largest non-Telstra/nbn greenfield provider, operating in around 100 sites. The BCR notes this figure refers to the number of services OptiComm has under development or contracted to deliver, and has been advised by OptiComm the actual number of premises ready for service is lower.
Other greenfield operators	FTTP	50,000[134]	Includes OPENetworks, Pivit and other private FTTP greenfield networks operators.
iiNet	VDSL2+	65,000[135]	The former TransACT network services the Canberra region and is the largest VDSL2+ network in Australia.
iiNet	HFC	80,000[136]	The former TransACT network services the regional Victorian centres of Ballarat, Geelong and Mildura.
TPG	FTTB	9,000[137]	The network currently passes 1,000 multi-dwelling units (MDUs) in metropolitan centres,[138] with TPG announcing plans to connect a total of 500,000 premises to this network.[139]

Source: network operator data, various public sources and media articles, BCR estimates.

Taking the above estimates of the number of premises ready for service in 2015, and applying BCR's projected yearly take-up rates for each network,[140] the BCR estimates there may be up to 380,000 active SIOs on other NBN equivalent networks by FY2022, by which time the NBN is expected be in a steady state of operations, compared to approximately eight million active NBN SIOs.[141]

6.3.6. Technologically neutral funding alternative

While the BCR has sought to align its eligibility criteria to existing regulatory and legislative definitions of NBN equivalence, there would be advantages in government choosing to adopt a technologically neutral definition of eligibility, rather than one tied only to fixed-line services.

As raised by both TPG and OptiComm in their submissions, restricting levy eligibility to fixed-line networks could have a distortionary effect on investment, providing an incentive for providers to explore alternative unlevied technologies such as small-cell fixed wireless. Indeed, TPG expressly raised this possibility in its submission to the BCR, stating:

If the position is that the tax will not be on wireless services, TPG may choose to make greater investments into the wireless service market. It is fundamental to economic activity in this country that such investments not be fraught with the regulatory risk of new taxes.[142]

A technologically neutral definition would also provide greater certainty as to whether future investments will or will not be levied, reducing the risk for industry that entirely new networks are captured during a future policy review point.

Subsequently, the Government could consider a variation on the BCR's preferred approach where it removes the fixed-line criteria, and expands eligibility to capture any high-speed broadband service that is being delivered to premises with an address within the fixed-line footprint. This would capture competing fixed wireless services but would still exclude mobile, on the basis that mobile is only a partial substitute and, unlike NBN services, is not tied to a premises.

The BCR notes this would not materially affect the BCR's calculations, given the current fixed wireless market for residential and small business customers appears to be small,[143] and under threat from the rollout of the NBN. Analysts note that BigAir Group, for example, is exiting this market segment, focusing instead on higher ARPU mid-sized corporate customers.[144] Nevertheless, the BCR agrees with OptiComm that these companies could decide to compete directly with the NBN, and that adopting a technologically neutral eligibility definition would capture this potential cross-subsidy leakage. It is open to the Government to consider whether the benefits of a technologically neutral levy base would outweigh the importance of regulatory alignment with relation to the existing level playing field provisions.

6.4. Implementing an NBN equivalent approach

6.4.1. Calculating contributions

The BCR recommends a per-SIO calculation as it provides certainty to industry regarding collection requirements. Further, compared to other potential approaches, a per-SIO calculation minimises the risk of volatility in industry contributions while the NBN is being rolled out.

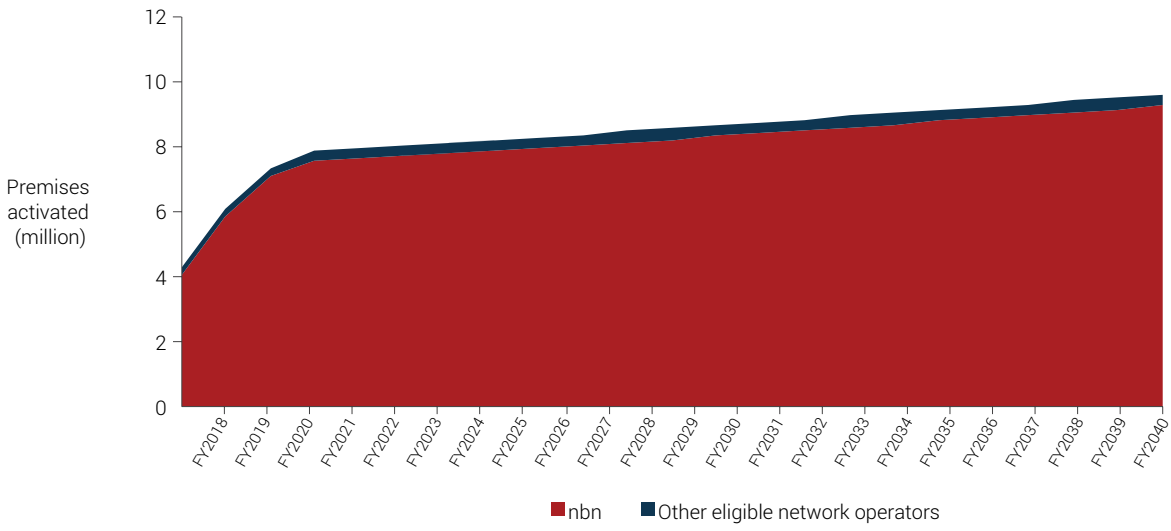
The BCR considers a suitable approach for calculating annual collection amounts is a monthly per-SIO contribution calculation based on long-term forecasts that average contribution requirements across the build phase and steady state.

Further, the BCR considers industry-funded arrangements should aim to draw contributions when and where there is the greatest ability to pay. In real terms, a fixed monthly per-service contribution helps achieve this. If there are more services in the market in the year, more contributions will be drawn that year. If Firm A has more SIOs in the market than Firm B, Firm A will make a proportionally greater contribution. This approach allows service providers to invest with certainty and reduces the possibility of unintended consequences or volatility resulting from changes in the nbn rollout profile.

Under a per-SIO approach, actual losses from FY2011–15 are added to the forecast fixed wireless and satellite net present value loss from FY2016–40 to calculate an overall loss. This is then divided by the average number of fixed-line SIOs serving residential and small business customers from the period FY2018–40.

The BCR has estimated the number of residential and small business fixed-line SIOs from the period FY2018–40 by adding nbn's projections for fixed-line activations to FY2022, with BCR's from FY2023–40, and BCR estimates of current and future fixed-line SIOs held by other providers. This results in an annual average of around 9.4 million fixed-line SIOs.

Figure 20: Number of premises activated by nbn and other eligible network operators, FY2018–40, BCR estimate



Source: BCR (2015).

The BCR considers funding arrangements should be calculated based on eligible SIOs, not just SIOs based on a particular speed-tier threshold, so as not to distort customers' broadband package selection.

The BCR considers the monthly per-SIO contribution should be fixed to be constant over time in real terms, that is, increase only with inflation in nominal terms. This provides temporal equity as it ensures consistent contributions for eligible participants and avoids penalising or rewarding competitive entry decisions. It also provides pricing certainty across the market. Eligible industry participants will know each year the exact contribution required for each service in operation.

It should be noted this approach does not seek to align funding contribution to the actual profile of non-commercial service losses. Such an approach would be sensitive to expenditure fluctuations across the build phase and the timing of replacement capex investment decisions.

The BCR recognises this approach differs from domestic and international funding schemes, which typically determine funding contributions based on market-share percentages. The BCR notes these programmes typically involve steady-state market operations. Ultimately, the BCR considers that until the build phase of the nbn is complete, it is appropriate to consider a tailored approach to calculating NBN non-commercial service contributions.

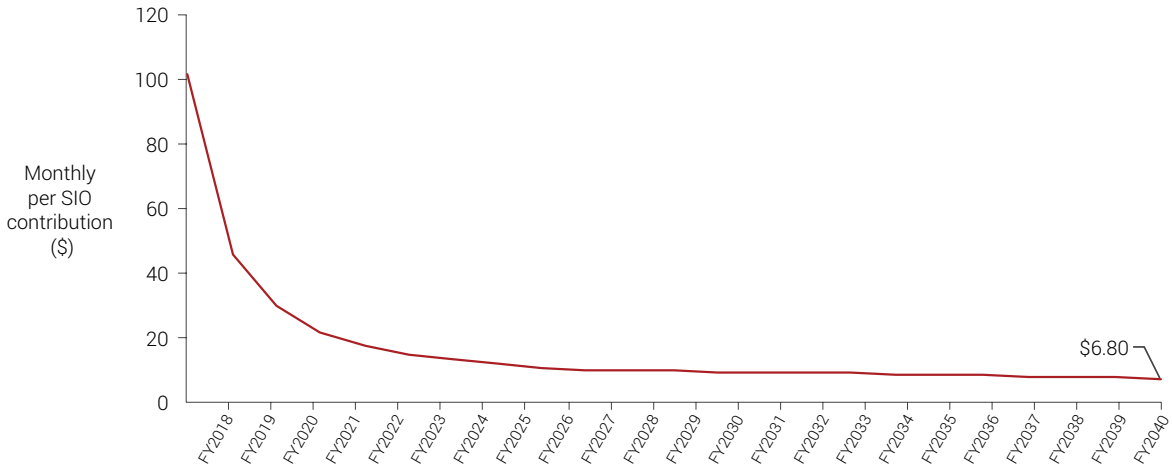
In December 2014, the Government announced it would amend Part 8 of the Act to require new networks targeting residential customers and offering high-speed broadband to be structurally separated as a default, and provide for the ACCC to authorise functional separation arrangements in certain circumstances. To maintain regulatory alignment, the BCR considers any change to the scope of Part 8 should trigger a review of the funding calculation approach. This could include, for example, a review of the eligibility of small business SIOs.

6.4.2. Monthly per-SIO contribution amount

The BCR estimates the monthly contribution amount per residential and small business fixed-line SIO in FY2015 constant real value is around $6.80, equivalent to approximately $7.30 nominal in FY2018 and approximately $8.00 nominal in FY2022.

A per-SIO calculation method is sensitive to the time period over which losses are estimated and recovered. A longer period for estimating and recovering losses means a greater number of average SIOs to smooth the losses. A shorter forecast period reduces the total losses to be recovered, but it also reduces the number of average SIOs and increases the monthly cost per SIO.

Figure 21: Monthly per-SIO funding required for different final years for funding arrangement, in FY2015 real value



Source: BCR (2015).

The outcomes highlighted in the above figure reflect that upfront build costs are high, while the initial number of SIOs is small and builds relatively slowly over time.

Formulae used to calculate per-SIO contributions are provided at Attachment C.

6.5. Financial outcomes

While favouring a funding arrangement limited to NBN equivalent services, the BCR has presented funding options based on both an NBN equivalent and broader industry approach to inform discussions and support government decision making.

Table 12 below summarises financial outcomes under an NBN equivalent funding approach.

Table 11: Financial outcomes under an NBN equivalent funding arrangement

	FY2018	FY2022
NBN equivalent fixed-line SIOs (cumulative)	240,000 (~5% market share)	380,000 (~4% market share)
NBN fixed-line SIOs (cumulative)	4.3 million (~95% market share)	8.1 million (~96% market share)
Total fixed-line SIOs (including NBN services)	4.5 million	8.5 million
Per fixed-line contribution monthly amount (nominal value of $6.80 FY2015 real value)	$7.30	$8.00
Per fixed-line contribution annual amount (nominal value)	$87.60	$96.00
Non-nbn annual contribution (nominal)	$21.0 million	$36.5 million
nbn annual contribution (nominal)	$376.7 million	$777.6 million
Approx total annual collection (nominal)	$397.7 million	$814.1 million

Note: Figures are rounded to one decimal place. NBN equivalent SIOs are based on BCR estimates of the number of premises ready for service and assumed take-up rates. nbn SIOs are based on nbn estimates, with medium business, large business and government customers removed from the total. The nominal per-SIO contribution collected each year is calculated by removing discounting from FY2015 present value. Estimates of the number of SIOs included in this report are based on total high-speed fixed-line SIOs. The estimates presented are preliminary and do not represent budget costings. The final figures may vary as details are finalised.

As highlighted in the below table, the key difference between the two funding option is the share of fixed wireless and satellite losses borne by nbn. Under the preferred NBN equivalent option, nbn funds 96 per cent of non-commercial services losses by the time it reaches a steady state of operations. Under a broader industry-based option, nbn funds only 13 per cent of losses, largely as a result of including mobile networks in the funding base.

Table 12: Financial outcomes under a broader industry funding base like the Telecommunications Industry Levy

	FY2018	FY2022
Non-nbn percentage of total contribution	95%	87%
nbn percentage of total contribution	5%	13%
Non-nbn annual contribution (nominal)	$377.8 million	$708.2 million
nbn annual contribution (nominal)	$19.9 million	$105.8 million
Approximate total annual collection (nominal)	$397.7 million	$814.1 million

Note: Figures are rounded to one decimal place. The BCR has calculated industry contributions under a broader industry-funding base by overall share of telecommunications revenue, using the same mechanisms as the TIL. The BCR has estimated nbn's contribution based on the 2013–14 TIL share, Telstra and Optus' FY2014 wholesale revenues, and BCR estimations. Total approximate annual collection is held constant between the funding options for comparison purposes. The estimates presented are preliminary and do not represent budget costings. The final contributions and collections may vary as details are finalised.

6.6. Cost and price implications of an NBN equivalent funding arrangement

Under the preferred NBN equivalent funding arrangement, wholesale prices are likely to stay the same for the 96 per cent of high-speed fixed-line services provided by nbn. The BCR expects competition will ensure that any reductions in nbn's wholesale prices will flow through to consumers, although this could be in many different ways.

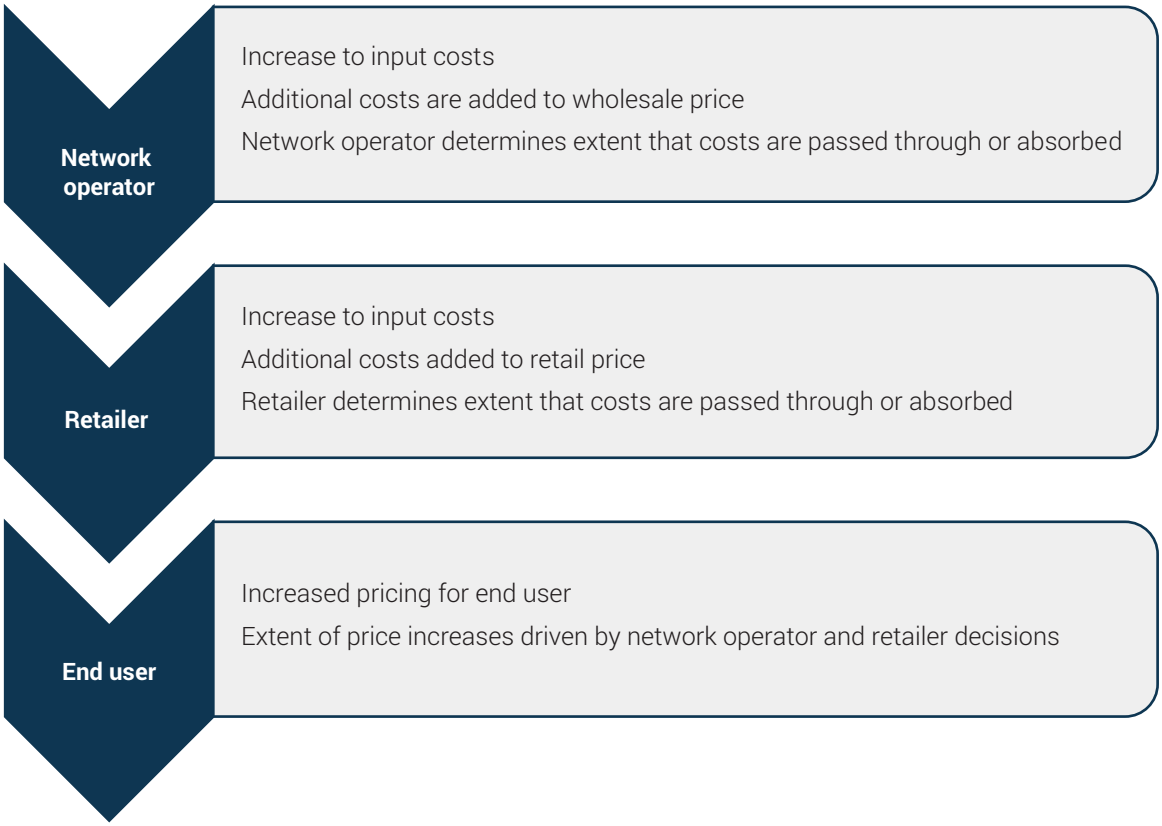
Costs for networks serving the remaining four to five per cent of the market will increase, making sure these networks contribute towards non-commercial services losses. This could result in a significant increase to non-nbn wholesale prices, if the per-SIO contribution is passed through to retailers.

The terms of reference ask the BCR to report on adjustments to nbn's pricing to reflect the removal of the internal cross subsidy for non-commercial NBN services. A monthly per-SIO contribution makes transparent the cross-subsidy that nbn fixed-line customers currently provide towards non-commercial services. In today's dollars, a $6.80 monthly per-SIO contribution would constitute around 17 per cent of nbn's fixed-line wholesale monthly average revenue per user.[145]

By the time the rollout is complete, the BCR estimates nbn will account for approximately 96 per cent of high-speed fixed-line services in operation. As its prices already incorporate a subsidy for non-commercial services, nbn prices should not rise as a result of the introduction of the levy. Instead, nbn could use industry contributions to reduce its prices, however as the levy is only expected to bring a modest annual contribution from non-NBN fixed-line network operators, these reductions would be minimal.

Costs for networks serving the remaining four to five per cent of the fixed-line market would, however, increase. While BCR has only limited access to current wholesale pricing structures, the extent to which the levy is passed through to retail prices would largely depend on the level of competition between network operators; mobile substitution affecting the price elasticity of demand; and commercial arrangements between network operators, developers and retailers.

Figure 22: Potential pass through of NBN non-commercial service funding



Source: BCR (2015).

In some areas there may be no change in prices, or if there was full pass through of a $6.80 monthly per-SIO contribution, the BCR estimates wholesale prices could rise significantly.

In its submission, OptiComm noted the requirement to contribute towards NBN non-commercial services would result in an increase in end user pricing, which represents a material impost on affected network operators. OptiComm noted:

OptiComm is disappointed with the BCR's detachment from commercial reality, as demonstrated by its statements that a monthly $6 per SIO levy is a 'modest contribution from non-NBN fixed-line network operators' and its seeming belief that an estimated 22% increase in costs can be absorbed by lower margins or reduced product offerings. These costs represent a very significant impost on OptiComm and if imposed will be the subject of legal scrutiny as there is no doubt that it negatively impacts the value of our business and assets.[146]

The Frontier Economics report commissioned by OptiComm noted:

As it stands, the BCR approach gives the impression that the current policy is costless for end users which is manifestly not the case.[147]

Frontier Economics found prices for fixed-line broadband services with a narrow levy were likely to be significantly higher than they would be with a broader levy.

Ultimately, the pass through of NBN non-commercial service funding contributions to end users is a preferred outcome of a tightly focused NBN equivalent funding approach, noting that any regulatory impediments to costs being passed through should be reviewed. An increase in end user pricing reflects level playing field outcomes, whereby additional costs are being borne by equivalent network operators for non-commercial services.

The extent to which revised prices are greater or less than equivalent nbn prices should reflect the efficiency of the competing network operator, rather than any benefit derived from not making equal contributions towards non-commercial services. The extent to which nbn's prices may differ from the prices of other network operators may also reflect the possible impacts of regulation and government policy.

Finally, the BCR notes the introduction of new funding arrangements would coincide with broader market reforms that may create new opportunities for industry participants.

7. Administration arrangements

This chapter considers the key activities that would be required to establish and operate the funding arrangement, and make funding arrangements transparent. Consideration has also been given to the contestability of funding arrangements.

7.1. Roles and responsibilities

The BCR recommends the periodic reforecasting of NBN non-commercial service losses and recalculation of the funding amount required should be the responsibility of the ACCC.

The BCR considers the ACMA is best placed to collect NBN non-commercial services funding.

The administration of the non-commercial services funding arrangements would involve two distinct roles. The first would be to determine the required funding amount in light of revenue and costs incurred and updated forecasts for fixed wireless and satellite services. The second, ongoing role would be to collect the funding contributions from eligible participants.

Table 13: Summary of the key responsibilities

Determine funding amount	Collect industry contributions
• Determine the total per-SIO amount required to fund NBN non-commercial services, based on an assessment of nbn costs and revenues for fixed wireless and satellite services	• Collect and assess company information and ensure all eligible network operators submit returns
• Conduct periodic reviews of the funding arrangement	• Calculate eligible individual participant contributions and invoice network operators for payments
• Publish updated forecasts	• Publish industry contributions
	• Administer disbursement of funding
	• Undertake periodic reviews of auditing and collection processes

7.1.1. Determine funding amount (ACCC)

Following discussions with industry, the BCR considers the ACCC to be the most appropriate agency to model and periodically re-calculate the per-SIO levy amount.

The ACCC is an independent Commonwealth statutory authority. It enforces the *Competition and Consumer Act 2010* and a range of additional legislation, promotes competition and fair trading, and regulates national infrastructure for the benefit of all Australians. It has a number of responsibilities in the regulation of the nbn through Part XIC of the *Competition and Consumer Act 2010*. These responsibilities

include a key role in determining the terms and conditions of access to services provided over the nbn, including through SAUs and access determinations.

In its submission, the ACCC outlined its suitability for the role:

As the ACCC is the economic regulator of telecommunications services under Part XIC of the Act, the ACCC is particularly well-placed to take on this role for two reasons. First, as acknowledged by the BCR, there would be some alignment with the ACCC's role in the regulation of the nbn through nbn's SAU. This includes, among other things, making an annual long term revenue constraint methodology (LTRCM) determination. As outlined in the ACCC's submission to the Initial Consultation Paper, the LTRCM specified in the SAU already provides a framework for defining and quantifying losses incurred by nbn.

Secondly, the ACCC has some expertise in demand and expenditure forecasting which may be useful for the periodic re-forecasting of non-commercial losses and recalculation of the funding amount. For example, the ACCC has experience with cost forecasting activities through its price regulation functions.[148]

7.1.2. Collection of industry data and contributions (ACMA)

The BCR notes concerns from OptiComm that basing forecasts on unreliable data reduces the credibility of findings.[149] For the purpose of this study, the BCR considers it is reasonable to provide estimates based on best available data to support government decision making.

However, the BCR agrees that industry information will be required to form the basis of accurate funding calculations. Consideration is required regarding the data gathering requirements, noting that under an NBN equivalent approach, eligible network operators will be required to provide the number of eligible SIOs by access technology. Consistent with TIL arrangements, auditing or independent third party verification could be considered to ensure the validity of submitted data.

In terms of the collection of funds, the BCR considers the ACMA to be the most appropriate agency to manage the administrative and reporting aspects of the scheme, including the collection of industry contributions.

The ACMA currently administers the collection of the TIL to fund the USO, the National Relay Service, emergency call service and other public interest telecommunication services provided by Telstra and other contractors. Telecommunication carriers with eligible revenue in excess of $25 million (known as 'participating persons') are required to lodge eligible revenue returns. The ACMA collects and audits these for accuracy and compliance and then determines each participating person's funding arrangement amount, issues an invoice and collects the payment.

Aligning administrative activities for the NBN non-commercial services funding arrangement would complement the ACMA's existing role under the TIL. While the information collected from carriers would be different (for example, the number of eligible SIOs instead of revenue), the role should not be a major impost on resources as the number of eligible carriers is expected to be small. As outlined in Chapter 7.2, an option for the ACMA could be to revise its current eligible revenue submission process to require all providers to identify the number of applicable SIOs as part of their statutory declaration.

The role of the ACMA in the new funding arrangement would also need to have regard for and be integrated with any changes coming out of the current review of the ACMA, commissioned by the Minister for Communications.[150]

7.2. Timeframe for introducing funding arrangements

The Telecommunications Regulatory and Structural Reform policy states the new NBN non-commercial services funding arrangements should be in place by the start of the new regulatory framework on 1 January 2017.[151] As a result, the BCR has assumed the legislative basis of the levy to be in place by FY2017, with the first reporting period in FY2018.

Any new industry-based funding arrangement creates uncertainty, which could have a chilling effect on investment. This could be ameliorated, in part, by providing reasonable notice and appropriate transition arrangements for any necessary changes to contractual, commercial or regulatory arrangements.

The BCR notes the overall contribution made by non-nbn networks is small, reflecting modest forecast levels of entry in the high-speed wholesale broadband market. Optus has proposed not introducing funding arrangements until there is further evidence of competitive entry:

There is a risk that a considerable amount of work and cost is devoted to developing an industry-wide levy mechanism to recoup a negligible amount of cross-subsidy leakage. To limit the red-tape costs on industry Optus recommends that whilst it would be useful to identify the losses associated with non-commercial services the implementation of an industry funding mechanism should only proceed once a threshold level of competing services has been triggered.[152]

Evidence from OptiComm and Telstra, and market commentary on the progress of the TPG rollout, also call into question the scale of high-speed fixed-line competition. In its final consultation paper, the BCR indicatively estimated the number of NBN equivalent fixed-line SIOs would be around 400,000 in FY2018 rising to around 550,000 by FY2022, or around six per cent of the market.

OptiComm noted in its submission, however, that the BCR had significantly overstated the size of its networks, and Telstra identified that its Velocity fibre networks should be exempted as these services will be transitioning to the nbn under the Definitive Agreement. Media reports have also commented that the TPG rollout is facing delays and practical difficulties in reaching scale.[153]

As a result, based on this market intelligence, the BCR has reevaluated its projections and now estimates the total number of other NBN equivalent SIOs at 240,000 in FY2018, growing to 385,000 in FY2022, or four per cent of the market. If it transpires that network competition is even less than estimated by the BCR, then this further reduces the subsequent total levy payments to nbn. However, as it does not affect the size of the fixed wireless and satellite loss, or significantly reduce the number of total industry SIOs, it would not have a material impact on the levy rate.

Deferring the introduction of the funding arrangements may be appropriate if costs, including setup and Commonwealth administrative costs and compliance costs for networks, exceeded benefits.

7.3. Regulatory and policy review points

The BCR recommends regulatory reviews (that is, funding resets) be carried out every five years in order to re-forecast nbn non-commercial service losses and recalculate the funding required.

The ACCC should be authorised to carry out a review outside the set review points if there is cause to do so, including a request by the Minister for Communications.

The Minister for Communications could commission a review of the policy settings for funding non-commercial services losses, if required.

nbn financial projections will change over time as the company gains more cost and revenue insights, and moves from the build phase to a steady state of operations. The BCR considers that as part of the NBN regulatory framework, review points should be added to reforecast financial losses, consistent with other regulated industries.

In Australia, the time between regulatory reviews is typically three to five years. In the United States, cost of service regulation is reviewed on average every two years. In the United Kingdom, price cap regulation has a cycle of four to five years.[154]

Review points need to strike the right balance between providing certainty for industry participants regarding the costs associated with non-commercial services and adjusting for latest estimates.

The BCR recommends five-year review periods. Over the five-year review period, the per-SIO contribution amount contemplated should be steady in real terms (only increasing in nominal terms with inflation). At each review point, any adjustments between periods should be dealt with through a process of 'overs-and-unders'. Where revised forecasts show an over-recovery in the previous period, this is returned through a deduction over the subsequent period. Conversely, an under recovery would see an upwards adjustment over the subsequent period.

The BCR also recommends the ACCC be authorised on a case-by-case basis—including at the request of the Minister for Communications—to carry out a review outside the set review points if there is cause to do so. The decision to perform any additional reviews would need to be considered alongside administration costs for the ACCC, nbn and industry stakeholders.

In additional to regulatory reviews, periodic policy reviews carried out by the Department of Communications and the Arts would support the sustainability of the NBN non-commercial services funding arrangement, by allowing adjustments to be made in line with market, technology or other changes. This mechanism would provide the opportunity to consider new and unforeseen developments that affect the efficiency of the levy including, for example, prior to or with the introduction of 5G mobile services offering comparable speeds, data allowances and prices.

Policy reviews would also be instigated ahead of major asset replacement decisions by nbn, such as the purchase of additional satellites, and could consider the merits of an alternative operator providing non-commercial services and the need for any revisions to the eligible funding base. The BCR considers these reviews could be carried out at the request of the Minister for Communications every five to 10 years, or as circumstances require.

7.4. Achieving transparency

The BCR considers that quantifying and publishing the losses made by NBN non-commercial services is the first step in achieving transparency. Transparency of future funding arrangements will be achieved by publishing the process for calculating funding contributions, and the per-SIO amount collected.

The BCR considers nbn's payments should be net of funding provided by other eligible parties. nbn payments should not require an actual transfer of funds but its contribution should be reported for transparency purposes.

Further to quantifying the extent of NBN non-commercial service losses, transparency of funding arrangements will be achieved through publishing the process for determining the overall NBN non-commercial service loss, the amount collected by nbn and non-NBN network operators on a per-SIO basis.[155]

In addition, nbn should account for cash outflows and inflows relating to the NBN non-commercial services funding arrangements as part of its accounting separation obligations. This would reflect a transfer of funds from the fixed-line networks to the non-fixed-line networks.

7.4.1. Operational arrangements for industry contributions

Consideration needs to be given to the receipt and disbursement of industry contributions. Care must be taken to avoid unnecessary transaction costs. This is particularly relevant under an NBN equivalent funding arrangement where nbn largely continues to fund non-commercial services. Introducing a requirement in which nbn transfers significant funds and then receives these same funds back is not efficient, particularly where nbn may need to borrow to cover a short-term funding shortfall.

The BCR considers that while nbn should not make actual payments out only to receive them back, there should still be a clear record of transaction showing nbn's contribution towards non-commercial services (for example, a notional invoice) for transparency.

At a high level, and subject to legal requirements, the key steps in the payment process would be:

1. The responsible entity issues notices and invoices to all eligible providers of high-speed broadband networks (including nbn), identifying the contribution amount owing. Where nbn is the largest provider of fixed wireless and satellite services, it will be a beneficiary, rather than a provider, of funding contributions.
2. Contributions from providers are collected by the responsible entity.
3. Payments are provided to nbn for the provision of non-commercial services.
4. Reporting is published annually with the contribution amount made by all eligible participants, including nbn.

The netting off of nbn contributions could be calculated using a debit/credit system or a set-off provision (similar to TIL arrangements).

The BCR's final consultation paper raised the question of whether the cost of funding non-commercial services should be reflected in end user invoicing to enhance transparency. Parties making submissions did not support this proposal. Telstra said it would create unnecessary red tape,[156] and ACCAN was concerned it would lead to confusion among customers.[157] As a result, the BCR does not support a requirement for network operators and retailers to separately identify the funding arrangement contributions on customer bills.

7.5. Contestability for non-commercial funding arrangements

To prevent instability and uncertainty during the scale up of the rollout, the BCR considers it premature to contest the provision of fixed wireless and satellite services at this point in time.

Once the fixed wireless and satellite networks are finished, the Government could periodically test the market for contestability.

So far, this paper has addressed contestability considerations in regard to high-speed network operators in fixed-line areas. However, contestability is also a relevant consideration for the delivery of services in the fixed wireless and satellite footprints.

Ultimately, contestability encourages innovation, promotes economic efficiencies and minimises distortions in the market. Submissions broadly supported the inclusion of contestability as one of the core principles of this funding exercise. The majority of submissions, however, were not supportive of this principle being extended to the actual provision of non-commercial satellite and fixed-line services.

Under the Statement of Expectations, nbn has an obligation to deliver high-speed broadband to all Australian premises irrespective of the commerciality of these services. In its submission, nbn noted how the natural monopoly characteristics of its non-commercial networks meant that it would be highly inefficient to encourage network duplication.[158] Similarly, Telstra and Optus both expressed views that competition in fixed wireless and satellite is unlikely and undesirable. Optus said it would be unrealistic to expect there to be interest from an alternative operator to provide non-commercial services, given the very large costs that would be sunk to provide the NBN fixed wireless and satellite services.[159] Telstra argued a redirection of non-commercial subsidies to new entrants has the potential to 'muddy the water around the nbn construct itself'.[160]

The BCR agrees it is premature to contest the provision of the non-commercial NBN fixed wireless and satellite services at this point in time. At present, nbn is scaling up the deployment of regional and rural infrastructure, with the launch of both long-term satellites scheduled for completion by this year, and the fixed wireless deployment expected to be largely complete by FY2018. Given nbn has already sunk significant costs to deliver these services, the BCR believes there is no value in encouraging a new entrant in non-commercial services unless its costs are demonstrably lower than nbn's future costs.[161]

The proposed funding arrangements are expected to be implemented by 2018, by which time more than 200,000 households are expected to have obtained an NBN fixed wireless or satellite service. Based on discussions with industry on the required levels of investment, and noting previous attempts by the Government to contest non-commercial telecommunication services,[162] the BCR believes competition for non-commercial service subsidy funding is unlikely in the short to medium term. Contesting these services when there is no other contestant would be a disruptive regulatory process, delaying the rollout, leading to additional administrative costs and creating regulatory and economic uncertainty.

Recognising ACCAN's concerns about the difficulty in transitioning established funding arrangements away from the incumbent,[163] a future policy review could assess potential contestability. There may also be times outside these formal policy review points where it would be sensible to re-assess the market for contestability. Ideally, contestability should incentivise a new entrant when it knows its costs are low and the assets of the existing provider are close to their economic life. Replacement decisions, such as the purchase of additional satellites or the introduction of 5G, could trigger a review into the state of the market and an assessment of contestability arrangements.

Market signals could also provide guidance as to when it may be appropriate to consider contesting the funding arrangements. A firm investing significantly in emerging complementary or competing broadband technologies in regional or rural areas, could be grounds for the Government to initiate a tender process to test the market. The BCR appreciates, however, that the Government will not know, at any point in time, whether there are technologies or firms that are more efficient than the incumbent.

Alternatively, the Government could accept unsolicited proposals from providers seeking to contest services. State governments have had success adopting this practice, particularly in the transport sector.[164] Beyond contestability of non-commercial service funding, the BCR notes the findings of the nbn Fixed Wireless and Satellite Review, which recommended nbn remain open to partnership opportunities for satellites and continue tendering for fixed wireless services under competitive conditions. These approaches support ongoing efficiencies in delivering non-commercial services.[165]

8. Intersection with other regulatory issues

The introduction of an NBN non-commercial service funding arrangement will intersect with a number of current regulatory mechanisms in the telecommunications sector. This section explores the synergies the new funding arrangement may have on the universal service obligation (USO), Telecommunications Industry Levy (TIL) and the special access undertaking (SAU), as well as future opportunities for reform presented by the NBN rollout across regional and rural Australia.

8.1. Universal service obligation

The BCR considers the proposed NBN non-commercial services funding arrangements can operate in parallel to existing TIL arrangements, which are used to fund the USO and other public interest telecommunication services.

Industry submissions advocate for USO reform as a result of the NBN rollout. While recognising the potential benefits of harmonising telecommunications funding arrangements, the BCR sees this as a broader policy issue beyond the intended scope of this study.

On 1 July 2012, as part of a package of legislation to achieve continuity of key telecommunications safeguards in the transition to the nbn, the previous USO and the National Relay Service (NRS) levies were replaced with a single levy, the TIL. It, together with government funding, covers the costs of the implementation and administration of service contracts and grants to deliver:

- Reasonably accessible standard telephone services and payphone services to all Australians on an equitable basis, regardless of where they live or carry on business (the USO).
- A national telephone service to enable people with a hearing or speech impediment to make and receive telephone calls (the NRS).
- Emergency call services.
- Other public policy telecommunications outcomes.[166]

While a review of the USO and associated funding arrangements goes beyond the intended scope of this study—as reflected in the Terms of Reference—in light of the recent Regional Telecommunications Independent Review Committee (RTIRC) findings and stakeholder submissions, the BCR makes the following general comments on this matter.

The USO has been an important safeguard in ensuring people across Australia have access to reliable telephony services. The importance of adequate voice services has been highlighted by the RTIRC review, established under Part 9B of the *Telecommunications (Consumer Protection and Service Standards) Act 1999*. These reviews are carried out every three years into telecommunications services in regional, rural and remote parts of Australia, and assess the adequacy of safeguards, including the USO, in these areas.

The 2015 RTIRC report was tabled on 22 October 2015. The review recommended the Government establish, in consultation with industry and consumer groups, a new funding mechanism called the Consumer Communications Fund. This fund would replace the current TIL levy and support loss-making regional infrastructure and services, with scope to include subsidy arrangements for the non-commercial nbn services.[167] The Government responded to the RTIRC recommendations in February 2016, and proposed a review into the consumer safeguard framework and its funding model.

A number of stakeholders noted the RTIRC recommendation and advocated for USO reform and a unified industry levy that included funding for non-commercial services. Vocus, for example, stated:

The BCR's investigation coincided with a related study into the universal service obligations, which recently resulted in publication of the Regional Telecommunications Review 2015. The two investigations both looked at the future provision of telecommunications services in regional Australia but have proposed different funding mechanisms, with the Regional Telecommunications Review recommending a broad recovery base to subsidise regional telecommunications services, including NBN broadband services. Vocus considers that the Regional Telecommunications Review's recommendations and the BCR's proposal can be combined by a NBN non-commercial services levy that is collected from all high-speed broadband services, whether fixed-line, fixed wireless or mobile.[168]

ACCAN suggested that:

USO arrangements could be amended to include the provision of broadband services in non-commercial areas … this would align the USO policy with the nbn policy. [169]

However, Telstra and Optus were opposed to merging the two arrangements. Telstra argued:

The USO is a retail service provision obligation designed to provide a safety net for customers at a retail level, not a wholesale infrastructure obligation.[170]

Similarly, Optus noted:

… it would be wrong to conflate the existing USO levy arrangements with the proposed NBN non-commercial funding arrangements. The objectives of these two schemes are quite different.[171]

The BCR considers the proposed NBN non-commercial service funding arrangements and the current TIL could operate effectively in parallel, and could effectively be transitioned to a new funding scheme in the future if needed. In Chapter 8.2, the scope for operational alignment between the proposed NBN non-commercial services levy arrangement and the TIL is explored, in order to minimise administrative burden and operational complexity.

8.2. Leveraging TIL operational arrangements

The BCR examined the merits of using a single operational process to collect industry information to determine eligibility for both the TIL and the NBN non commercial services funding arrangement. In line with the Government's deregulation commitment, a funding arrangement that uses the same or a similar collection mechanism would lessen the administrative and compliance burden on industry. The table below shows the eligibility and calculation elements of the BCR's preferred NBN non commercial service funding option (per SIO contribution) and the TIL.

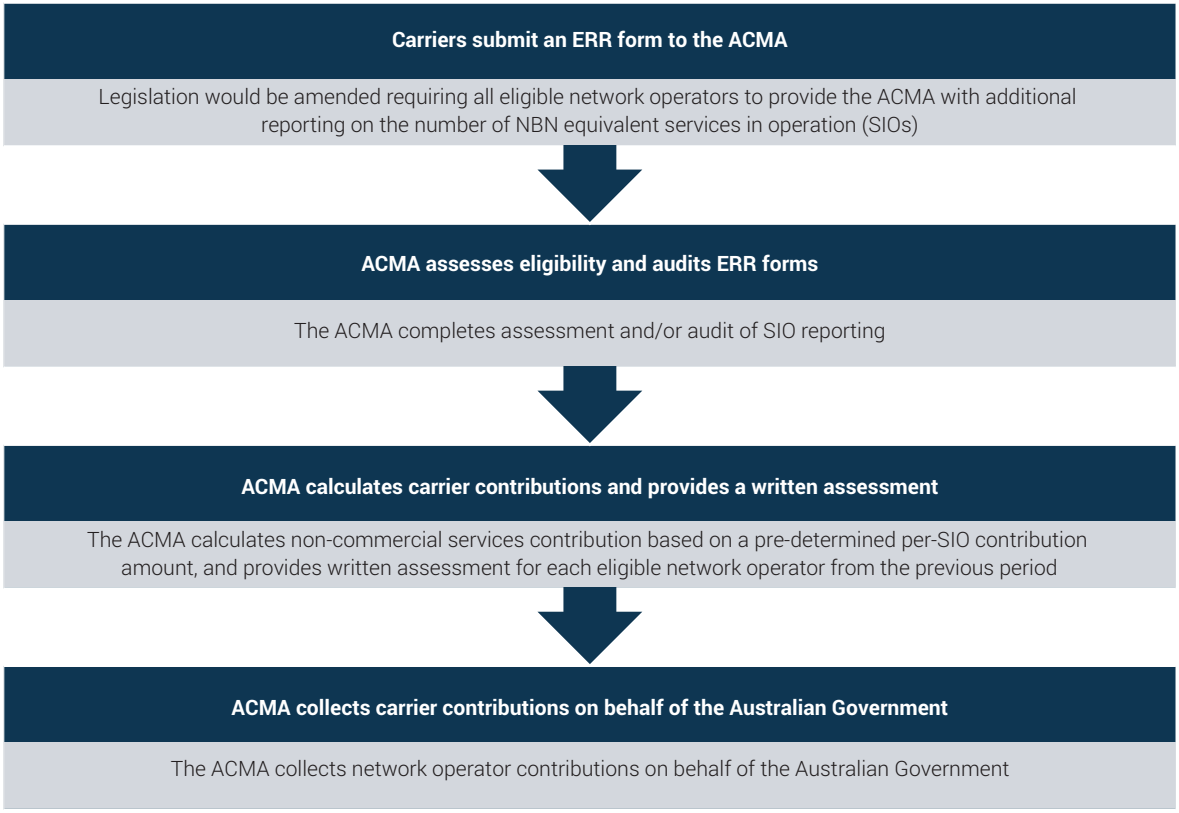
Table 14: Collection of preferred funding arrangement for NBN non-commercial services and the TIL

	NBN equivalent	TIL
Contributors	Operators of high-speed fixed-line broadband networks serving residential or small business premises	Telecommunications carriers (with scope to include carriage service providers if required in future)
Eligibility	Eligible SIO	Eligible telecommunications revenue (> $25 million p.a.)
Contribution calculation	Based on total number of residential and small business fixed-line SIOs	Based on share of eligible telecommunications revenue
Amount to be funded	Average forecasted losses	Actual costs of relevant contracts, grants and administrative costs, less $100 million per annum of government contribution
Administrator	The ACMA	The ACMA

The NBN equivalent funding arrangement would be payable by operators of high-speed fixed-line broadband networks serving residential or small business premises, based on their number of residential and small business SIOs. The ACMA (as the proposed collection entity) would need to implement a reporting mechanism in order to collect this information from eligible participants. An option could be to revise the current eligible revenue submission process to require all providers to identify the number of applicable SIOs as part of the compulsory statutory declaration.

The ACMA could then calculate the contribution for each eligible provider using the per-SIO amount determined by the ACCC. Amending existing processes would limit the administration burden on both the ACMA and industry. Figure 23 below examines how existing TIL processes could be leveraged to support the proposed NBN non-commercial services funding arrangements.

Figure 23: Comparison of current and proposed ACMA responsibilities



Source: BCR (2015).

The BCR notes, beyond alignment with existing reporting mechanisms, there may be other options available to minimise the administrative complexity and burden on industry.

8.3. Special access undertaking

On 13 December 2013, the ACCC accepted a SAU from nbn that specifies price and non-price terms and conditions relating to access to nbn fibre, fixed wireless, satellite networks and other related services. The SAU sets maximum prices irrespective of technology, and so are the same for services delivered over fixed-line, fixed wireless and satellite networks.

The SAU features revenue cap and prudency measures to provide nbn with the opportunity to recover its prudent and efficient costs over the term of the SAU. The revenue requirement represents: the revenue that nbn must earn in that year to recover its operating costs, the costs of financing previous capital investments, a return on previous investments through regulatory depreciation and an allowance for taxation costs. The revenue requirement could be viewed as the annualised costs of providing services.

The BCR expects its proposed funding arrangement could be readily accommodated within nbn's SAU, which provides for revenue from other sources (potentially levy income) to contribute to the recovery of costs. In its submission to the BCR's consultation process, nbn noted:

…it is premature to be discussing any modifications that nbn may need to make to the SAU. nbn considers the BCR should proceed on the basis that nbn will seek appropriate amendments to the SAU to accommodate the final arrangements for the funding of nbn fixed wireless and satellite services.[172]

The ACCC does not have the powers under Part XIC of the Competition and Consumer Act 2010 to require nbn to vary an existing SAU, or to otherwise initiate changes to an existing SAU.[173]

In its final submission, the ACCC notes:

Should nbn seek to vary its SAU to accommodate the BCR's proposed funding arrangements and/or the Government's policy that nbn transition to price caps, the ACCC will consult with industry and other interested stakeholders as part of its assessment process.[174]

8.4. Telecommunications regulatory and structural reform

The funding of NBN non-commercial services is part of the broader Telecommunications Regulatory and Structural Reform policy, announced by the Government in December 2014 in response to the recommendations of the Vertigan Review. This reform agenda outlined a number of new government commitments, including to legislate broadband infrastructure provider of last resort (IPOLR) obligations, and to amend the existing level playing field provisions for superfast fixed-line networks under Part 8 of the Act.

The BCR recognises the importance of regulatory symmetry, and has addressed the need for consistency with the overall regulatory framework under the principle of sustainability (see Chapter 5.4). The proposed non-commercial services funding arrangement broadly aligns with existing regulatory instruments and frameworks. However, these funding arrangements, and in particular the eligibility criteria, may need to be reviewed when new legislation that amends or alters the overarching telecommunications regulatory framework is introduced.

Attachment A: Terms of Reference

The Bureau of Communications Research (BCR), within the Department of Communications, will investigate and provide a report to the Minister for Communications and the Minister for Finance by 30 September 2015, on options for the efficient and transparent funding of non commercial services in the national broadband network (nbn).

The BCR will provide advice on options to replace the current arrangement, where nbn funds non-commercial services through an internal cross-subsidy, with direct funding arrangements based on industry contributions.

The BCR will provide recommendations on the total amount and possible structure of industry contribution arrangements. In developing this advice the BCR will:

1. Identify and quantify losses incurred by fixed wireless and satellite nbn services, including:
    a. accounting for losses incurred across the nbn fixed wireless and satellite networks
    b. the reasonable share of costs associated with commons such as nbn's operations support systems, transit network and corporate functions
    c. accounting for nbn's increased flexibility over time to adjust pricing in non-commercial areas subject to price cap arrangements.
2. Consider options for structuring the funding arrangements, including:
    a. efficiency and transparency in collection
    b. eligibility requirements of contributors (for example, revenue and services)
    c. actual and forecast losses with options to allow for changes to forecasts
    d. adjustments to nbn pricing to reflect the removal of the internal cross subsidy for non-commercial nbn services.
3. Consult with industry on the amount and possible structure of contribution arrangements.
4. Consider the interaction of proposed funding arrangements with relevant nbn-related regulatory instruments and other telecommunications levy schemes, including how the funding arrangements would interact with the nbn SAU and the TIL.
5. Identify any financial risks to the Commonwealth posed by alternate funding and financing mechanisms.
6. Provide advice on competition issues arising from implementing the proposed funding arrangements, and consider long-term implications, such as them being contested.

The BCR should take into account evidence from previous reports and inquiries from overseas and Australia, including information from the Independent Cost-Benefit Analysis of Broadband and Review of Regulation, the Fixed Wireless and Satellite Review, nbn Strategic Review and nbn's Corporate Plan process. The BCR should also consider other issues that may be relevant to this task and provide recommendations.

The BCR will also develop a publicly releasable version of its final report.

Attachment B: Consultation process

In accordance with the Terms of Reference, the BCR undertook a comprehensive consultation process as part of this project. This included the release of two discussion papers, resulting in a number of industry submissions and a series of follow-up meetings with key stakeholders. In addition to formal consultation, the BCR also carried out extensive internal review processes, seeking ongoing feedback from the relevant policy areas within the Department and other agencies across the public service.

The initial consultation paper was released on 8 May 2015, and sought stakeholder views on the proposed approach to the financial model and design of funding options. The BCR received a total of 14 public submissions from the following organisations:

- Australian Communications Consumer Action Network (ACCAN)
- The Australian Competition and Consumer Commission (ACCC)
- Competitive Carriers' Coalition (CCC)
- DigEcon Research
- Great Northern Telecommunications
- Ian Martin Advisory Pty Ltd (Ian Martin)
- iiNet Limited (iiNet)
- John de Ridder Consulting Pty Ltd (John de Ridder)
- Macquarie Telecom Group Limited (Macquarie Telecom)
- nbn co limited (nbn)
- Singtel Optus Pty Ltd (Optus)—initial and supplementary submissions
- Telstra Corporation Limited (Telstra)
- Vodafone Hutchison Australia Limited (Vodafone)

The final consultation paper was released on 13 October 2015, and sought stakeholder views on the initial financial model outcomes and the BCR's proposed funding options. The BCR received a total of 10 public submissions from the following industry stakeholders and interested parties:

- Optus
- TPG Telecom Limited (TPG)
- Vocus Communications Limited (Vocus)
- Dr Lucy Cradduck
- Mr Bruce Bebbington
- Mr John de Ridder
- OptiComm Co Pty Ltd (OptiComm)
- ACCC
- Telstra
- nbn

Both consultation papers and submissions are available online via the Have your say page on the website of the Department of Communications and the Arts.

Attachment C: Calculation of NPV and per–SIO contribution

We calculate the total loss estimate of the NBN non-commercial services as the sum of known costs from FY2011–15, plus the discounted sum of the estimated future costs from FY2016–40. In equation form, we write:

$$NPV_{total} = \sum_{y=20112015} C_y + \sum_{y=2016}^{2040} \frac{C_y}{(1+w)^{y-2015-1/2}}$$

Where:

- NPV_{total} is the total loss estimate of the NBN non-commercial services
- C_y is the nominal cost of non-commercial activities during year y
- w is the discount rate, taken to be the WACC (note that the −1/2 term in the exponent is to adjust for mid-year cash flows).

The costs per year can be further broken down into costs from the LTSS, FW, and the ISS.

The levy is assumed to apply monthly to each fixed-line service in operation between FY2018–40, and to increase with inflation, which we take to be 2.5 per cent as at November 2015. So the total nominal amount levied in year y is:

$$12 \times S_y \times l \times 1.025^{y-2015}$$

Where S_y is the average number of activated fixed-line premises in year y, l is the levy per line in 2015 dollars, and 1.025^{y-2015} adjusts the levy per line for inflation. Thus the total discounted amount levied between FY2018–40 is:

$$\sum_{y=2018}^{2040} \frac{12 \times S_y \times l \times 1.025^{y-2015}}{(1+w)^{y-2015}}$$

We determine the value of the levy per SIO by setting the total discounted amount levied between FY2018–40 to be equal to the total discounted cost of the nbn's non-commercial activities. That is the levy per SIO is the solution for l to:

$$NPV_{total} = \sum_{y=2011}^{2015} C_y + \sum_{y=2016}^{2040} \frac{C_y}{(1+w)^{y-2015-1/2}} = \sum_{y=2018}^{2040} \frac{12 \times S_y \times l \times 1.025^{y-2015}}{(1+w)^{y-2015}}$$

Next, we calculate the real subsidy per premises activated, per month for the LTSS and the FW service. The total amount levied in 2015 dollars is given by:

$$\sum_{y=2018}^{2040} 12 \times S_y \times l$$

We then apportion this to the LTSS and the FW service using the NPV value of the costs associated with the LTSS and the FW service. In particular, the total real subsidy corresponding to the LTSS is:

$$\frac{NPV_{LTSS}}{NPV_{total}} \times \sum_{y=2018}^{2040} 12 \times S_y \times l$$

where:

$$NPV_{LTSS} = \sum_{y=2011}^{2015} C_y^{LTSS} + \sum_{y=2016}^{2040} \frac{C_y^{LTSS}}{(1+w)^{y-2015-1/2}}$$

and C_y^{LTSS} is the costs of the LTSS during year y. Finally the real subsidy per premises activated, per month for the LTSS is given by:

$$\frac{1}{12 \times \sum_{y=2018}^{2040} S_y^{LTSS}} \times \frac{NPV_{LTSS}}{NPV_{total}} \times \sum_{y=2018}^{2040} 12 \times S_y \times l$$

Where S_y^{LTSS} is the average number of activated LTSS premises in year y. The real subsidy per premises activated, per month for the FW service, is given by:

$$\frac{1}{12 \times \sum_{y=2018}^{2040} S_y^{FW}} \times \frac{NPV_{FW}}{NPV_{total}} \times \sum_{y=2018}^{2040} 12 \times S_y \times l$$

where

$$NPV_{FW} = \sum_{y=2011}^{2015} C_y^{FW} + \sum_{y=2016}^{2040} \frac{C_y^{FW}}{(1+w)^{y-2015-1/2}}$$

and CyFW and SyFW are the cost of the FW service and the average number of activated FW premises, respectively, during year y.

Attachment D: Performance of the options against the funding principles

The BCR has assessed the different funding approaches against the principles of designing funding arrangements discussed in Chapter 5.

Competitive neutrality and contestability

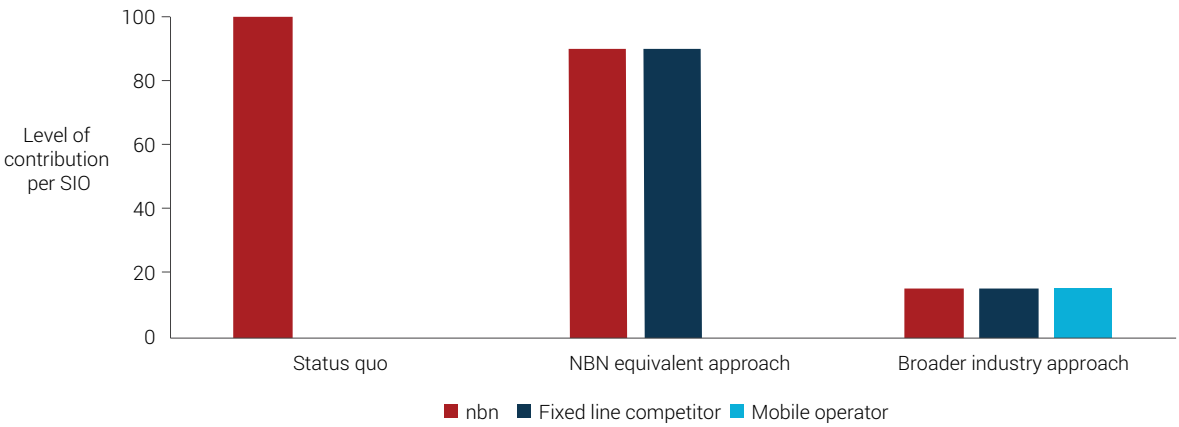
Under the status quo, the revenue nbn must recover from fixed-line customers is inflated by the fixed wireless and satellite cross subsidy, reflecting the current approach of using the Government-owned entity nbn to meet a social objective; comparable services at comparable prices in urban, regional and remote areas. However, privately-owned fixed-line competitors are at present not subject to this impost resulting in an uneven playing field.

Compared to the status quo, an NBN equivalent funding arrangement removes the distortion between nbn and its fixed-line competitors by making sure they also bear a share of the cost of subsidising non-commercial service losses. It also enables a small reduction in the costs that nbn must recover from fixed-line customers. The BCR estimates that under this approach, nbn goes from funding 100 per cent of fixed wireless and satellite losses, to about 96 per cent by FY2022, with competitors paying the balance, based on their market share.

Under a broader industry funding arrangement, the cost of funding fixed wireless and satellite losses is spread across a much broader base. As a result, the contribution of nbn and its fixed-line competitors is equal, but substantially lower.

The below figure is an illustrative example highlighting that both funding arrangements address the uneven burden on nbn of funding fixed wireless and satellite losses, and provide for transparent, non-discriminatory funding of the Government's social objective through a specific charge. In this regard, both options perform equally on the criteria of competitive neutrality and contestability by ensuring level playing field outcomes.

Figure 1 (Att. D): Impact of proposed funding arrangements on level playing field contestability: illustrative example



Source: BCR (2015).

Both an NBN equivalent and a broad-based funding approach support competitive neutrality, as both would ensure consistent payments towards non-commercial services by nbn and non-NBN network operators. This is illustrated in hypothetical example in the table below.

Table 1 (Att. D): Comparison of options on basis of level playing field contestability: illustrative worked example

	NBN equivalent	Broader industry
A. Assumed annual collection amount	$100,000,000	$100,000,000
B. nbn fixed-line SIOs	1,000,000	1,000,000
C. Non-nbn fixed-line SIOs (i.e. NBN equivalent)	100,000	100,000
D. Broader industry base SIOs (excluding nbn SIOs)	5,000,000	5,000,000
E. nbn share of contribution (based on SIOs)	91% [B/(B+C)]	17% [B/(B+C+D]
F. Non-nbn share of contribution (based on SIOs)	9% [C/(B+C)]	83% [(C+D)/(B+C+D)]
G. nbn contribution	$91 million [A*E]	$16 million [A*E]
H. Non-nbn contribution	$9 million [A*F]	$84 million [A*F]
I. nbn contribution per SIO, per month	$7.60 [G/B/12]	$1.40 [G/B/12]
J. Non-nbn contribution per SIO, per month	$7.60 [H/C/12]	$1.40 [H/(C+D)/12]
K. nbn reduction in contribution per SIO, per month	$0.76 [H/B/12]	$7.00 [H/B/12]

Note: This is a hypothetical worked example, with figures for illustrative purposes only. See Tables 11 and 12 for BCR estimates of nbn and non-nbn share of contributions under NBN equivalent and broader industry base funding options. Figures have been rounded.

Both approaches would make sure equivalent contributions by nbn or private competitors towards non-commercial services allowing all industry participants to compete equally. In this regard, both funding approaches support the overarching competitive neutrality requirements that government entities such as nbn should not be advantaged (or disadvantaged) over private sector competitors by virtue of public sector ownership, and in this case, as a result of nbn's obligation to ensure all Australians have access to very fast broadband at affordable prices.

Further, the specific competitive neutrality requirements discussed in Chapter 6.3 are unaffected:

- **Rate of return.** As discussed in Chapter 5.2, the quantum of NBN non-commercial service losses have been calculated using the long-term bond rate plus a risk premium of 350 basis points. This approach is consistent with competitive neutrality guidelines[175] and aligns with the rate of return used in SAU, and which the ACCC considers as appropriate to allow nbn to make a commercial return on investment.
- **Debt neutrality.** Under either approach, where nbn seeks to access third party debt to fund non-commercial services this would occur at market rates.
- **Regulatory neutrality.** Under either funding approach, nbn would be subject to the same regulatory environment as private sector businesses, including liability for making contributions to fund fixed wireless and satellite losses.

An underlying assumption is that nbn is currently fully funding fixed wireless and satellite losses from an internal cross subsidy, rather than a share of these losses being funded by the Government through a non-commercial rate of return. However, if this was not the case, the two funding options would not perform equally on the criteria of competitive neutrality and contestability, with an NBN equivalent levy leading to a higher funding burden on competitors. In nbn's case, this funding burden would be shared between nbn and the Government through a non-commercial rate of return.

Economic efficiency

The BCR considers an NBN equivalent funding arrangement performs better on the criteria of economic efficiency because it maintains incentives for cost control and market responsiveness for nbn.

In the BCR's view, limiting eligibility to NBN equivalent services means that nbn remains strongly accountable for fixed wireless and satellite losses, as it must fund nearly all of these losses from its own fixed-line customers. If it is not able to do this, it suffers a low rate of return for which it is accountable to its shareholder ministers, or must make the case to this group and the ACCC for changed regulatory or service settings. This provides strong incentives for the nbn board to minimise fixed wireless and satellite losses.

By contrast, under a broader industry base, the BCR estimates nbn bears about 13 per cent of fixed wireless and satellite losses by FY2022 (see Table 12), with the broader telecommunications industry bearing the balance. In the BCR's view, this materially reduces nbn's accountability and incentives to control costs. While the nbn board would make the decisions about fixed wireless and satellite costs, prices and product offerings, losses resulting from those decisions would be borne by the broader telecommunications industry.

Despite funding most of the loss, the industry would have limited ability to influence it, other than through representations to the shareholder ministers or the regulator. While a process that involves the setting and resetting the non-commercial services cost pool would consider whether nbn's costs were productively efficient, the BCR considers this would be less effective than market constraints and long-term price caps, and accountability to shareholder ministers.[176]

Any reduction in accountability would be potentially concerning given the magnitude of the decisions that could face the nbn board in the future. For example, if the percentage of households in regional areas that took up the fixed wireless service materially exceeded forecast take-up rates, or if downloads per regional customer were greater than forecast, then the fixed wireless and satellite networks could face capacity constraints. This could necessitate difficult choices between costly capacity augmentation, degrading services or changing product offerings in regional areas to meet demand, or seeking regulatory approval for higher prices.

An NBN equivalent funding option would help make sure nbn continues to take a strongly disciplined approach to additional investment—including fully considering innovative low-cost solutions—as it would bear the consequences of these decisions, rather than the broader telecommunications industry bearing much of the burden.

In short, the BCR considers productive and dynamic efficiency would be higher under an NBN equivalent funding arrangement, as nbn has stronger incentives to minimise losses and embrace innovations that reduce future investment requirements, and better meets customer needs.

The BCR considers an NBN equivalent funding arrangement is also likely to perform better when it comes to allocative efficiency. It considers the gains in allocative efficiency of maintaining market disciplines on nbn are likely to outweigh the loss of it if a narrower base to fund non-commercial services was used.

Under an NBN equivalent funding arrangement, nbn has strong incentives to minimise losses and tailor its product offerings and prices to best reflect consumers' preferences and willingness to pay, achieving allocative efficiency. However, under a broader industry-based funding arrangement, the BCR estimates nbn bears only about 13 per cent of non-commercial services losses by FY2022, which the BCR considers would reduce nbn's incentives to minimise the difference between value to customers (seen in the price) and the cost of production.

Against this, a broader industry-based funding arrangement would spread costs more broadly, including to mobiles, and lead to a smaller loss of allocative efficiency from funding non-commercial services. Economic theory shows that collecting a given amount of tax revenue from a broad base is less distortionary than collecting the same amount from a narrow base.[177]

Further, the greater the price responsiveness of demand, the greater the dead-weight loss in economic efficiency from differential taxation, which implies close substitutes should be taxed equally.[178] In this context, the BCR notes a funding arrangement limited to NBN equivalent services treats close substitutes equally. High-speed fixed-line networks would face the same funding contribution as nbn.

Extending the funding base to include mobiles would improve the funding aspect of allocative efficiency simply because the costs are spread more broadly. However, the BCR considers these would be moderate as mobile services are only partial substitutes for fixed-line services at this time. While 21 per cent (3.9 million) of adult Australians elect for mobile-only services for internet usage,[179] only five per cent of data downloaded in the three months ending 30 June 2015 was over mobile handsets, with 92 per cent of data still downloaded over fixed-line networks.[180] The BCR notes this may change in the future with the introduction of 5G technology, or if mobile network operators leverage their mobile networks to deliver fixed wireless services within the nbn fixed-line footprint. This could be considered in any future reviews of the funding arrangement (see Chapter 8.3).

Finally, the BCR notes the purpose of the funding arrangement is to provide a competitively neutral way to fund fixed wireless and satellite services, given the Government's December 2014 decision to liberalise infrastructure-based competition. The BCR believes a funding arrangement limited to NBN equivalent services achieves this objective, while minimising broader impacts on cost disciplines, nbn regulatory settings, and the telecommunications industry.

By contrast, a broad-based funding approach would substantially alter the governance and funding of nbn, impacting regulatory settings and increasing imposts on the broader telecommunications industry. Given the modest level expected of fixed-line entry, a funding approach that has these much wider impacts would appear to be a disproportionate response to a modest level of cross-subsidy 'leakage'.

For these reasons, the BCR considers that limiting eligibility to NBN equivalent services is on balance the most economically efficient way of providing competitively neutral funding of fixed wireless and satellite losses, in the context of freeing up infrastructure competition.

Transparency, sustainability and equity

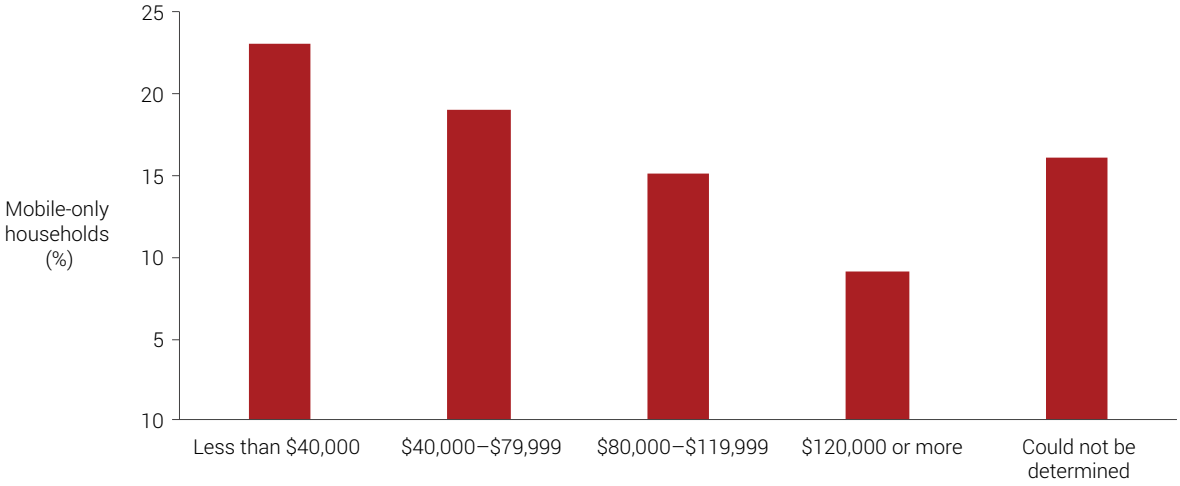
As discussed above, the BCR considers the choice between the funding options turns on their differential impact on economic efficiency. As long as the nbn's rate of return is not a source of competitive distortion, then the two options have a similar impact on competitive neutrality. On the remaining criteria of transparency, sustainability and equity, the two options are broadly comparable.

In terms of transparency, under both options the aggregate annual subsidy for fixed wireless and satellite services, as well as the subsidy paid by nbn and the total subsidy paid by other networks, would be transparent.

From a sustainability perspective, an NBN equivalent funding arrangement faces risks to sustainability and equity in the longer term as it is based on a single technology, and over the long-term a higher percentage of consumers may choose alternative technologies such as mobile. This risk could be reviewed through a periodic policy review process.

In considering equity, given the widespread use of telecommunications services, both funding arrangements would fall broadly across society. According to the ACMA, 21 per cent of adult Australians do not have a fixed-line broadband service, and would therefore not contribute to the funding of non-commercial services under the preferred approach. However, as a disproportionate share of these households are low income,[181] there would be some vertical equity benefits of this uneven funding. The following figure shows the percentage of households in 2012–13 with a mobile-only broadband connection by income bracket.

Figure 2 (Att. D): Mobile substitution by income bracket, 2012-13



Source: BCR 2016, based on ABS, Household use of information technology, 2012–2013 (data on mobile substitution by income bracket is available on request).

(Endnotes)

1 In April 2015, NBN Co Limited announced a re-brand from NBN Co to nbn. To ensure a clear distinction between the company and the network, this report uses the term 'nbn' for the purpose of company description, and 'NBN' to describe the company's networks and services.

2 The BCR notes this per-SIO levy is higher than the amount presented in its Final Consultation Paper. This is due to a final model review.

3 Australian Government, 2014, Telecommunications Regulatory and Structural Reform, December, p. 6.

4 This report was provided to government in December 2015 for its consideration. A small number of updates have been made to reflect information available as at March 2016.

5 nbn, final submission, pp. 5–6.

6 GR Faulhaber, 1975, 'Cross-subsidization: pricing in public enterprises', *American Economic Review*, 65(5), December, pp. 966–77.

7 ACCC, 2014, Tests for assessing cross-subsidy, June, p. 2.

8 nbn, initial submission, p. 5.

9 Australian Government, 2010, Statement of Expectations, December.

10 McKinsey KPMG Implementation Study, 2010.

11 Analysys Mason, 2012, Review of the efficiency and prudency of nbn's fibre, wireless and satellite network design, p. 152.

12 nbn, fact sheet: Fixed Wireless, accessed 26 June 2015.

13 nbn, 2013, Media release 'Faster internet for the bush', 6 February.

14 Australian Government, 2014, Statement of Expectations, April.

15 nbn, 2015, Fixed Wireless and Satellite Review, May. See for example, p. 70.

16 Ibid.

17 nbn, 2016, Rollout information—Weekly Summary, 4 February.

18 nbn, Corporate Plan 2016, pp. 60, 63.

19 nbn, 2011, Media Release 'nbn selects fixed wireless network partner for mid-2012 service start', 1 June.

20 nbn, 2015, Media release 'nbn co pilot to boost broadband speeds for the bush', 20 April.

21 nbn, 2014, Fixed Wireless and Satellite Review, p. 26.

22 nbn, 2014, Media Release 'nbn prioritises bringing broadband to the bush', 22 July.

23 nbn, Corporate Plan 2016, p. 60.

24 The Hon Malcolm Turnbull MP, 2015, Media Release 'NBN satellite launch to revolutionise broadband for regional and remote Australia', 13 August.

25 nbn, 2014, Media Release 'Ericsson to deliver fixed wireless and satellite ground services', 30 July.

26 nbn, 2016, Rollout information—Weekly Summary, 4 February.

27 nbn, Corporate Plan 2016, p. 63.

28 nbn, 2014, Fixed Wireless and Satellite Review, May, p. 86–87.

29 Ibid p. 43, 67.

30 See Recommendation 1; Regional Telecommunications Independent Review committee (RTIRC), Regional Telecommunications Review 2015, pp. 31–33.

31 Ibid, p. 64.

32 GSMA, 2014, Understanding 5G: Perspectives on future technological advancements in mobile, December.

33 Smith, M., 2015, 'Richard Branson to pitch NBN satellite alternative', Financial Review, 9 September.

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40 Ibid, p. 20.

41 Australian Government, 2004, Australian Government Competitive Neutrality Guidelines for Managers, February, p. 41

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43 Australian Government, 2014, Telecommunications Regulatory and Structural Reform, December, p.4.

44 As discussed in Chapter 5: model approach and outcomes, an allocation has been calculated to FY2022 to support financial projections from FY2023 and beyond.

45 Australian Government, 2004, Competitive Neutrality Guidelines for Managers, February, p. 37.

46 A WSA comprises up to 192 base stations that connect to a single fibre access node. See, Analysys Mason, 2012, Review of the efficiency and prudency of nbn's fibre, wireless and satellite network design, 26 September, p. 82.

47 nbn, initial submission, p. 7.

48 Ian Martin, initial submission, p. 5.

49 See, for example, nbn, initial submission, p. 7.

50 See, for example, ACCAN, initial submission, p. 2; Ian Martin, initial submission, p. 5.

51 Vodafone, initial submission, p. 10.

52 Queensland Treasury and Trade, 2014, Non-current asset policies for the Queensland Public Sector, NCAP–3—Valuation of Assets, December, p. 9.

53 ACCC, 2011, Public inquiry to make final access determinations for the declared fixed-line services, Discussion Paper, April (public version), p. 2.

54 See, John de Ridder, initial submission, p. 6; Optus, initial submission, pp. 7–8.

55 ACCC, initial submission, p. 4.

56 Optus, initial submission, p. 8.

57 Australian Government, 2004, Australian Government competitive Neutrality Guidelines for Managers, February, p. 32.

58 Based on 10 year Australian bond yield as at 16 July 2015. See Bloomberg business. Inflation assumed at 2.50 per cent as per PPB Advisory estimates from June 2015.

59 nbn, initial submission, p. 13.

60 Wireless-only premises relates to the residential household population with no active fixed-line broadband service. Wireless-only premises forecasts are based on Ovum and nbn analysis. Vacant/unoccupied premises are based on statistics from the Australian Bureau of Statistics.

61 The BCR notes this is 6.5 per cent higher than the loss estimate presented in its Final Consultation Paper, due to a final model review.

62 Optus, final submission, p. 5.

63 Telstra, final submission, p. 4.

64 See, for example, Ian Martin, initial submission, p. 6; nbn, initial submission, p. 8.

65 Ian Martin, initial submission, p. 3.

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67 ACCAN, initial submission, p. 3.

68 nbn, initial submission, p. 8.

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70 nbn, initial submission, p. 8.

71 See, for example, nbn, initial submission; Ian Martin, initial submission.

72 Clause 3.1, Coalition of Australian Governments (COAG), 1995, Competition Principles Agreement—11 April 1995 (As amended to 13 April 2007).

73 Australian Government, 1996, Commonwealth competitive neutrality policy statement, June.

74 Australian Government, 2004, Australian Government Competitive Neutrality Guidelines for Managers—Financial Management Guidance No. 9, February, p. 30.

75 Australian Government, Commonwealth competitive neutrality policy statement, June 1996, p. 5.

76 nbn, initial submission, p. 8.

77 John de Ridder, initial submission, p. 6.

78 These additional costs are sometimes known as excess burdens or deadweight losses.

79 O Gabbitas and D Eldridge, 1998, Directions for State Tax Reform, Productivity Commission Staff Research Paper, p. 19.

80 ACCAN, initial submission, p. 4.

81 O Gabbitas and D Eldridge, 1998, Directions for State Tax Reform, Productivity Commission Staff Research Paper, p. xxii.

82 Ibid p. xxii.

83 Australian Government, 2014, Telecommunications Regulatory and Structural Reform, p. 6.

84 ACCAN, initial submission, p. 6.

85 BCR Initial Consultation Paper, p. 25.

86 Optus initial supplementary submission, p. 6.

87 nbn, initial submission, pp. 16–17.

88 iiNet, initial submission, p. 6.

89 Telstra, final submission, p. 4.

90 Optus, final submission, p. 2.

91 ACCC, final submission, p. 2.

92 TPG, final submission, p. 1.

93 Vocus, final submission, p. 2.

94 iiNet, initial submission, p. 7.

95 Vodafone, initial submission, p. 17.

96 ACCAN, initial submission, p. 4.

97 Frontier Economics submission, p. 2.

98 TPG, final submission, pp. 1–2.

99 TPG, final submission, p. 2.

100 Cisco, 2015, Virtual Networking Index, 2014–2019 White Paper, May.

101 Ben Grubb, 2015 'The real reason iiNet customers are facing internet slowdowns after Netflix's arrival', *The Sydney Morning Herald*, 8 April.

102 nbn, final submission, p. 10.

103 TPG, final submission, p. 1.

104 Frontier Economics, OptiComm, final submission, p. 14.

105 ACCC, final submission.

106 nbn, 2014, Fixed Wireless and Satellite Review, May, p. 9, 26.

107 Ibid.

108 See Recommendation 1, Regional Telecommunications Independent Review Committee (RTIRC), Regional Telecommunications Review 2015.

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110 ABS, 8153.0 Internet Activity, Australia, June 2015. See volume of data downloaded. Fixed-line includes DSL, cable, fibre and other fixed-line broadband. Wireless includes satellite, fixed wireless, mobile wireless via a data card, dongle, USB modem or tablet SIM card and other wireless broadband. The volume of data downloaded via mobile handsets is separately recorded by the Australian Bureau of Statistics, and these figures have been included in order to capture all data downloaded in Australia.

111 The ACMA, 2015, Australians get mobile, research snapshots, 9 June.

112 nbn, final submission, p. 11.

113 OptiComm (2015), final submission, pp. 8–9, 5 November. In terms of download speed, OptiComm cited a study by British firm OpenSignal, which in January 2015 found the average Sydney user on Vodafone's 4G network could download at 33.9 Mbps, Telstra customers could download at 20.7 Mbps and Optus at 18.3 Mbps. In terms of data allowance and price comparability, OptiComm noted that on 4 November 2015, Optus introduced a new mobile broadband plan, offering 50 GB data for $70/month. OptiComm suggested this was comparable in price and data download to NBN plans such as iiNet's offer of a 25/5 Mbps NBN 50 GB data fibre plan for $64.90/month. The BCR notes the maximum advertised speed for the Optus product is 12/1 Mbps.

114 Frontier Economics, OptiComm, final submission, p. 10.

115 Optus initial supplementary submission, p. 8.

116 For example, Telstra has stated it will invest $5 billion to deliver 4G coverage to 99 per cent of the population. See Andy Penn, Telstra CEO, opening statement, Telstra Digital Summit, 2015.

117 TPG, final submission, p. 2.

118 Frontier Economics, OptiComm, final submission, p. 5.

119 Australian Government, 2015, Statement of Expectations, 8 April.

120 nbn, Corporate Plan 2016, p. 43.

121 nbn, final submission, p. 12.

122 Vertigan Review, National Broadband Network—Market and Regulatory Report, p 74.

123 Ibid, p 76.

124 As at June 2014, there were 55,300 businesses employing 20 or more employees, compared to over 8 million residential premises; ABS, 8165.0—counts of Australian Businesses, including Entries and Exits, Jun 2010—Jun 2014, March 2015.

125 Telstra, final submission, p. 5.

126 Telstra, final submission, p. 6.

127 Australian Government, 2014, Telecommunications Regulatory and Structural Reform, December, p. 10, in response to recommendations no. 4.

128 Telstra, final submission, p. 5.

129 Department of Communications and the Arts, No double up—the adequately served policy, accessed 11 September 2015.

130 OptiComm is currently the largest non-NBN provider of high-speed fixed-line fibre services, with an annual turnover in excess of $20 million. See, Golombek, M. (2014), 'Connecting Communities: OptiComm', *Business in Focus*, Accessed 10 March 2016.

131 nbn, Corporate Plan 2016, p.60.

132 Piltz, D. (2013), 'South Brisbane Exchange migrations completed', Telstra News, 24 January, Accessed 10 March 2016.

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134 BCR estimate, based on projected size of greenfield market. See, Paul Budde, Australia—Broadband—FttH Greenfield Market, December 2014.

135 Robin Eckermann & Associates (2013), RDASI-ACT NBN Readiness: Smart work towns project, July, p. 4.

136 BCR estimate, based on the number of total active services in 2011, See, Hutchinson, J, (2011), TransACT: Cable in for the long stretch, *itnews*, 7 June, Accessed 10 March 2016.

137 Based on the current number of MDUs passed by TPG divided by the average number of premises per MDUs. See, for estimated number of premises per MDUs, Taylor, J. (2012), NBN Co waiting on apartment cable contracts, *ZDNet*, 30 October, Accessed 10 March 2016.

138 Coyne, A. (2016), TPG close to passing 1000 buildings with fibre, *itnews*, 16 February, Accessed 10 March 2016.

139 Peace, R. (2014), TPG revenue soars, ISP releases FTTB plan details, *Computerworld*, 23 September, Accessed 10 March 2016.

140 These projections assume progressively declining take-up rates for legacy networks on the basis of increasing competition from nbn, and steady take-up for new networks, including TPG's FTTB. The BCR also assumes greenfield operators capture a small percentage of all new developments.

141 nbn, Corporate Plan 2016, p.12.

142 TPG, final submission, p. 2.

143 There were approximately 40,000 non-nbn fixed-wireless internet subscribers at the end of December 2014, noting that not all of these would have met the eligibility criteria (high-speed services to residential or small business premises in the fixed-line footprint). The BCR calculated this by subtracting the number of premises activated on the nbn fixed-wireless network at the end of Q4 2014 from the total number of fixed-wireless subscribers reported in the ABS internet activity report in December 2014.

144 Credit Suisse, 'Equity Research Report—BigAir Group Limited', December 2014.

145 nbn FY2015 ARPU is $40 per month. See, nbn Corporate Plan 2016, p.64

146 OptiComm, final submission, p. 11. Note, the BCR has recalculated the NPV loss estimate since the release of the Final Consultation Paper, which has increased the monthly per-SIO amount from $6 to $6.80.

147 Frontier Economics, OptiComm, final submission, pp. 6–7.

148 ACCC, final submission, p. 4.

149 OptiComm, final submission, p. 7.

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151 Australian Government, 2014, Telecommunications Regulatory and Structural Reform, December, p. 6.

152 Optus, initial submission, p. 5.

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156 Telstra, initial submission, p. 11.

157 ACCAN, initial submission, p. 8.

158 nbn, initial submission, p. 10.

159 Optus, initial submission, p. 7.

160 Telstra, initial submission, p. 8.

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163 ACCAN, initial submission, p. 8.

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166 See, for discussion, ACMA, Telecoms funding arrangements, accessed 30 July 2015.

167 See, Recommendation 9; Regional Telecommunications Independent Review Committee (RTIRC), Regional Telecommunications Review 2015, p. xvi.

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169 ACCAN, initial submission, p. 9.

170 Telstra, initial submission, p. 11.

171 Optus, final submission, p. 6.

172 nbn, initial submission, p. 20.

173 ACCC initial submission, p. 2.

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