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# Review of NBN's broadband pricing objectives

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A report for Telstra

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# Executive Summary

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We have been asked by Telstra to review NBN Co Ltd (NBN Co)'s broadband pricing objectives by reference to conventional economic frameworks for assessing the pricing of infrastructure assets in Australia.

## Context – NBN Co Ltd

NBN Co is a government-owned corporation established to design, build and operate the national broadband network (nbn). As a wholesaler of super-fast broadband services, NBN Co sells network capacity to retail service providers (RSPs), who then enter into contracts with individuals and businesses to provide broadband internet and telephony services.

NBN Co has been given a commercial mandate and, consistent with that mandate, its pricing strategy focuses on maximising revenues from the sale of wholesale broadband services. However, the prioritisation of commercial outcomes over the substantial expected public social returns to the nbn is at odds with the public interest. In practice, maximising the expected public social returns would require NBN Co to prioritise user take-up over maximising profits.

NBN Co is subject to economic regulation in the form of a special access undertaking that is framed around the long term objective of ensuring that NBN Co can recover its costs, including a return on capital invested over the lifetime of the asset. NBN Co does not have any formal projections as to when it anticipates that the combination of take-up and prices will be sufficient for NBN Co to earn revenue that approaches its maximum allowable level. Accordingly, NBN Co pricing is determined by its objectives, rather than by any active regulatory constraint.

## Social benefits of the nbn

The premise for the investment in a super-fast national broadband network was to drive productivity:<sup>1</sup>

*Australia's future productivity, competitiveness and wealth creation relies on world class infrastructure. In the global economy of the 21<sup>st</sup> century, no aspect of infrastructure is more crucial than advanced communications networks.*

*[...] For Australia to turn around its declining productivity, we must have a national fibre to the node network.*

National access to the nbn has been associated with driving Australia's economic prosperity, competitiveness of small business, creating new markets for businesses and new jobs for Australians, enabling access to services like e-health and e-education, and promoting media diversity.<sup>2</sup>

These benefits accrue not only to individual broadband users, but also to society as a whole, so that the social returns from the nbn exceed the private return to NBN Co and its users. In economic terms, the nbn generates positive externalities. Economics predicts that where such positive externalities are substantial, the private market outcome is likely to be inefficient under-consumption, since social benefits are not adequately taken into account.

It is inherently challenging to estimate with any precision the impact of the nbn network on the wider Australian economy. However, estimates to date suggest that the order of magnitude for the impact of the nbn is very large. For example, in 2018, NBN Co commissioned advisory firm AlphaBeta to measure the 'nbn

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<sup>1</sup> Australian Labor Party, *New directions for communications: a broadband future for Australia – building a national broadband network*, March 2007, p i.

<sup>2</sup> Australian Labor Party, *New directions for communications: a broadband future for Australia – building a national broadband network*, March 2007, p 1.

effect' on Australian lives and the economy. AlphaBeta estimated that the nbn network enabled an additional \$1.2 billion in economic activity in 2017 alone.<sup>3</sup> The same report estimates that the nbn network's impact on GDP is set to grow to \$10.4 billion in 2021.<sup>4</sup>

In her address to CommsDay Summit on 9 April 2019, Shadow Minister for Communications Michelle Rowland shared estimates undertaken by the Parliamentary Library: She stated that:<sup>5</sup>

Based on the World Bank modelling, the Parliamentary Library found that the Australian economy would realise an \$800 million per annum benefit by 2028 for every additional 100,000 non-broadband households which connect to fixed-line broadband.

Another way to look at this is: the broadband penetration rate in the UK is 95 per cent according to S&P Global, and in Australia it is 86 per cent according to the ABS.

If we were able to leverage the NBN to help bridge half this gap — just half — this could produce an economic benefit of \$4.2 billion per annum by 2028.

The size of the social benefits generated by the nbn project depend upon the network being utilised – the higher the take-up of the network, the greater will be the impact of the network on the Australian economy, business ecosystem and individual users.

## Economics of the nbn

Although NBN Co faces economic regulation on the revenues it can earn on nbn services, NBN Co's prices fall much below the caps implied by regulation. The reason for this is that NBN Co's ability to raise its prices is constrained by market forces, such as those arising from competition in the form of alternative fixed and wireless options, and the ability to pay of its users.

In its 2018-2021 Corporate Plan, NBN Co stated a target monthly average revenue per user (ARPU) of \$52 by 2021, representing significant growth on 2017 ARPU of \$43. In 2018, ARPU increased marginally to \$44, and the ARPU for half-year 2019 increased again to \$45. These small year-on-year increases suggest that it may be challenging for NBN Co to achieve its target of \$52 by 2021. The extent to which NBN Co will be able to achieve its revenue growth depends on expected increases in end-user willingness to pay, increases in data consumption, speed tier mix and business market opportunities.<sup>6</sup> However, an increase in consumers' willingness to pay over time is uncertain.

Notwithstanding uncertainty in NBN Co's ability to recover its efficient costs, NBN Co remains a monopoly provider of fixed broadband infrastructure and so faces a degree of choice over the level of prices it sets for users, who each place a value on their willingness to pay for the nbn. If NBN Co sets prices for wholesale broadband services that are relatively high, this can have the effect of restricting the number of users on the network. Put differently, by targeting large increases in ARPU, NBN Co appears to be focusing on profit rather than on utilisation of the nbn (and, therefore, on the social benefits of the network).

## Efficient pricing

It is commonly accepted that infrastructure owners ought to be able to earn enough revenue from users to recover their efficient costs, including a reasonable return on the relevant capital investment. If revenue is

<sup>3</sup> NBN Co, *Connecting Australia*, 2018, p 14.

<sup>4</sup> NBN Co, *Connecting Australia*, 2018, p 14.

<sup>5</sup> Michelle Rowland MP (Shadow Minister for Communications), *Address to CommsDay Summit: Labor's responsible plan to improve the nbn*, 9 April 2019, [http://www.michellerowland.com.au/speech\\_address\\_to\\_commsday\\_summit\\_labor\\_s\\_responsible\\_plan\\_to\\_improve\\_the\\_nbn\\_9\\_april\\_2019](http://www.michellerowland.com.au/speech_address_to_commsday_summit_labor_s_responsible_plan_to_improve_the_nbn_9_april_2019), accessed on 30 May 2019.

<sup>6</sup> NBN Co, *Corporate plan 2018-2021*, p 53.

restricted so that the asset owner cannot generate a return on investment, then the owner will have minimal incentives to invest in maintaining the asset, or to invest in new facilities.

Pricing of the services provided by infrastructure assets therefore requires striking a careful balance between enabling the asset owner to recover its efficient costs, without setting prices that are so high as to discourage user take-up of the service. The considerations that inform this balance will inevitably vary from one circumstance to another and may well be quite specific to the particular infrastructure service.

In circumstances where there are substantial public benefits to using the network, and where many of those benefits are dependent on the proportion of user take-up of the service, it is likely that the balance should be struck so as to give more emphasis to take-up of the service.

## Lessons from other infrastructure sectors

Infrastructure investment is undertaken through a range of financing and remuneration models, with these generally tailored to the particular circumstances, including the extent of (expected) private demand and public benefits generated by the infrastructure services.

The context for both the commercial objectives and economic regulation of infrastructure services varies from one sector to another, and care must be taken in drawing conclusions on the basis of observations from different industries. However, some lessons can be drawn from the diverse set of infrastructure experiences.

These lessons are:

- the public funding of infrastructure, often coupled with the presence of significant public social benefits (positive externalities), tends to coincide with a limitation on the ability to recover all capital costs;
  - > publicly managed assets that generate substantial public benefits are also less likely to have a purely commercial objective than assets that do not generate such levels of public benefits;
- perhaps obviously, the presence of substitutable services, such as road transport over rail, or non-tolled road routes over toll roads, often places a material constraint on ability of an infrastructure service to recover all its costs; and
- willingness to pay and the take-up of an asset may also be quite different from expectations established at the point at which a decision was made to construct the relevant asset.

The experience of the nbn project has strong parallels with several other infrastructure sector investments but, in our opinion, most closely resembles the circumstances and experience of toll roads. The similarities arise because, in contrast to many other monopoly infrastructure services we have identified, toll roads have close demand substitutes in the form of alternative, non-tolled roads. This introduces an additional layer of uncertainty in forecasting demand for the infrastructure.

Similarly, the nbn faces a material degree of competition in the form of affordable 4G (and soon to be 5G) delivered broadband services. Wireless broadband is an imperfect substitute for fixed broadband, and the extent to which 5G may constrain the nbn's services in the future is unknown.

Investment in a substantial infrastructure asset does not necessarily confer to the owner an enduring ability to recover sufficient revenues to cover its costs of investment, particularly where there are substitutes or where the service is otherwise non-essential (and so willingness to pay is constrained), and where demand is uncertain.

In addition, both toll roads and the nbn generate substantial positive externalities, so that the social benefits of their use each extend beyond the interests of individual users. Toll roads generate positive externalities in the form of reduced congestion and improved road safety. Of itself, this consideration is grounds for mitigating the expectation that a commercial return should be generated on public funding in investment projects that generate such benefits. In such circumstances, it is likely that the public interest requires the

striking of the balance we describe above more towards short and long term maximisation of use of the service, over long term recovery of the original investment cost.

The nbn project is now in a mature phase of its investment process, and the costs associated with the decision to undertake the project have largely been incurred. There is no available decision that will bring those costs back. Reflecting the strong desirability of assessing striking the right balance by taking a forward-looking perspective, in our opinion there is a substantial risk that NBN Co's current corporate objectives are giving rise to pricing decisions that prioritise capital cost recovery over breadth of take-up of the service. This seems highly likely to compromise the potential gains in welfare from a faster, more widespread take-up of fixed line broadband services.

## Recommendations

Our discussion highlights that:

- there is a need for more explicit recognition that, despite an original intention for a commercial return, the nbn project meets a societal need for near universal access to high speed, fixed line broadband service;
- NBN Co's corporate objective should be amended so that maximising utilisation of the nbn takes priority over the maximisation of revenue; and
- there should be no requirement to derive a commercial return on the investment in the public (social) benefits of the network.

This amounts to striking a better 'balance' in the trade-off between short term allocative efficiency over long term dynamic efficiency, on a spectrum of competing objectives that is usually present in most, commercially delivered infrastructure.



# 1. Introduction

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We have been asked by Telstra to review NBN Co Ltd's (NBN Co) wholesale broadband pricing objectives and evaluate these against an economic framework for efficient pricing of large infrastructure assets in Australia.

The particular focus of our review is whether NBN Co's pricing and commercial objectives, as developed in conjunction with its government shareholders, ought to be refined in light of the significant public benefits arising from NBN Co's broadband network.

This report is structured as follows:

- section two describes NBN Co's function, objectives and context;
- section three describes an economic framework for evaluating the pricing strategy of large infrastructure investments such as the nbn network;
- section four draws on case studies from other large infrastructure assets in Australia, being electricity, water, coal export facilities and associated port infrastructure, and toll roads; and
- section five applies the economic framework and learnings from other sectors to draw a conclusion on NBN Co's present pricing objectives and strategy.



## 2. NBN Co

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NBN Co is a publicly owned company, specifically established to design, build and operate the national broadband network (nbn).

This section sets out the function, objectives, and political context for NBN Co's pricing objectives and strategy.

### 2.1 Wholesale provider

As a wholesale-only provider, NBN Co sells capacity on the network to retail service providers (RSPs) under open access conditions. RSPs provide broadband internet and phone services to individuals and businesses.

NBN Co charges RSPs a fixed monthly fee for each RSP end-user, called an Access Virtual Circuit (AVC) charge. The AVC is the bandwidth allocated to the end-user premises, and the AVC charge depends on the maximum bit rate requested. The second charge is the Connectivity Virtual Circuit charge (CVC), which depends on the maximum capacity that the RSP wants to flow between the RSP's network and the nbn at the point that the two networks connect.

### 2.2 Corporate objectives

NBN Co has a number of main corporate objectives, including:

- coverage, ie, access to the nbn for Australian homes, schools and businesses;
- affordable prices; and
- a mandate to operate its business on a commercial basis.

We describe each of these objectives below.

#### 2.2.1 Coverage

The coverage objective of the nbn is that all Australian homes, schools and businesses have access to affordable, high-speed broadband services. NBN Co maintains a national wholesale pricing structure, under which is obliged to charge uniform prices across Australia, on a non-discriminatory basis, using a mix of technologies.

This directive was set out in NBN Co's first Statement of Expectations (SoE):<sup>7,8</sup>

The Government's objective for NBN Co is to connect 93 per cent of Australian homes, schools and businesses with fibre-to-the-premises technology providing broadband speeds of up to 100 megabits per second, with a minimum fibre coverage obligation of 90 per cent of Australian premises. All remaining premises will be served by a combination of next-generation fixed wireless and satellite technologies providing peak speeds of at least 12 megabits per second.

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<sup>7</sup> NBN Co Ltd, *Statement of Expectations*, 20 December 2010, p 1.

<sup>8</sup> The Shareholder Ministers of NBN Co issue strategic guidance through a document called the Statement of Expectations (SoE). The SoE forms an important part of NBN Co's governance framework. The current Statement of Expectations was issued on 24 August 2016, and replaced previous statements (issued in April 2014, September 2013 and December 2010).

In the current SoE, the parameters of the ubiquitous reach objective were re-stated as expecting the network to provide peak wholesale download data rates of at least 25 megabits per second to all premises, and at least 50 megabits per second to 90 per cent of fixed line premises as soon as possible.<sup>9</sup>

NBN Co has been directed by government to prioritise locations that are poorly served, to the extent that is commercially and operationally feasible. Extending high-speed broadband to regional, remote areas is complicated and expensive. Put simply, in these areas, demand will not cover costs.

An expert panel commissioned to review the progress of the nbn estimated that the cost of deploying and operating NBN Co's fixed wireless network and satellite service may be around \$5 billion in net present value (NPV) terms, compared to benefits in the order of \$1 billion NPV.<sup>10</sup>

### 2.2.2 Affordable prices

An implementation study by KPMG and McKinsey strongly emphasised that prices should be set to promote take-up and affordability goals.<sup>11</sup>

Wholesale prices for NBN services should be set to meet the goals of affordability and take-up. [...] NBN Co's immediate priority should be take-up of service, which will require wholesale pricing that provides retailers with a better business case on fibre than they currently enjoy on copper, for a significant portion of their customer base.

Both the SoE and NBN Co's corporate plan reference the objective for wholesale prices to be affordable. Notwithstanding, NBN Co's pricing strategy does not appear to give any significant weight to this objective.<sup>12</sup>

From a policy perspective, one key aspect of migration to the nbn is that consumers switching to the nbn should not be left worse off by paying more, or getting less.<sup>13</sup> However it does not appear that nbn prices are consistent with this objective. As recently stated by Australian Competition and Consumer Commission (ACCC) Chairman Rod Sims:

We are observing prices of low-speed NBN plans offered to new customers that are at least \$10 per month higher than what consumers paid for equivalent plans on the ADSL network. [...]

NBN pricing overall is no longer being set by reference to the prices that were available on ADSL networks. [...]

We are quite possibly charting a course that favours meeting NBN Co's revenue projections, at the expense of the NBN's potential to benefit the economy, and consumers.

### 2.2.3 Commercial mandate

NBN Co is directed to act commercially in its current SoE.<sup>14</sup>

nbn should pursue these objectives [the broadband policy objectives] and operate its business on a **commercial basis**. [emphasis added]

At the project's outset, claims were made that it would be a compelling commercial venture for personal investment,<sup>15</sup> and that none of the project's costs would be borne by the taxpayer. This view was supported

<sup>9</sup> NBN Co Ltd, *Statement of Expectations*, 24 August 2016, p 1.

<sup>10</sup> NBN Panel of Experts, *NBN market and regulation report*, 1 October 2014, page 11, para 1(d).

<sup>11</sup> KPMG and McKinsey & Co, *Implementation study for the national broadband network*, 2010, p 32.

<sup>12</sup> Based on HoustonKemp review of the NBN Co corporate plan and website.

<sup>13</sup> Rod Sims, *NBN affordability a growing issue*, Address to CommsDay Summit, Sydney, 8 April 2019.

<sup>14</sup> NBN Co Ltd, *Statement of Expectations*, 24 August 2016, p 1.

<sup>15</sup> <https://www.malcolmturnbull.com.au/media/address-to-the-national-conference-on-corporate-turnarounds-transformation>, accessed 26 June 2019.

in the implementation study, which estimated an internal rate of return for the project of between six and seven per cent.<sup>16</sup>

A commercial mandate establishes conflicting incentives from those set by NBN Co's coverage objective. This conflict has been acknowledged by NBN Co. In 2010, Mike Quigley, the then-CEO of NBN Co, remarked:<sup>17</sup>

So who should own the wholesale network? If it is in private hands, you would expect the management of the wholesale company to strive to maximise shareholder returns. We should not expect national interests, including the guarantee of good service to rural and remote communities, to be top of the priority list.

## 2.3 Economic regulation of NBN Co

NBN Co is subject to price regulation by the ACCC. A key part of the regulatory framework is NBN Co's Special Access Undertaking (SAU), which governs the prices that NBN Co can charge for the services it provides to RSPs, as well as other terms. The current SAU was accepted by the ACCC in December 2013.

### 2.3.1 SAU

The SAU sets out:

- NBN Co's annual revenue requirement;
- a cap on price increases of consumer price index (CPI) inflation less 1.5 per cent;
- the calculation of NBN Co's Regulatory Asset Base (RAB); and
- information disclosure requirements.

NBN Co states in its SAU that:

NBN Co will be allowed the opportunity to recover its costs over time (inclusive of an appropriate return on capital), but no more.

The terms of the SAU set an upper limit on the revenues that NBN Co may recover, often referred to as a revenue ceiling. Under the SAU, NBN Co is able to recover a return on capital, a return of capital (depreciation), and to recover its operating expenses. NBN Co's return on capital is set by a weighted average cost of capital (WACC) which includes a return on initial losses (unrecovered costs). The WACC reflects the opportunity cost of invested capital to government. The nominal WACC has ranged from 5.6 per cent to 10.2 per cent from FY09 to FY17, based on NBN Co's regulatory information.

Although the revenue ceiling is potentially applicable in each year of the SAU, it will not have an impact on NBN Co's pricing decisions until such time as NBN Co has recovered its initial losses and generated the required return on those losses. There is a likelihood that the revenue ceiling may never have any restrictive effect on NBN Co's pricing decisions.<sup>18</sup>

Recent analysis by Frontier Economics has echoed these sentiments, stating that NBN Co's accumulated losses are growing at a rate that outstrips its current and future ability to recover them.<sup>19</sup>

Telstra has observed that the price caps under the SAU are significantly higher than NBN Co's current discount offers.<sup>20</sup> NBN Co does not appear to have any formal projections as to when it anticipates that the

<sup>16</sup> KPMG and McKinsey & Co, *Implementation study for the national broadband network*, 2010, pp 38 and 359.

<sup>17</sup> Mike Quigley, *speech delivered at Charles Todd Oration*, 18 August 2010.

<sup>18</sup> NERA Economic Consulting, *Review of the long term revenue constraint in NBN Co's SAU*, 18 January 2013, pp 7-8.

<sup>19</sup> Frontier Economics, *Writing down the NBN: requisite or red herring?*, February 2019, p 2.

<sup>20</sup> Telstra, *Submission to NBN Co – Special Access Undertaking LTRCM 2017-18*, 21 December 2018, p 3.

combination of take-up and prices will be sufficient for NBN Co to earn revenue that approaches its SAU-specified cap, and so there are no projections capable of abating the uncertainty as to whether the current regulatory constraint on NBN Co will ever be binding on NBN Co's pricing decisions.

## 2.4 Social benefits of the nbn

The premise for the investment in a super-fast national broadband network was to drive productivity:<sup>21</sup>

*Australia's future productivity, competitiveness and wealth creation relies on world class infrastructure. In the global economy of the 21<sup>st</sup> century, no aspect of infrastructure is more crucial than advanced communications networks.*

*[...] For Australia to turn around its declining productivity, we must have a national fibre to the node network.*

National access to the nbn has been associated with driving Australia's economic prosperity, competitiveness of small business, creating new markets for businesses and new jobs for Australians, enabling access to services like e-health and e-education, and promoting media diversity.<sup>22</sup>

In 2018, NBN Co commissioned advisory firm AlphaBeta to measure the 'nbn effect' on Australian lives and the economy.<sup>23</sup> AlphaBeta estimated that the additional GDP estimated to be enabled by the nbn in 2017 to be \$1.2 billion.<sup>24</sup> The same report estimates that the nbn's impact on GDP is set to grow to \$10.4 billion per annum in 2021.<sup>25</sup>

AlphaBeta compared regions where the nbn was connected to those regions where the nbn has not yet been connected, and found that:

- new business growth was five times faster in nbn access network connected regions;<sup>26</sup>
- women are more likely to become self-employed in connected regions;<sup>27</sup> and
- the nbn project improved Australia's internet equality and decreased the proportion of people without access.<sup>28</sup>

These productivity benefits are of social or public nature, because they accrue to Australia as a whole, rather than only to the users of the network. The size of the social benefits generated by the nbn project depend upon the network being utilised – the higher the take-up of the network, the greater will be the impact of the network on the Australian economy, business ecosystem and individual users.

AlphaBeta's base modelling appears to assume a take-up of 8.6 million premises by 2021, a take-up rate of 73-75 per cent of premises.<sup>29</sup>

<sup>21</sup> Australian Labor Party, *New directions for communications: a broadband future for Australia – building a national broadband network*, March 2007, p i.

<sup>22</sup> Australian Labor Party, *New directions for communications: a broadband future for Australia – building a national broadband network*, March 2007, p 1.

<sup>23</sup> NBN Co, *Connecting Australia*, 2018.

<sup>24</sup> NBN Co, *Connecting Australia*, 2018, p 14.

<sup>25</sup> NBN Co, *Connecting Australia*, 2018, p 14.

<sup>26</sup> NBN Co, *Connecting Australia*, 2018, p 8.

<sup>27</sup> NBN Co, *Connecting Australia*, 2018, p 10.

<sup>28</sup> NBN Co, *Connecting Australia*, 2018, p 12.

<sup>29</sup> AlphaBeta *Connecting Australia: summary of methodology*, 2018, p 10, which references NBN Co, *Corporate plan 2018-2021*, p 43.

In her address to CommsDay Summit on 9 April 2019, Shadow Minister for Communications Michelle Rowland shared research undertaken the Parliamentary Library on estimated additional economic benefits to Australia of improving household broadband take-up, undertaken by the Parliamentary Library:<sup>30</sup>

Based on the World Bank modelling, the Parliamentary Library found that the Australian economy would realise an \$800 million per annum benefit by 2028 for every additional 100,000 non-broadband households which connect to fixed-line broadband.

Another way to look at this is: the broadband penetration rate in the UK is 95 per cent according to S&P Global, and in Australia it is 86 per cent according to the ABS.

If we were able to leverage the NBN to help bridge half this gap — just half — this could produce an economic benefit of \$4.2 billion per annum by 2028.

### 2.4.1 Digital inclusion

One important social impact of the nbn project is its effect on digital inclusion. Digital inclusion refers to the extent to which a population is able to connect to online communities, information and other services. In 2016, Australian Bureau of Statistics (ABS) data showed that over 2.5 million Australians were not internet users.<sup>31</sup> This becomes increasingly problematic as digital inclusion is fundamental to full participation in today's economic and social life, and internet access is increasingly regarded as an essential service.<sup>32</sup>

The Australian Digital Inclusion Index (ADII), developed by researchers at RMIT together with Telstra and Roy Morgan, measures Australia's online participation across the dimensions of access, affordability and digital ability. The most significant themes from the ADII include that:

- overall, digital inclusion in Australia has improved over the period 2014 – 2018;
- digital inclusion varies by State, with the Australian Capital Territory (ACT) having the highest, and South Australia having the lowest, inclusion score;
- the gaps between digitally included and excluded Australians are substantial, and widening for some groups;<sup>33</sup>
  - > in general, Australians with the lowest levels of income, education and employment are significantly less included;
  - > the gap between the highest and lowest income houses has widened since 2014, as has the gap between older and younger Australians, and those employed and those outside the labour force.

The most recent ADII report states that there is emerging evidence that the nbn rollout is starting to have a positive impact on digital inclusion – primarily relating to the access dimension, rather than affordability or digital ability.<sup>34</sup> Increasing digital inclusion is an important social benefit of the nbn project.

<sup>30</sup> Michelle Rowland MP (Shadow Minister for Communications), *Address to CommsDay Summit: Labor's responsible plan to improve the nbn*, 9 April 2019, [http://www.michellerowland.com.au/speech\\_address\\_to\\_commsday\\_summit\\_labor\\_s\\_responsible\\_plan\\_to\\_improve\\_the\\_nbn\\_9\\_april\\_2019](http://www.michellerowland.com.au/speech_address_to_commsday_summit_labor_s_responsible_plan_to_improve_the_nbn_9_april_2019), accessed on 30 May 2019.

<sup>31</sup> Australian Bureau of Statistics, *Household use of information technology 2016-17*, 2018.

<sup>32</sup> Thomas, J, Barraket, J, Wilson, C, Ewing, S, MacDonald, T, Tucker, J and Rennie, E, *Measuring Australia's digital divide: Australian digital inclusion index 2017*, RMIT University, p 5.

<sup>33</sup> Thomas, J, Barraket, J, Wilson, C, Ewing, S, MacDonald, T, Tucker, J and Rennie, E, *Measuring Australia's digital divide: Australian digital inclusion index 2017*, RMIT University, p 5.

<sup>34</sup> Thomas, J, Barraket, J, Wilson, C, Ewing, S, MacDonald, T, Tucker, J and Rennie, E, *Measuring Australia's digital divide: Australian digital inclusion index 2017*, RMIT University, p 44.

## 3. Economics of infrastructure assets in Australia

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This section discusses issues relevant to the economics of pricing and managing infrastructure assets.

In particular:

- regulation for monopoly infrastructure assets should enable service providers to recover the prudent and efficient costs of delivering services;
- the existence of substantial, upfront or lumpy investment requirements alongside relatively low ongoing operating costs of using the infrastructure service creates a tension in the application of the principles identified above;
- a monopoly supplier of services has choices in relation to the price (and quality) it sets for its service;
- relatively low access prices will increase the number of users in the short term, while reducing dynamic incentives for technical innovation and new investment in the long term; and
- it may be appropriate to place greater weight on the take-up of the service rather than commercial incentives in circumstances where there are substantial public benefits to using the network and where many of those benefits are dependent on the proportion of user take-up of the service;

We also set out different mechanisms for funding infrastructure assets, particularly in the presence of significant positive externalities, and the costs incurred by taxpayers in the provision of the nbn.

### 3.1 Conventional framework for regulating monopoly services

The economic framework and pricing principles for regulated monopoly infrastructure assets are well established, being that:

- prices should be set to enable the service provider to recover the prudent and efficient costs of delivering the service;
- the service provider should have a reasonable assurance that costs efficiently incurred, including a return on capital costs, will be recovered over the life of the investment;
- consumers must be protected from the ability and incentive of the service provider to raise prices above the cost of supply in a substantial or sustained manner – so that consumption or use of the service is consistent with maximising consumer welfare; and
  - > in the presence of significant social benefits associated with the infrastructure, these must also be taken into account as part of an assessment about maximising consumer welfare; and
- incentive mechanisms should be put in place that promote investment by the service provider to achieve productive efficiency gains, ie, to find the least-cost combination of capital and operating inputs.

Prices that are consistent with these objectives will generally promote the efficient allocation and use of resources and capital invested, including by encouraging customers to use the allocatively efficient amount of such services.

### 3.2 Substantial, lumpy investments

The existence of substantial, upfront or lumpy investment requirements alongside relatively low ongoing operating costs of using the infrastructure service creates a tension in the application of the principles identified above. In particular, the objective of being able to generate sufficient revenue to recover the cost of delivering the service (including all of its capital costs) may conflict with the parallel objective of maximising the social benefits of the network through encouraging take-up.

Of all infrastructure services, this tension is greatest in circumstances where the initial costs of providing the services are substantial and largely one-off in nature.

The nbn strongly exemplifies these characteristics. The nbn project is one of Australia's most substantial infrastructure investments, involving an equity funding commitment of \$29.5 billion.<sup>35</sup> Once the rollout is expected to be complete, the total and debt equity requirements of NBN Co are expected to be approximately \$50 billion.<sup>36</sup>

The nbn project is now in a mature phase of its investment process, and the costs associated with the decision to undertake the project have largely been incurred. The up-front investment costs have been funded by government.

### 3.3 Constraints on the ability to recover costs

Regulating infrastructure monopolies by means of the framework set out above is relatively straightforward (at least conceptually) in situations where the efficient, cost-recovery price is below the price that the monopoly provider would otherwise be able to set.

In contrast, where the efficient, cost-reflective price suggested by conventional economics is above the price that the monopoly would otherwise set, the service provider instead faces pricing constraints that are determined by market rather than regulatory factors. NBN Co is a prime example of such circumstances – its ability to set prices and so the revenues it is able to earn is not constrained by regulatory arrangements but rather by market considerations, such as competition from alternative fixed and wireless broadband options, and users' ability or willingness to pay for its services.

Notwithstanding the constraints faced by NBN Co's ability to recover its costs, NBN Co remains a monopoly supplier of fixed broadband services,<sup>37</sup> and so has choices in relation to the price (and quality) it sets for its wholesale service. These constraints are determined by end users' willingness to pay for the nbn and substitute wireless services available to them. The consequence is that NBN Co is in a position to make choices as to the level of prices it sets and so the degree of implicit restriction it imposes on the number of users on the network. Those choices manifest as to the degree of priority that NBN Co gives to revenue maximisation over encouraging maximum take-up of its broadband service.

### 3.4 Efficient pricing

'Efficiency' is a term of art in economics and is widely accepted by economists as having three distinct dimensions. These are:

- productive efficiency, concerned with the means by which goods and services are produced, is attained when production takes place with the least-cost combination of inputs;
- allocative efficiency, concerned with what is produced and for whom, is attained when the optimal set of goods and services is produced and allocated so as to provide the maximum benefit to society, although:
  - > in markets where there are material externalities in supply or consumption, any assessment of allocative efficiency must also take these into account; and
- dynamic efficiency, which is concerned with society's capacity to achieve the efficient production and allocation of goods and services through time, in the face of changing productivity and/or technology (which reduces the cost of production and alters the optimal mix of inputs), the changing preferences of consumers, and the competing demands of consumers and producers in different periods.

<sup>35</sup> NBN Co, *Corporate plan 2019-22*, section 2.4.7, page 64.

<sup>36</sup> Parliamentary Budget Office, *National Broadband Network | Impact on the budget*, 2016, p vi.

<sup>37</sup> Australia's legacy copper ADSL and cable broadband networks are not sustainable competitors to the nbn over the medium term. Existing ADSL services will no longer be provided to premises from 18 months after the nbn is available.



Relatively low access prices will increase the number of users in the short term, while reducing dynamic incentives for technical innovation and new investment in the long term.

### 3.4.1 Welfare maximising prices

The Hilmer Committee recognised that there is no universally appropriate framework for the efficient structure and level of pricing for infrastructure assets, ie:<sup>38</sup>

Neither the application of economic theory nor general notions of fairness provide a clear answer as to the appropriate access fee in all circumstances. Policy judgments are involved as to where to strike the balance between the owner's interest in receiving a high price, including monopoly rents that might otherwise be obtainable, and the user's interest in paying a low price, perhaps limited to the marginal costs associated with providing access.

It is commonly accepted that infrastructure owners ought to be able to earn enough revenue from users to recover their efficient costs, including a reasonable return on capital investment. If revenue is restricted so that the asset owner cannot generate a return on investment, then the owner will have minimal incentives to invest in maintaining the asset, or to invest in new facilities.

Pricing of infrastructure assets therefore require striking a careful balance between enabling the asset owner to recover its efficient costs, without charging prices that are so high as to unnecessarily discourage user take-up of the service. The considerations that inform this balance will inevitably vary from one circumstance to another and may well be quite specific to the particular infrastructure service.

In circumstances where there are substantial public benefits to using the network and where many of those benefits are dependent on the proportion of user take-up of the service, it is likely that this balance should be struck with greater weight given to take-up of the service.

## 3.5 Funding infrastructure assets

The nbn has strong positive externalities, or 'social benefits' as described in section 2.4 above. It is common for governments to fund these kinds of large infrastructure projects, because such investments are likely to be undersupplied by the private sector. This is because, in general, the positive social benefits that accrue cannot be fully captured through private prices. The private profits to investors will not therefore supply a full-strength signal to potential investors about the total (social and private) worth of the investment.

Recognising the social benefits of an infrastructure asset in setting prices requires that general taxpayers fund more of the investment (ie, government funding), rather than users, relative to infrastructure assets that do not generate material social (public) benefits.

Government faces a spectrum of financing options in providing funding for a publicly-owned investment. These options include a mixture of utilising existing cash flows (bootstrapping), debt or equity funding, as well as grant funding (ie, direct subsidies), financed by means of its tax base. The government must strike the efficient balance across these available options, carefully weighing up the complex sets of costs and risks associated with each.

In the 2018-19 budget strategy and outlook paper, the authors acknowledged that although the Commonwealth has traditionally supported new infrastructure indirectly by providing grant funding, more recently it has started to use a wider range of methods to support infrastructure, including equity investments, concessional loans at reduced interest rates, and guarantees over specific project risks.<sup>39</sup>

<sup>38</sup> *National Competition Policy Report (The Hilmer report)*, 25 August 1993, p 253.

<sup>39</sup> Treasurer of the Commonwealth of Australia, *Budget strategy and outlook: budget paper no. 1 2018-19*, 8 May 2018, pp 4-13.

### User-pays options

Government funding via a combination of debt, equity and/or bootstrapping implies that the cost of the infrastructure is funded by users over the life of the asset. There are a number of important considerations for and against recovering the total cost of the nbn from its users.

A key potential benefit of user-pay options is that it may provide a clear price signal to users on the cost of the network. However, price signals to users are blunted by the community service obligations (CSO) of NBN Co to cross-subsidise the network through national pricing and minimum service levels. In addition, in the face of positive externalities, a cost-reflective price would result in under-utilisation of the network, since the private equilibrium price and quantity would not take these social benefits into account.

User-pay options are consistent with concepts of equity that aim to ensure that those who receive the benefits from a government-provided service also pay for it. However in the case of the nbn, where there are widespread social benefits that do not simply accrue to individual users, it is unclear that the group receiving benefits from the nbn can be easily distinguished from the entire Australian population.<sup>40</sup>

### Positive externalities and public funding

Access to the nbn is expected to foster productivity, to provide a platform for innovation and to deliver economic and social benefits for all Australians.<sup>41</sup>

Ideally, wherever there is a combination of public and private benefits to be gained, these two forms of 'return' should be transparently measured and recorded, with the corollary that:

- there should be no requirement to derive a commercial return on the investment in public (social) benefits of the network; and
- a commercial return on investment should only be sought on the proportion of the investment that is put towards private investment.

Recognising that at least some proportion of the nbn investment represents the government's substantial investment into positive social outcomes, it could be considered double-counting to expect the nbn investment as a whole to generate a commercial return, even under an entirely user-pays model. In the absence of an ability to isolate these two investments and account for them separately, the expectation for a commercial return should nonetheless be tempered by the extent of social benefits.

### General taxation

It is commonly accepted that public goods should generally be funded from broad-based taxes.<sup>42</sup> However, most taxes result in some loss of economic efficiency, which affects both producer and consumer welfare. For example, taxes may alter individuals' incentives to work, to invest, or induce them to change their buying behaviour. Additional costs associated with taxation include enforcement costs, evasion costs and compliance costs.

The cost of these distortions give rise to losses in consumer welfare, ie, reduced consumption of goods and services. The consumer welfare losses will be greatest when demand is very responsive to small changes in the price of a good or service that is raised due to taxation, ie, where a small increase in price is met with a large decrease in demand. For this reason, governments may choose to target inelastic goods for higher rates of taxation.<sup>43</sup>

<sup>40</sup> This argument is made in *Australia's future tax system: report to the Treasurer*, December 2009, part 2, vol 2, p 325, in respect of roads.

<sup>41</sup> Nbn Co, *Statement of Expectations*, 24 August 2016, p 1.

<sup>42</sup> *Australia's future tax system: report to the Treasurer*, December 2009, part 2, vol 2, p 325.

<sup>43</sup> Connolly, S and Munro, A, *Economics of the public sector*, Pearson Education Limited, 1999, pp 186-187.

The stronger the positive externalities, the more there is to gain from a national policy of universal access to the nbn. However, the greater the proportion of Australia that is connected to the nbn, the higher the gross cost of establishing the network. To the extent that the nbn is funded through general taxation, the absolute value of the efficiency burden also increases with the extent of the population that may access the nbn.<sup>44</sup>

### 3.6 Taxpayer costs to date

The Commonwealth has provided \$29.5 billion in equity to nbn. In addition, the government has provided NBN Co with access to \$19.5 billion in debt on commercial terms, at a fixed interest rate of 3.96 per cent.<sup>45</sup>

NBN Co is a public non-financial corporation (PNFC). As such, NBN Co's activities do not affect the budget fiscal balance or underlying cash balance. Rather, the equity investment and loan provided to NBN Co sit as assets on the Government balance sheet, often referred to as 'off budget' funding.

These investments were funded by government debt, with an associated borrowing cost, approximately equal to the government five-year bond rate of 5.4 per cent as at November 2010.<sup>46</sup> The associated annual public debt interest (PDI) costs and interest receipts from the loan are included in the aggregate underlying cash balance. The Parliamentary Budget Office has previously estimated that the annual financing cost to government on the equity provided to NBN Co was around \$580 million in 2015-16, and expected to increase to \$2.1 billion in the year 2026-27.<sup>47</sup>

In order to avoid a net cost to the taxpayer, the project would need to yield a return to government that at least exceeds this borrowing cost. Although the initially projected internal rate of return (IRR) for NBN Co of 7.0 per cent exceeded the government five-year bond rate at that time, by 2013 the Strategic Review of the NBN estimated an IRR of 3.1 to 5.3 per cent.<sup>48</sup> This means that the investment in the nbn has not covered the government's borrowing costs, a cost that is also borne by the taxpayer.

As noted in a blog post by the Grattan Institute, in relation to PNFCs:<sup>49</sup>

Putting these projects off budget does not save taxpayers the cost of bad decisions. But it does kick the can down the road, leaving future taxpayers to pick up the tab for today's largesse. Equity injections into PNFCs are financed by government borrowing. And the interest bill on the growing stock of debt is starting to bite.

The total, final cost of the nbn to the taxpayer cannot be known with any precision unless/until such time as NBN Co is sold.<sup>50</sup> However, it appears that, despite initial claims that the nbn would be an appealing commercial venture, the nbn has already conferred material costs to the taxpayer. The key question moving forward is how much the taxpayers should pay, as compared to users.

We have noted that resolving such a question requires a balancing of competing economic considerations and, in the presence of relatively elastic demand and substantial social benefits, straightforward economic principles would suggest that to minimise social losses, a large proportion of costs should be borne by the taxpayer.

<sup>44</sup> This is because there is a direct, positive relationship between the amount of funding required and the total efficiency burden.

<sup>45</sup> Treasurer of the Commonwealth of Australia, *Budget strategy and outlook: budget paper No. 1, 2018-19*, 8 May 2018, pp 9-39.

<sup>46</sup> NBN Co, *Corporate Plan 2011-2013*, 2010, p 134.

<sup>47</sup> Parliament of Australia Parliamentary Budget Office, *National Broadband Network: impact on the budget*, 2016, p 5.

<sup>48</sup> NBN Co, *Strategic review*, December 2013, p 17.

<sup>49</sup> Terrill, M and Wood, D, *The infrastructure budget trap*, posted by John Menadue, 7 May 2018, <https://johnmenadue.com/marion-terrill-and-danielle-wood-the-infrastructure-budget-trap>.

<sup>50</sup> Parliament of Australia Parliamentary Budget Office, *National Broadband Network: impact on the budget*, 2016, p vi.

## 4. Lessons from other sectors

Infrastructure investment is undertaken through a range of financing and remuneration models, with these generally tailored to the particular circumstances and extent of external or non-monetisable benefits. The context for different asset valuation and regulation across industries and states varies, and care must be taken in drawing conclusions on the basis of observations from different industries. However, some lessons can be drawn from the diverse set of infrastructure experiences.

These themes are:

- the public funding of infrastructure, often coupled with the presence of significant public benefits, tends to coincide with a limitation on the ability to recover all capital costs;
  - > publicly managed assets that generate substantial public benefits are also less likely to have a purely commercial objective;
- perhaps obviously, the presence of substitutable services, such as road transport over rail, or non-tolled road routes over toll roads, often places a material constraint on ability of an infrastructure service to recover all its costs; and
- willingness to pay and the take-up of an asset may be quite different from expectations established at the point at which a decision was made to construct the relevant asset.

Table 4.1 below highlights some key characteristics of some of Australia's significant infrastructure assets.

Table 4.1 Features of infrastructure assets in Australia

|                             | Presence of substitutes? | Strong demand for service | Government ownership? | Social benefits beyond users | Ability to recover costs? |
|-----------------------------|--------------------------|---------------------------|-----------------------|------------------------------|---------------------------|
| Electricity network         | No                       | Yes                       | Now, generally, no    | Substantial                  | High                      |
| Gas pipeline infrastructure | No                       | Yes                       | No                    | Some                         | High                      |
| Water                       | No                       | Yes                       | Yes                   | Substantial                  | Medium                    |
| Coal export facilities      | No                       | Yes                       | Now, generally, no    | No                           | High                      |
| Toll roads                  | Yes (other routes)       | Uncertain                 | No / PPP              | Substantial                  | Low                       |
| NBN                         | Yes                      | Uncertain                 | Yes                   | Substantial                  | Low                       |

### 4.1 Electricity network and gas pipeline infrastructure

#### 4.1.1 Electricity networks

Electricity networks are natural monopolies that are characterised by very large fixed costs and relatively low marginal operating costs. Networks have millions of individual customers with inelastic demand, very limited countervailing bargaining power, and limited ability to substitute to other energy sources. Electricity is considered a necessity, makes up a relatively small proportion (approximately two per cent) of household

expenditure, and willingness to pay is high. In the absence of economic regulation, electricity networks have strong ability to exercise substantial, enduring market power.

Because of this strong ability and incentive to exercise market power, and noting that electricity is an essential for all Australians, comprehensive revenue cap rules exist to both ensure consumer protection and capital cost recovery.

Following a number of reviews undertaken in the late 1980s and early 1990s, the Council of Australian Governments (COAG) agreed to implement the reforms necessary to facilitate the development of an integrated and competitive electricity market in eastern Australia (ie, the National Electricity Market (NEM)). This decision triggered a wave of structural and regulatory reforms that entailed, amongst other things, the vertical and horizontal disaggregation of government-owned monopolies, the privatisation of generation, network and retail assets in some jurisdictions, and the removal of regulatory impediments to competition in the generation and retail markets.

In December 2005 the Ministerial Council on Energy (MCE) established an expert panel on energy access pricing to advise on a model to achieve a common approach to revenue and network pricing across the energy market.<sup>51</sup> These rules have since undergone a series of reviews, reform and testing of these reforms.

The National Electricity Law (NEL) established the Revenue and Pricing Principles for distribution network service providers (DNSPs). These principles set out that a network business should have a reasonable opportunity to recover its efficient costs and should be provided with incentives to promote efficiency.

#### 4.1.2 Gas pipeline infrastructure

Gas pipelines have natural monopoly characteristics. There are only a very small number of cases where different transmission pipelines are competing for the transportation of gas to the same demand centres. Pipelines are not tightly constrained by competition from alternative energy sources, the risk of stranding, any countervailing power of shippers or by the threat of regulation. Gas pipeline infrastructure typically faces strong, inelastic demand with high willingness to pay in excess of costs.

All gas pipelines are subject to some form of regulatory oversight. The extent of regulation on a pipeline depends on the extent of third party access, the capacity of the pipeline and the extent to which a pipeline operator is considered to have substantial market power. Other 'regulation factors' include the presence and extent of barriers to entry in a market for pipeline services, actual and forecast demand for pipeline services, any network externalities between a natural gas service provided and any other service provided by the service provider in any other market, and the elasticity of demand.

## 4.2 Water and wastewater sector investment

Water services are considered essential to industry, and to communities and individual consumers. Water utility companies have natural monopoly characteristics, with capital expenditure representing the majority of total costs, and relatively low operating and maintenance costs. As such, water service providers are typically geographic monopolists.

The provision of water and wastewater services generates substantial public benefits for health, the economy and the environment. In light of substantial public benefits, it is not surprising that there is a high proportion of public sector financing and continued government ownership in the water and wastewater sector.

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<sup>51</sup> Expert Panel on Energy Access Pricing, *Report to the Ministerial Council on Energy*, April 2006, p 6.

Because water infrastructure services are highly capital intensive, relatively minor variations in the rates of return and/or the asset values on which they are sought can have a significant impact on pricing. In addition, the inclusion or exclusion of contributed assets has a substantial impact.<sup>52</sup>

#### Water services reform

In 1994, the COAG agreed to implement a strategic framework for the reform of the Australian water industry. A key element of the strategy framework agreed to by the COAG involved the development of a water pricing regime which was founded on the principle of full-cost recovery, formalised in the COAG pricing principles. The COAG principles endorse the use of the deprival value for valuing assets in the water industry, unless 'specific circumstances' justified another approach.

#### Pricing principles

Historically, water services were charged at below cost, sending inefficient pricing signals. Under the National Water Initiative (NWI) Pricing Principles, water businesses must charge between the lower bound and upper bound pricing, being:<sup>53</sup>

- lower bound pricing – water services recover their ongoing costs and an allowance for future asset replacement and refurbishment; and
- upper bound pricing – full cost recovery under the NWI that involves all costs of providing water services, including a market-reflective return on the capital used to provide them and a full recovery of that capital.

The National Water Commission derived a set of principles for government subsidies of irrigation assets, being that:<sup>54</sup>

- government contributions to investments should be proportional to the value of the public benefits produced by the investments, and the public benefits should be transparently estimated;
- where government provides capital funding for investments that produce private benefits, the full costs (including a return on capital) should be recovered from the beneficiaries over the life of the project using consistent methods; and
- water users should be informed about the immediate and future implications for water charges.

#### **Principle 6: Community Service Obligations<sup>55</sup>**

Where practical, jurisdictions should aim to reduce or eliminate subsidies or Community Service Obligations. Any shortfall between the revenue required to achieve cost recovery from water users and the total costs recovered through water charges, should be transparently reported.

#### Line in the sand valuation in NSW

In New South Wales (NSW), asset valuations were established by the Independent Pricing and Regulatory Tribunal (IPART) in the price determination in 1996: the 'line in the sand' valuation. A line in the sand practice differentiates between legacy investment decisions and new investment decisions and essentially locks in the opening RAB value to be rolled forward.

The line in the sand valuation represented a substantial asset write-down. In 1998-99, Sydney Water valued its assets at \$12.6 billion (in its annual report), compared to a regulatory asset value of \$5.4 billion for 1999-

<sup>52</sup> ESCOSA, *Urban water pricing processes inquiry 2004-05 – Final Report*, section 4.6, p 33.

<sup>53</sup> Department of Agriculture and Water Resources, *National Water Initiative pricing principles*, April 2010, p 4.

<sup>54</sup> National Water Commission, *Australian water reform 2009: second biennial assessment of progress in implementation of the National Water Initiative*, 2009.

<sup>55</sup> Department of Agriculture and Water Resources, *National Water Initiative pricing principles*, p 15.

00.<sup>56</sup> More generally, line in the sand approaches often lead to valuations that are lower than the commonly used depreciated optimised replacement cost (DORC) valuation.<sup>57</sup>

With regards to bulk water pricing in NSW in the 1998-99 and 1999-00 determination, the National Competition Tribunal disallowed a rate of return on past investment on the basis that previous investments in the NSW water industry were not undertaken for commercial reasons, which resulted in effective price decreases.

### 4.3 Coal export facilities and associated port infrastructure

The vast majority of Australian coal is exported. Australia, along with Indonesia, exports the largest volume of coal in the world. Coal is generally transported by rail from mines to port terminals with coal handling facilities so that it may be shipped to its final destination. Coal mines typically purchase the services required to transport the cargo.

Key components of the export supply chain are monopolies; critical gateways for coal export with little to no substitutes. Coal producers have high willingness to pay for coal export services, and the coal export and associated port infrastructure services are a minor cost element in the context of the overall cost of producing and exporting coal.<sup>58</sup>

Capital city ports have all been privatised. Port of Newcastle, the world's largest coal export port, was privatised in 2014 with a sale price of \$1.75 billion. The new owner revalued its port assets to \$2.4 billion shortly thereafter.<sup>59</sup>

Coal terminals have also generally been privatised, and some are vertically integrated upstream into coal production.<sup>60</sup>

### 4.4 Construction and operation of toll roads

Since the early 1990s, toll road projects have been undertaken by Public Private Partnerships (PPPs). Toll roads have helped to ease congestion in large capital cities, generating public benefits in the form of reduced travel time and vehicle operating costs, and improved safety.<sup>61</sup>

Despite their public benefits, many recent toll road projects have failed, primarily due to unrealistically high traffic (demand) forecasts. These projects have been unable to generate sufficient revenue to enable a normal rate of return, or even to recover the investment of capital.

Unlike many other monopoly infrastructure assets described in this section, toll roads have close demand substitutes in alternative, non-tolled roads. This introduces an additional layer of uncertainty in forecasting demand for the infrastructure.

Examples of privately financed toll road failures include:

- Cross City Tunnel (Sydney) – the project was undertaken as a PPP with no intended net cost to Government, and opened in August 2005. Observed traffic volumes were much lower than forecast, and

<sup>56</sup> Independent Pricing and Regulatory Tribunal, *Sydney Water Corporation – prices of water supply, sewerage and drainage services, medium-term price path from 1 October 2000*, September 2000, p 21.

<sup>57</sup> Greg Houston and Jeff Balchin, *Initial value of regulatory assets – the Australian experience*, Presentation to the Electricity Distribution and Gas Pipelines Workshop, 24-25 February 2010, Slide 7.

<sup>58</sup> See, for eg. National Competition Council, *Revocation of the declaration of the shipping channel service at the Port of Newcastle, statement of preliminary views*, para 6.87, p 40.

<sup>59</sup> Rod Sims, *Ports: What measure of regulation - keynote address at Ports Australia Conference*, October 2016. Accessible at <https://www.accc.gov.au/speech/ports-what-measure-of-regulation>

<sup>60</sup> For example, in Queensland, The Hay Point Coal Terminal, Adani Abbot Point Terminal and Wiggins Island Coal Export Terminal are each vertically integrated into mining.

<sup>61</sup> Department of Infrastructure and Regional Development, *Toll Roads in Australia: Information Sheet 81*, p 1.

below break-even volumes. The private consortium went into receivership in December 2006, and the tunnel was sold for \$695 million in June 2007 – while the total cost of the tunnel was estimated at around \$800 million;

- BrisConnect (Brisbane) – the airport link tunnel connecting Brisbane Airport with the CBD was completed in July 2012. Initial forecasts that the Airportlink would attract 170,000 vehicles per day were met with actual volumes of less than 50,000 daily users;<sup>62</sup>
- Lane Cove Tunnel (Sydney) – the tunnel opened in early 2007. The tunnel's owners, Connector Motorways, went into receivership in January 2010 after traffic volumes failed to meet expectations. The Tunnel was purchased for \$630 million in May 2010; and
- Clem Jones Tunnel (Brisbane) – the tunnel runs for 4.8 kilometres under central Brisbane. It was opened in 2010 by RiverCity Motorway, costing around \$3.2 billion. Patronage was much lower than forecast, and the company was placed in receivership in 2011 owing \$1.3 billion to its syndicate of banks.

The Department of Infrastructure and Regional Development information sheet on toll roads presents a comparison of daily forecast versus actual traffic on Australian toll roads, reproduced below:<sup>63</sup>

Table 4.2 Forecast and actual daily volumes on select toll roads

| Toll Road         | Forecast daily volume | Actual daily volume |
|-------------------|-----------------------|---------------------|
| Cross City Tunnel | 85,000                | 27,000              |
| Lane Cove Tunnel  | 104,786               | 44,420              |
| Clem7, Brisbane   | 60,000                | 26,711              |

Source: Black, J, *Traffic risk in the Australian toll road sector*, Public Infrastructure Bulletin, Vol. 1, Issue 9, 2014, p 5

As a result of the failed toll road projects, the nature of private sector involvement has changed, being less inclined to take on demand risks.<sup>64</sup> Government will now typically take the construction cost risk, and then turn the operation to private sector.

For example, the Toowoomba Second Range Crossing project, a bypass route to the north of Toowoomba, currently under construction, is being funded on an 80:20 basis by the Australian and Queensland governments.<sup>65</sup> The PPP involves up-front contributions for construction, and ongoing service payments over the 25-year operation and maintenance stage, dependent on performance of the project.

A key lesson from the toll road sector is that the investment in major infrastructure does not necessarily enable the asset owner to generate sufficient revenue to recover costs, or to enable a normal rate of return. In light of the substantial public benefits in the form of reduced congestion and traffic time, as well as safety, the inability to recoup costs does not necessarily suggest that toll roads are not economic, but that public funding and/or underwriting of risk may be required to generate the public benefits.

<sup>62</sup> See <https://www.abc.net.au/news/2015-11-24/brisbanes-troubled-airportlink-sold-at-almost-60pc-loss/6968586>, accessed 9 March 2019.

<sup>63</sup> Black, J, *Traffic risk in the Australian toll road sector*, Public Infrastructure Bulletin, Vol. 1, Issue 9, 2014, p 5.

<sup>64</sup> Magner 2016, cited by Department of Infrastructure and Regional Development, *Toll Roads in Australia: Information Sheet 81*, p 4.

<sup>65</sup> Queensland Treasury website, <https://www.treasury.qld.gov.au/growing-queensland/project-procurement-and-advisory/toowoomba-second-range-crossing/>, accessed 12 March 2019.



Once constructed and opened, a toll road that fails to recover its economic costs remains a valuable infrastructure asset and can continue to be operated and generate a return on an appropriately valued asset base. In a quote for the ABC, the Brisbane Lord Mayor stated of the Clem7 tunnel:<sup>66</sup>

My reaction is of course that I'm very sad for small investors who've lost money, but having said that, the fact remains that this project, this tunnel will be open for 100 years.

## 4.5 Conclusion – lessons from other sectors

Public funding of infrastructure projects tends to be greater when there is a relatively high proportion of non-monetisable benefits, and where there are substantial risks, either from the cost or demand side. Where public benefits are substantial, these offset an expectation of generating a normal return on the asset base.

NBN Co has closest parallels to the toll road example, by virtue of:

- the existence of societal objectives that may be difficult to monetise, eg, universal service, wider benefits of service;
- the existence of somewhat close substitutes, ie, wireless broadband;
- substantial, up-front construction cost/project delivery risk; and
- substantial demand risk.

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<sup>66</sup> See <https://www.abc.net.au/news/2011-02-25/clem7-operator-placed-in-receivership/1958924>, accessed 12 March 2019.

## 5. Application to NBN Co

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The nbn project is expected to generate large productivity gains, impacting on Australia's economic prosperity, competitiveness of small business, creating new markets for businesses and new jobs for Australians, enabling access to services like e-health and e-education, and promoting media diversity.

Notwithstanding the public benefits that may accrue from the nbn, the expectation that NBN Co will generate a normal return on investment is increasingly unrealistic. Consistent with the experience in the construction and delivery of many toll roads, NBN Co is not guaranteed of generating sufficient revenues to recover all of its capital costs.

Like toll roads, the quantum and growth rates of willingness to pay for high speed broadband has been, and continues to be, a major source of uncertainty throughout its project life. Research on broadband demand suggests that elasticity of demand is relatively high, such that a higher-than-optimal price is likely to give rise to large distortions and welfare losses.<sup>67</sup>

In particular, the NBN Expert Panel report found that the greatest value of higher speed broadband is for improving speeds when and where they are lowest, and that the value to users of additional higher speeds diminishes as speeds increase.<sup>68</sup> Put differently, for most households or individuals, a 50 megabit per second broadband connection is not considered twice as valuable as a 25 megabit per second connection, and a user would not be willing to pay double for the twice the speed.

In the case where publicly funded infrastructure generates significant public benefits, there is a strong economic case for striking a balance that gives more emphasis to maximising those public social benefits through take-up, and less emphasis to earning a commercial return. NBN Co's SoE and corporate plan, by contrast, emphasise commercial returns and do not have any explicit objective in relation to maximising the take-up of broadband services.

The nbn project is now in a mature phase of its investment process, and the costs associated with the decision to undertake the project have largely been incurred. There is no available decision that will bring those costs back.

Reflecting the strong desirability of striking the right balance by taking a forward-looking perspective, in our opinion there is a substantial risk that NBN Co's current corporate objectives are giving rise to pricing decisions that prioritise capital cost recovery over breadth of take-up of the service. This seems highly likely to compromise the potential gains in welfare from a faster, more widespread take-up of fixed line broadband services.

### 5.1.1 Recommendations

Our discussion highlights that:

- there is a need for more explicit recognition that, despite an original intention for a commercial return, the nbn project meets a societal need for near universal access to high-speed, fixed-line broadband service;
- NBN Co's corporate objective should be amended so that maximising utilisation of the nbn takes priority over the maximisation of revenue; and
- there should be no requirement to derive a commercial return on the investment in public (social) benefits of the network.

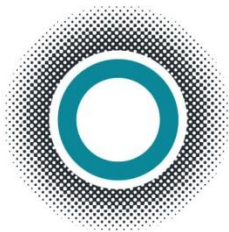
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<sup>67</sup> NBN Panel of Experts, *NBN market and regulation report*, 1 October 2014, p 20.

<sup>68</sup> NBN Panel of Experts, *NBN market and regulation report*, 1 October 2014, p 57.

This amounts to striking a better 'balance' between short term allocative efficiency over long term dynamic efficiency that is usually present in most, commercially delivered infrastructure.





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