Enhancing NBN's Value

Comparing NBN with Australia's Top 10 Trading Partners and OECD

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Abstract: The NBN, Australia's National Broadband Network, is nearing its 2020 completion. The value of the NBN depends on what you compare it to. While Australia's broadband has significantly improved over the last ten years, it is useful to compare Australia's NBN with similar activity in the OECD and with Australia's Top 10 Trading Partners to gain a richer understanding of NBN's value. Australia's broadband performance compares poorly with other OECD countries on download speed, especially over 100 Mbps download subscriptions and average download speed. However, imminent release in May 2020 of new NBN gigabit pricing could significantly improve Australia's world ranking on this average download speed comparison. Recommendations for improving NBN's value beyond speed are made, including encouraging affordable gigabit NBN services; ongoing NBN upgrades; encouraging NBN use; focussing NBN Corporate Reporting on customer satisfaction and ongoing international comparison.

Keywords: NBN, Broadband, International comparison, Value, Australia.

Introduction

This paper is an expanded version of a presentation at TelSoc's NBN Futures Forum – Learning from International Experience (TelSoc, 2020), 25 February 2020, and a submission to the Joint Standing Committee on the NBN, *Inquiry into the business case for the NBN and the experiences of small businesses* (Parliament of Australia, 2020). The data, presentation and Parliamentary submission are available at Figshare (Ferrers and OECD, 2019). The NBN, Australia's National Broadband Network, is a $51 billion investment "to lift the digital capability of Australia" (NBN Co., 2019a, p.4), to "ensure all Australians have access to high-speed, resilient and secure broadband" (NBN Co., 2019a, p.12) and "to foster productivity and provide a platform for innovation in order to deliver economic and social benefits for all

Australians" (NBN Co., 2016). The NBN is an important foundation infrastructure on which to build Australia's innovation future.

Value is a way of understanding a complex, dynamic innovation like NBN. But what is value? Value is how we work out what something is worth, individually and socially through valuing practices (Ferrers, 2013; 2018). Value is also the emotional attitude we have toward something, either positive or negative, strong or weak. Value is also a way of understanding the complexity of modern innovation, as a personal emotional response to fast-moving new products and services. NBN triggers emotional reactions from many people, which evidences their assessment of NBN's value. One valuing practice is *comparing*. We assess a thing's value by placing it next to something else. Therefore, I compare NBN with other countries' overseas broadband experience and national broadband plans, and it helps to understand NBN better. I use data from OECD, and then narrow in to examining Australia's Top 10 Trading Partners, based on Australia's exports and imports (OEC, n.d.).

Broadband is often thought about in terms of speed, upload and download. But it also has other important dimensions, such as price and reliability and technical aspects, such as latency. The Broadband Commission, which encourages nations to improve their broadband, sets seven goals for broadband in their 2025 Targets (ITU/UNESCO, n.d.). The major targets include:

- A national broadband plan (or strategy or including broadband in the universal service definition)
- Affordability in terms of a per cent of income
- User penetration, i.e. that the network is used, aiming at 75% worldwide (and lower in developing countries).

Other goals of the 2025 Targets include skills to use broadband, for instance amongst the elderly, the unemployed or other disadvantaged groups; digital financial services; use of broadband by SMEs (small and medium businesses); and lastly "gender equality across all targets".

The Broadband Commission also sees broadband more broadly:

> "The concept of '*meaningful universal connectivity'... encompasses broadband adoption that is not just **available**, **accessible**, **relevant** and **affordable**, but also that is **safe**, **trusted**, **empowering users** and leading to **positive** impact."* (ITU/UNESCO, 2019, p. ix)

This paper seeks to consider what is NBN's value (more broadly), through comparing Australian consumer experience with other countries' experience. I will look at: (1) Where have we come from?; (2) Where do we stand now?; and (3) Where are we going with the NBN? NBN

Co. also provided a view (AlphaBeta, 2019) of where it stands internationally after public pressure about falling in Speedtest rankings, which I will touch on later.

Where have we come from?

In 2020, the NBN rollout is nearly complete, but where were we ten years ago? In 2009, Australia, according to ABS (2009), had 10% of internet subscriptions still on dial-up services, using 100 MB per month. Faster DSL and cable services were averaging 6 GB per month. NBN Co., the builder of the NBN, reports average usage in late 2019 of 255 GB per month (NBN Co., 2019a, p.24). Thus, over ten years there was substantial progress in data activity. Similarly in speed, ten years ago only around 10% had a service faster than 25 Mbps, and a substantial proportion of users were on less than 2 Mbps (see Figure 1 below; which follows OECD's best-at-leftside-of-graph convention).

OECD collects data from 36 member countries (OECD, 2019), including about broadband in a Broadband Portal (OECD, 2018). Included for each country is the number of broadband subscriptions at various speeds. Australia is a member of OECD, but not all of its major trading partners are. OECD (2018) data reports Australia had only around ¼ of services at over 25 Mbps, with the rest under 25 Mbps. Later versions of this OECD (2018) data, since I downloaded the report (Ferrers and OECD, 2019), interestingly, no longer provide an Australia subscription speed breakdown, reporting only total users.
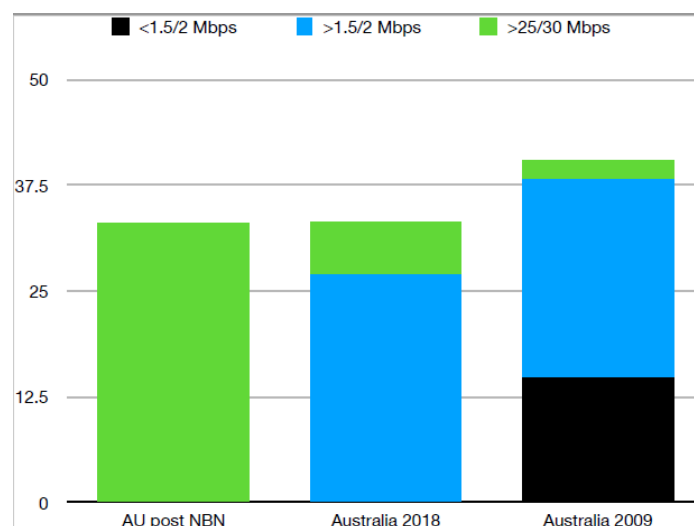

Figure 1. Australia Broadband Download Speeds 2020, 2018, 2009 – Subscriptions per 100pp. ABS (2009) 8153.00, OECD (2018), Author estimate post-NBN usage.

By the end of the initial NBN rollout (June 2020), everyone will have at least 25 Mbps services, per the NBN *Statement of Expectations* (NBN Co., 2016); 90% of fixed line services will have access to 50 Mbps service. Thus, over ten years, broadband has had substantial progress in Australia. Yet, despite the progress, much of the attitude towards the NBN is vocally negative.

Perhaps this is because NBN users compare their current service with what might have been under a full fibre rollout, or what they experience in other countries. I turn to this next.

Where are we now?

The OECD provides broadband usage statistics every two years from 36 countries (OECD, 2019). The latest speed and usage data available were for the end of 2018 (OECD, 2018). The statistics include number of subscriptions and prices, but of interest in this value analysis is how many subscriptions are at various speeds: over 100 Mbps, under 25 Mbps, and 25-100 Mbps. This data provides useful insight into what customers are prepared to pay for. It signals the value to consumers of the various broadband speeds. Another data source on broadband usage is the Ookla Global Speed Index. In this section, we look at Australia's ranking in both datasets.
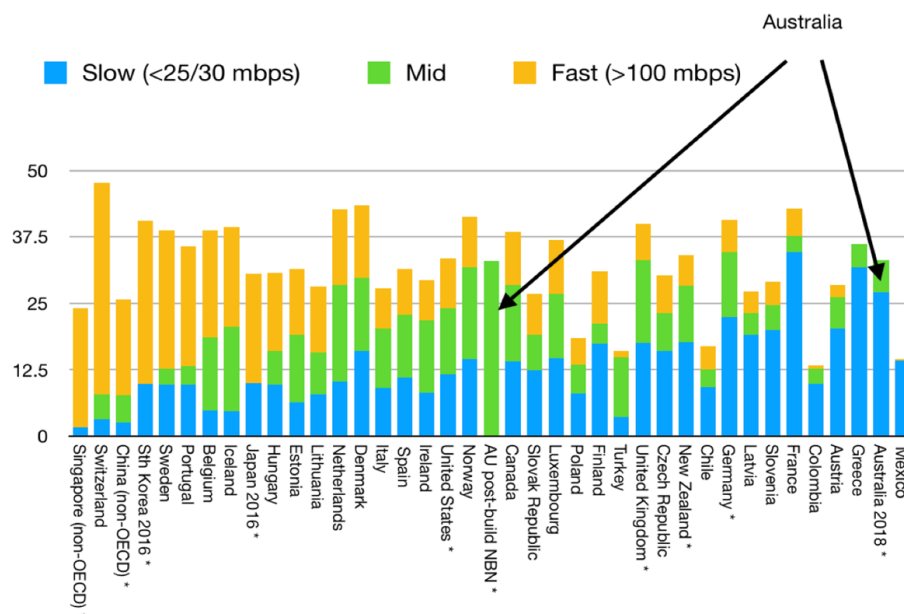

Figure 2. Australia Broadband Download speeds vs OECD (2018), plus China, Singapore (sorted by average speed). NB: * indicates one of Australia's Top 10 Trading Partners. Source: Ferrers and OECD (2019).

Firstly, ranking the OECD countries by average download speed, Australia in 2018 is placed near the bottom (see Figure 2, which again follows OECD's best-at-left-side convention). But with expected speed increases (at least 25 Mbps for all, 90% with 50 Mbps), Australia jumps to mid-range in the average speed rankings. NBN Co. noted this increase in performance, particularly that Australia's average speed would jump ahead of France, Germany and New Zealand, based on their 2018 reported broadband performance levels. However, the Speedtest Global Index, a monthly national broadband speed table (Ookla, 2019), reveals countries' average speeds are increasing, often at 30%, and sometimes 100% in a single year. A graph of this data is provided below (Figure 3). So, comparing Australia's performance in 2020 against

other countries' OECD 2018 broadband performance, as a proxy for their 2020 performance, is problematic due to the fast-changing nature of this data.

A few points are obvious from the graph (showing the 36 OECD countries, plus Singapore and China):

- Many countries (except Australia) report very fast services (at over 100 Mbps). Australia reports Nil in this category, but ACCC (n.d.) reports at the end of 2018 show around 400,000 NBN connections at 100 Mbps, similar to Austria. This level of very fast broadband, however, would only lift Australia one place in the ranking. The lack of very fast services puts our national average close to the bottom. Later, I will show that only a few per cent of very fast services can significantly lift Australia's average national broadband speed.

- Even countries with lots of very fast broadband (e.g. Japan, South Korea) still have substantial services on slow speeds (less than 25 Mbps).

- Post NBN build, I assumed all Australians would have minimum 25 Mbps services, so Australia would be the exception with no slow-speed users. However, Australia has one million NBN users on 12 Mbps (ACCC, 2020), which has not reduced as millions of new NBN users switch to or join NBN on 50 Mbps, even though faster services are available.

The OECD graph shows many more countries than can be explored in depth in this paper. Therefore, I choose to narrow the comparison to those countries with which Australia has strongest links, in terms of exports and imports. Looking at the Top 10 Trading Partners would include around 70-80% of Australia's exports and imports. Other possibilities are to compare Australia to similar area countries (e.g. Canada, China), high broadband countries (e.g. Sweden), and our local neighbours (e.g. New Zealand, Indonesia). Trading partners are a sensible choice for comparison, since our trade (both imports and exports) shows who Australia, in the world, is most connected to. I used data from the OEC (n.d.) which identifies Australia's major trading partners as:

- OECD countries: Germany (DE), Japan (JP), New Zealand (NZ), South Korea (SK), United Kingdom (UK), United States (US);

- Non-OECD countries: China (CN), India (IN), Singapore and Thailand (TH).

These ten countries provide an interesting mix of local and distant, small and large area, small and large populations, G20 and other countries.

The Broadband Commission shows national broadband plans for several OECD countries in its State of Broadband Report (ITU/UNESCO, 2018, p. 37). In Table 1, I compare the national broadband plans of Australia's Top 10 Trading Partners, expanding on the State of Broadband

Report ([ITU/UNESCO, 2018](#)), looking at their planned national speed and penetration targets. But I have collated plan details for all ten major trading partners (see Appendix 1, Parliamentary Submission, [Ferrers and OECD, 2019](#)). I summarise those (see Table 1), then examine in a little more detail, three countries – China, South Korea and Thailand (as representative of the variety of our trading partners' approaches to their national broadband plans). Conveniently, the Broadband Commission provides links to all countries' national broadband plans. Interestingly, there are now over 150 countries with national broadband plans, up significantly from when Australians first nationally considered the NBN in the 2007 Federal election, when there were only 34 such plans ([ITU/UNESCO, 2019](#)).

Table 1. National Broadband Plan targets – Australia's Top 10 Trading Partners.
Source: Broadband Commission ([2018](#)), Appendix 1, Ferrers and OECD ([2019](#)) Parliamentary Submission.

Broadband Penetration Target	Speed		
	Slow	**Medium**	**Fast**
High	AU 100% 25 Mbps UK 95% 25 Mbps TH 95% broadband	DE 100% 50 Mbps IN 100% 50 Mbps NZ 99% 50 Mbps	SK 99% 100 Mbps
Medium		AU 90%* 50 Mbps	
Lower **Missing**: Singapore, Japan **NB**: * Urban		CN 70%* 50 Mbps	US 80% 100 Mbps CN 50%* 100 Mbps plus some gigabit TH cities 100 Mbps (2020) IN gigabit to villages (2020), multi-gigabit (2022)

Source: ITU/UNESCO ([2018](#)); China ([2013](#)); Thailand ([MICT, 2015](#)); India ([n.d.](#)).

Australia's national broadband target is similar to Germany, New Zealand, India and China targets in speed (50 Mbps). Australia has similar 100% coverage speed targets (25 Mbps) to the United Kingdom and Thailand. However, Australia's main speed target is slower than several Trading Partners, such as the United States, Thailand and South Korea's faster target (100 Mbps). Thus, Australia's NBN speed target, like our OECD NBN post-build ranking, is middling: not too fast, not too slow. Similarly, if you compare OECD ([2018](#)) reported speeds with these countries, we are similarly mid-ranked (but I found no current data for India or Thailand).

A second data source to use to compare Australia to our trading partners is the Speedtest Global Index ([Ookla, 2018](#); [2019](#)) data which is updated monthly with national speed averages. Similar to OECD ([2018](#)) data, Australia performs poorly relative to the trading partners, only coming in ahead of India. Using data from Ookla for two years, it is also possible to see the change over one year (from end 2018 to end 2019).

Table 2. Ookla (2018; 2019) National Average Download Speed: Australia's Top 10 Trading Partners

Country	2018 (Mbps)	2019 (Mbps)	Increase (Mbps)	Increase (%)
Singapore	200	190	-10	-5
South Korea	110	160	50	50*
United States	110	130	20	20
Thailand	55	110	50	100
New Zealand	85	105	0	20
Japan	100	105	5	5
China	85	100	20	20
Germany	65	80	20	20
United Kingdom	55	65	10	20
Australia	33	42	10	30
India	26	38	10	50

NB:* South Korea fell from 130 Mbps (in 2017), so increase is a bounce-back. All figures rounded.

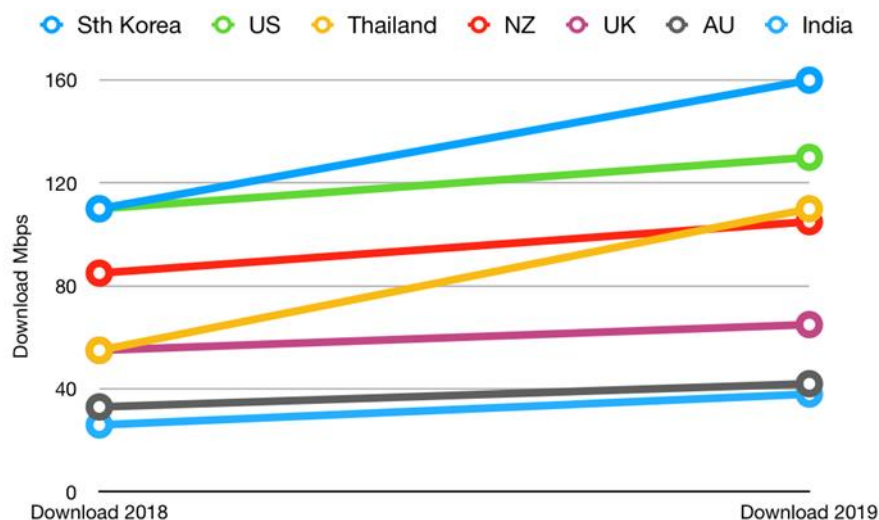A graphical version of Table 2 is shown in Figure 3.

Figure 3. National Average Download Speed, per Ookla Speedtest Global Index (Dec 2018, 2019). NB: Japan, China (removed) similar to New Zealand. Germany (removed) similar to United Kingdom.

A few points from this graph are:

- Every country is following a similar trajectory of around 20-30% growth in speed per year, as shown by parallel increases – India, Australia, United Kingdom, New Zealand, United States; a jump of 10 Mbps in the slower countries and 20 Mbps in the faster countries. Thus, looking at OECD (2018) figures, which are over a year old, is likely to underestimate national average speeds by 20-30% per year. Hence NBN Co.'s suggestion (NBN Co., 2019b), using 2018 OECD data, that a post-build NBN will be faster in 2020 than France, Germany or New Zealand (AlphaBeta, 2019), is unlikely to be realised.

- A couple of countries showed a greater increase than 30%: Thailand jumped 100% from 55 Mbps to 110 Mbps in just one year, and South Korea jumped from

100 Mbps to 160 Mbps. South Korea had fallen from 130 Mbps in the year before (2017), so seems more like a statistical aberration. However, the Thailand download gain seems worthy of further investigation below.

- The Speedtest average for Australia in late 2019 is 42 Mbps, quite similar to my estimate of 50 Mbps average for a post-build Australian average national download speed. What this average doesn't make obvious is that the slowest NBN Co. plan (12 Mbps) continues to retain around one million NBN users, which is unchanged by the large recent increase in faster 50 Mbps services (ACCC, n.d.).

I now examine three countries in more detail – China, South Korea and especially the substantial speed rise in Thailand.

Case 1: South Korea

South Korea is held up as a leader in broadband and has been for several years (Labour, 2019). This can be seen by its new national target that 50% of premises will be able to access 10 Gbps by 2022 (Wang, 2018), an order of magnitude faster than Australia in early 2020. Reports from the United Kingdom (Labour, 2019) compared the United Kingdom broadband capability unfavourably to South Korea and Japan in the lead-up to the United Kingdom late-2019 election, and referenced both Japan and South Korea having 99% of their homes able to access the best broadband – fibre to the home (FTTH). FTTH is regarded as the gold standard for broadband (Gregory, 2019), compared to the multi-technology mix (MTM) of Australia. Looking deeper into broadband in South Korea, however, shows that South Korea has an MTM too (Netmanias, 2018); even though there is widespread (99%) access to FTTP, take-up is less widespread (see Table 3 below).

Over the last ten years, HFC has remained a significant proportion of South Korea's broadband, falling from 5 million connections (2006) to 4 million connections in 2017. Fibre over that time increased significantly from nothing to nearly 8 million connections, while xDSL services fell from 6 million to 1 million premises. A fourth type of broadband, called LAN (UTP), seems to be FTTB, that is, broadband to apartment buildings using copper (unshielded twisted pair; UTP) to deliver broadband into apartments. LAN (UTP) has risen from 3 million connections in 2006 to over 8 million in 2017, even more popular than FTTH. Some observers might combine LAN (UTP) and FTTH as fibre connections, making fibre some 75% of total broadband services. However, South Korea appears to have an MTM like Australia, given its considerable use of HFC, notwithstanding nearly everyone could have FTTH (99% access) if they wanted to use it. FTTH is available, but not used, everywhere.

One lesson from South Korea (see Table 3) is to "improve, improve, improve". Improve your strong technologies and reduce your weaker technologies. Similarly for NBN Co., a priority

after finishing the build is to start the next phase of improvements, which I **recommend** below as an appropriate approach in Australia.

Table 3. South Korea Multi-Technology Mix. Source: Netmanias (2018)

Technology	2007 (Million Users)	2007 (%)	2017 (Million Users)	2017 (%)
FTTB (LAN-UTP)	3	21	8.5	40
FTTH	0	0	7.5	36
HFC	5	36	4	19
xDSL	6	43	1	5
Total	**14**	**100**	**21**	**100**

Case 2: China

China in contrast has used FTTH for a significant rollout since 2013 (see Table 4 below). Except for regional broadband, fibre is used, so it appears, in nearly all urban areas. China reports annually on their broadband status including fibre. China's plan in speeds is very similar to Australia, aiming for 70% penetration of 50 Mbps broadband, and 50% of homes to have access to 100 Mbps, plus some with access to gigabit (China, 2013). Australia's NBN is similar. It is committed to 50 Mbps for 90% of the fixed-line network, but it has capability for gigabit services for 55% of the NBN urban footprint, using a mix of FTTH, HFC and FTTC technologies (Fletcher, 2019; 2020).

Table 4. China Fibre Broadband User Subscriptions. Source: CNNIC (2018, 2019)

Date	Fibre User Subscriptions (M)	Fibre User Subscriptions (FTTH*) / Total Internet Users (%)	Fibre user Subscriptions at/over 100 Mbps (%)
Dec 2012	20.3	11.6	
Dec 2013	40.8	21.6	
Dec 2014	68.3	34.1	
Dec 2015	119.7	57.1	
Dec 2016	227.7	76.6	
Dec 2017	293.9	84.3	38.9
Dec 2018	368.3	90.4	70.3
Jun 2019	395.8	91.0	77.1

NB: * Includes FTTO – Fibre to the Office.

What is different about China is the level of usage of high speeds across their network (Table 4). China reports how many of their users are on the 100 Mbps speeds, and the numbers are extraordinary for a country of China's size, with some 480 million households (Euromonitor International, 2020). China reports in mid-2019 396 million fibre-using households and offices, which is over 80% of China's total 480 million households. With 77% Chinese households or offices on fast (at or over 100 Mbps) broadband services, this equates to over 300 million fast broadband subscriptions.

An interesting comparison with China is the next biggest broadband country, the United States. Both countries report that 90% of their homes can access 100 Mbps (FCC, 2019; CNNIC, 2019). As a proportion of users, in 2018 China had far greater fast broadband users than the United States (70% vs 28%; OECD, 2018), and a year later China had 77% premises on this speed.

Reflecting on lessons from China's broadband, and looking forward for Australia, and for the use of the NBN, post-build, in Australia, we want to be more in the position of China, with a well-used broadband network with a high proportion of users on the 100 Mbps service, than the United States, with a far smaller proportion of users on the 100 Mbps service. Therefore, I **recommend** *NBN Co. focus post-build on encouraging more high-speed network usage*. It is possible that China puts consumers on high-speed plans without them choosing high-speed plans. NBN Co. did a similar thing in Australia, by making 25 Mbps and 50 Mbps plans the same price. Major telcos like Telstra and Optus upgraded plans to 50 Mbps without asking consumers. China possibly has a similar situation where usage of fast services is not a choice.

One small extra data point is that China's ARPU (average monthly revenue per user) for fixed broadband is around $6 per month (China Mobile, 2019). Gigabit prices are expected to be around $60 per month (China.org.cn, 2019). Both prices are substantially lower than Australia, but the fast China gigabit service is priced at a significant premium (i.e. 10 times ARPU) to the typical broadband service.

Case 3: Thailand

A third country worthwhile to examine is Thailand, and especially its recent sizeable increase in average national broadband speed (per Ookla data, Table 2, Figure 3). Looking at local Thailand telecoms media reveals that Thailand has a recent sizeable population of fibre internet users. By 2018, there were 7 million fibre users, some 39% of 18 million Thai households. Around that time, there were price falls for gigabit services, which fell 70% (Bangkok Post, 2018) from around $500 per month to $140 per month. While average broadband users spend $30 per month (True Corp, 2019), the availability of gigabit services at more affordable prices may possibly explain the sudden 100% rise in national average broadband speed (see Table 2; Figure 3).

I examined some of the YouTube advertising for fast broadband services to see how Thailand was promoting such services. There were very generic business services (TrueInternet, 2014, 1:10), with interesting future-oriented tools (such as see-through iPads). Fibre to the home was promoted as more reliable, for instance during the heavy tropical rain in Thailand (Infographic Thailand, 2016, 0:53). Some suggested services on Thai broadband are very

familiar in Australia, including E-Shopping, E-Payment, E-Entertainment, E-Education, and perhaps less familiar services such as E-Medical and E-Security (FibreOne, 2016, 2:49).

Similarly in Australia, gigabit services are coming to a wider market as gigabit is enabled for HFC and FTTC services, beyond the current FTTP availability. NBN Co. has announced (NBN Co., 2019c) that a more affordable gigabit price will be available shortly. Current gigabit NBN services (Enterprise Ethernet; NBN Co., 2018) are around $800 per month (Aussie Broadband, n.d.), beyond the reach of most households, but targeted at business users and interestingly available on three-year plans to anyone in the fixed-line network, with free installation of fibre to any fixed-line premises (Aussie Broadband, n.d.). The new prices are expected to allow lower retail pricing in a few months' time, perhaps as low as $150-200 per month, with the possibility of even lower prices if retailers do not guarantee top speeds during congested peak hours. This is a key element of the future path of a post-build NBN.

Looking at these cases, Australia has a similar multi-technology mix as South Korea, but the higher installation of FTTH in South Korea (36%), Thailand (39%) and China (80%) goes a long way to explain Australia's poor comparative average download speed performance. I discuss national broadband averages in the next section. Interestingly, South Korea, which is seen as a world broadband leader, has FTTH available to 99% of homes, but it is only used by 36%, suggesting weak demand to increase speeds from slower-but-popular FTTB technology, used by 40% of Korean households. These cases paint a more complex picture of broadband demand. They do not show that Australia has a weak, slow NBN, requiring immediate upgrade to full fibre, but that Australia needs to, in part, emulate countries that are progressively working to improve their broadband capability. Australia is doing this too, especially with more widespread gigabit services coming available in mid-2020 to 55% of NBN residential premises (FTTP, HFC, FTTC), and available for all Australian fixed line business premises (through Enterprise Ethernet). But affordable gigabit is just one part of what I **recommend** as a broader commitment, through my five recommendations below, to enhancing the value of Australia's NBN. I turn now to what next for the NBN.

Where are we going?

In a few short months, the NBN will be declared built. If there is one thing Australia's political powers can agree on (as Minister of Communications, Paul Fletcher and Shadow Minister of Communications, Michelle Rowland did agree on when they introduced the first TelSoc Futures Forum (TelSoc 2019)), and with the NBN there are regrettably few things they agree on, it is that following the significant NBN investment, Australia needs:

(1) to "get the maximum social and economic impact from the $51 billion [of] taxpayer's money",

(2) to work out "how best to leverage this extraordinary national investment" (Minister Fletcher) and

(3) how to "maximise the benefit of [NBN] investment now and in the future" (Shadow Minister Rowland).

I have no doubt the next steps are twofold. Firstly, maximise use of the fastest speeds through the release, scheduled in May 2020, of new affordable gigabit plans. From May, FTTH, HFC and FTTC, some 55% of the fixed line network, are likely to be able to provide access for many significantly faster and significantly cheaper gigabit offerings. I foresee that the upcoming NBN "closing ceremony" and Press Release will celebrate the end of the NBN build and the release of affordable gigabit services. This is quite a contrast to earlier statements by NBN Co.'s CEO (Morrow, 2017) that "there is still minimal consumer demand for these ultra-fast speeds". The demand is not for speed at any price, but for speed at reasonable and affordable prices; for speed at a price which consumers see as *good value*. In contrast, New Zealand has 10% of its users on gigabit speeds (Crown Infrastructure Partners, 2019, p.6), though their prices are likely to be far lower (sometimes (Broadband Compare, n.d.; UFB NZ, n.d.) under $100 per month) than Australia's CVC-driven pricing. Therefore, I **recommend,** an important next step is *NBN Co. launch affordable gigabit services.*

One benefit of more widely used gigabit services is a likely significant impact on national average speed, with potential for large improvements in Australia's ranking in Ookla international rankings (Table 2, Figure 3). As a mathematical exercise (see Table 5), if post-build NBN average speed was 50 Mbps, then a 5% uptake of gigabit services would double average national speed to around 100 Mbps. A 10% uptake would triple average national speed to about 150 Mbps, and a 20% uptake would lift average national speed to 240 Mbps. A 5% gigabit uptake would put Australia at the top of the OECD (2018) national averages, but only lift Australia to 7th (equal) of our Top 10 Trading Partners. A 10% uptake would place us 3rd amongst our trading partners, and a 20% uptake would take us to first place. Table 5 summarises the impact of gigabit users on Australia's global speed ranking.

Table 5. Impact of gigabit users on Australia's national average download speed. Source: Author comparison

Scenario	Average Download Speed (Mbps)	Ookla Rank (2019) vs Top 10 Trading Partners	OECD Rank (2018)
Australia 2018 (OECD)	21	10th	35 / 36
Australia post-build NBN	50	10th	18 / 36
5% gigabit	98	Equal 7th	1 / 36
10% gigabit	145	3rd	1 / 36
20% gigabit	240	1st	1 / 36

The second obvious NBN step forward is to commit to ongoing improvements in the NBN. Table 5 shows the ranking leap is what I call a 'tyranny of averages'. Australia could place fastest amongst our Trading Partners (with a 20% gigabit uptake) but 80% of NBN users would have had no change in their broadband performance. And some NBN performance is poor. The NBN Fixed Wireless and Satellite services are guaranteed to deliver a minimum 25 Mbps (NBN Co., 2016), under the *Statement of Expectations*. Similarly, some of the FTTN services have only slow access speeds (less than 50 Mbps) – perhaps around 25% of FTTN connections — yet with 20% gigabit users, Australia would be the fastest amongst our peers, our Top 10 Trading Partners. It is to this 25% of poorest connections that some of the profits from NBN post-build should be directed to enhance the network for the worst-performing services. Therefore, I **recommend**: *Post-build NBN Co. continue to invest in enhancing the network for the worst-performing technologies and services.*

Conclusions/Recommendations

In conclusion, the initial NBN rollout is nearly complete, and we need to think about enhancing the value of the NBN after that. Comparing the Australian NBN to overseas approaches can shed new light on the value of our NBN. I propose several recommendations, which I made to the NBN Joint Standing Committee (Ferrers and OECD, 2019) *Inquiry into the business case for the NBN and the experiences of small business*, from my international comparative analysis above, including:

R1: NBN Co. launch gigabit services at affordable prices. Affordable network services indicate high value. And gigabit services will lift Australia's comparative international broadband download performance. New gigabit pricing is due in May 2020 (NBN Co., 2019c), so we will see if it is affordable.

R2: NBN Co. continue to invest to enhance the NBN post-build, especially for the poorest performing 25% of connections, from NBN generated cashflow, according to a new *Statement of Expectations*, preferably bipartisan. An improving network is enhancing its value.

R3: Focus NBN Co. on encouraging NBN usage, including affordable pricing, such as entry-level pricing of 50 Mbps (rather than 12 Mbps) service, and affordable gigabit pricing. NBN should have a high-performing but also highly used network (like China), rather than a less used network (like the United States). An unused NBN is low value.

For completeness, I include now two further value-enhancing recommendations I made to the Parliamentary Inquiry (Parliament of Australia, 2020), but which did not fit within the story in the paper above. These recommendations address feedback the Inquiry sought about the

following issues from its terms of reference: "a. the economics of the NBN including key operational and financial performance forecasts in the Corporate Plan 2020-23; c. network coverage issues, including reporting of outages; f. compliance with the NBN Statement of Expectations and the adequacy of that Statement". In value terms, these recommendations make NBN value more transparent by reporting regularly on customer satisfaction (R4) and international comparisons (R5).

R4: NBN Co. should listen to customers, plan for their satisfaction including targets in Corporate Reporting (such as speed, reliability, affordability and other dimensions as outlined in the Broadband Commission's 2025 Targets; ITU/UNESCO, n.d.), measure customer satisfaction (by relevant categories, such as technology, urban and rural, business and consumer) and report their satisfaction to the public within regular financial reports. Customer satisfaction is a key indicator of NBN value and enhancing customer satisfaction enhances NBN value.

R5: Given the above international comparison analysis has merit and value, NBN Co. Corporate Plans should include regular target setting based on international comparison with Australia's Top 10 Trading Partners, along key metrics, to reflect shareholder preference for relative performance against these countries. The NBN's value becomes more richly visible and understandable by comparing its performance to its international peers, particularly Australia's top 10 Trading Partners.

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