

The Gigabit Gap

A discussion paper on what's next for the NBN

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OMDIA - Foreword & Summary

NBN Co. has recently achieved its target of rolling out services across the nation – except for a very small number of complex premises numbering around 100,000 – representing less than 1% of total Ready to Connect (RTC) premises.

After 10 years the nationwide network deployment has been completed with over 90% of premises able to access download speeds of at least 50Mbps.

Having completed its coverage mandate, the question is now “What next for the NBN?”

For the past 10 years NBN has been focused on its network build and the migration of services onto the network.

Alongside these targets, management has been incentivized to achieve revenue targets, improve end user experience and enhance the reputation of the business.

While NBN will still be obliged to deploy additional network, the business is now set to transition to one focused on maximizing take-up and achieving positive cash-flows.

Ongoing investment

NBN will continue to have an extensive capital investment programme. NBN’s obligations to provide broadband access to new locations continues under the Statutory Infrastructure Provider legislation, extending the requirement to ensure availability of broadband with a download speed of at least 25Mbps on reasonable request.

NBN will also continue to compete to extend its wholesale network in Greenfield estates, as well as looking to invest to support its ambitions in the business segment.

The capital investment program will also focus on continuing to enhance retail service providers capabilities to support their end users and improve the overall user experience for subscribers.

The unanswered question for the industry and the broader community is to what extent NBN’s capital program will be directed towards upgrading the network?

NBN have outlined options for future upgrades across its network technology portfolio, and through the course of the build phase implemented upgrades, including enhancements to wireless capacity and upstream speeds on the HFC plant.

The ongoing upgrade of the network will in part be achieved through the replacement of network components that reached their end of life.

As is standard for telecommunication network operators, an allocation of 12 to 15% of revenues will be directed to capital expenditure.

While this will include the deployment of new network footprint, it importantly allows for the ongoing replacement of network components with new equipment with enhanced capabilities.

Work still to be done

While this replacement cycle allows for the progressive upgrading of network capabilities, this may not address some of the more challenging performance constraints of the network.

Addressing the remaining services where long copper loops, or degraded copper, result in performance below the 25Mbps and 50Mbps targets will need a more substantive plan.

Unfortunately, rather than just swapping out electronic components with new equipment, these areas require greater investment, most likely in the form of new fibre runs.

Future objectives

Of interest to the industry and the community will be the new targets set for the NBN. With completion of the mass market deployment, the privatization of the NBN moves up on the agenda and financial performance comes more into focus.

NBN has already successfully attracted financing from the private debt markets with facilities for A\$6.1 billion secured in May 2020.

Confidence that NBN will meet its target of achieving positive cash-flow in 2023 will determine the scope for further refinancing of the A\$19.5 billion debt facility provided by the Australian Government. The Government debt facility is expected to be substituted with private debt by June 2024.

To achieve its cash-flow objectives not only does the NBN need to continue to drive take-up and revenue per end user, expenditure on operations and investment in the network will be wound back considerably.

The challenge for management is to balance the need for continued service improvements with financial outcomes, particularly with privatization on the horizon.

Beyond this are national goals for using the NBN as a platform for competitive advantage and growth.

Unlike many of our trading partners Australia has not adopted an aspiration to be a gigabit enabled nation.

Gigabit services may not be an end in themselves but ensuring the NBN can continue to be a platform that facilitates Australia's digital evolution requires an expansive, and growing capability.

At this point parts of the network do support gigabit services, but current availability and retail pricing suggest these services will remain niche.

Building universal high-speed broadband to a large nation like Australia was an ambitious undertaking, with the completion of the mass market rollout it is timely to consider the next steps in the development of the NBN as a platform for Australia's digital future.

1: Introduction

Before the deployment of the National Broadband Network (NBN) the availability of high-speed broadband in Australia was almost exclusively the preserve of the 3 million or so homes able to access the Hybrid-Fibre Coaxial (HFC) networks deployed by Telstra and Optus in the mid-90s.

Although originally deployed to deliver pay TV services these networks were later engineered to deliver broadband and delivered speeds which well exceeded 100Mbps on the downstream service – although upload speeds were typically capped at around 2Mbps.

For those Australians not living in the 3 million premises able to access those HFC networks the best on offer were the ADSL2+ services available on the Telstra network and which delivered a top-speed of 24Mbps for those living appropriately close to the Telstra exchange.

However, as the Department of Communications *'Broadband Availability Report'* published in February 2014 demonstrated real world ADSL speeds experienced by most Australian homes and businesses were nowhere near those 24Mbps speeds – they were, in fact, well below that level.

Indeed, the landmark report – the first time the Federal Government had tracked broadband availability in this manner – showed that 3.7 million ADSL homes could receive peak speeds of only 9Mbps and 900,000 ADSL homes could only receive peak-speeds of 4.8Mbps.

Table 1: Non-NBN Australian fixed-broadband access - 2013

Technology	Speed	Premises
HFC	100Mbps+	3 million
ADSL	24Mbps	9.9 million
No Access	N/A	0.7 million

Source: Department of Communications

At a time when a single HD video stream consumed around 5Mbps of bandwidth just by itself then these speeds were clearly nowhere near adequate for the vast majority of homes and businesses in Australia.

Of course, most of the country was already well aware that there was a serious problem with broadband quality and speeds with the issue tackled by both the Howard Government and the Rudd Government.

On coming to power with a plan for a nationwide FTTN network the Rudd Government broadband policy – continued by the Gillard Government – evolved into the creation of a Government Business Enterprise in the form of NBN Co to deliver a national wholesale broadband network.

NBN Co was subsequently tasked with delivering Fibre-to-the-Premises to 93% of premises in the country with the remaining 7% connected by Fixed Wireless and Satellite technologies.

Network construction of the FTTP network started in 2010 with NBN Co announcing the locations of the fortunate 'first release' sites that would be able to connect to the network.

By June 2013, just a couple of months out from the Federal Election at which the second Rudd Government would lose power to the Coalition, the NBN FTTP network was Ready to Connect at nearly 150,000 premises of which around 30,000 premises had activated services on the NBN.

Following a series of reviews incoming Communications Minister Malcolm Turnbull ultimately decided that the design of the NBN should abandon the all-FTTP model in the fixed-broadband footprint and instead be changed to his Multi Technology Mix model.

The main argument behind the MTM deployment was that it made more sense to deliver universal faster speeds sooner via upgrading and extending existing ADSL and HFC networks rather than delivering the originally planned and technically superior but slower to deploy FTTP technology.

However, this discussion paper does not propose to investigate the arguments of whether the NBN should have stuck with its original all FTTP plan or whether the move to the MTM model was correct.

Instead, we will examine where Australia is positioned now that the volume rollout of the NBN has been completed and what the options are in terms of upgrading the network from its current status.

2 - Connecting a nation

As outlined in the introduction back in 2013 Australia was a country of broadband haves and have nots in terms of high-speed broadband – with the vast majority of the population in the ‘have not’ category.

Whilst 91% of the population could access ADSL services nearly half of these were accessing speeds of well below 10Mbps at peak-time and a staggering 700,000 premises had no access at all to fixed-broadband, most of them – but by no means all – in rural and regional Australia.

At the change of government in September 2013 the incoming Coalition Government elected to continue with the existing rollout of FTTP connections that were already in construction as well as continuing with the Fixed Wireless and Satellite deployment.

However, the existing construction plans for the remainder of the FTTP broadband network were scrapped and instead the bulk of premises on the fixed-broadband footprint were allocated either FTTN or HFC technology.

Further down the track in March 2016 NBN Co announced its intention to launch ground-breaking Fibre-to-the-Curb (FTTC) technology to an initial 700,000 premises which was later increased to 1 million and then finally 1.4 million premises by the end of the rollout.

The change in approach from all-FTTP in the fixed-line footprint did enable NBN Co – after a two year period of realignment whilst it retooled for FTTN and HFC deployment – to significantly ramp up the construction of the network and activation of end-user premises to services on the NBN.

NBN Co. Ready to Connect & Activation Net Additions (2015-2020)

	Jun-15	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20
New RTC premises (000)	601	1,730	2,610	1,592	2,917	1,656
New Activations (000)	275	613	1,345	1,592	1,497	1,685

Source: NBN Co.

Indeed, between June 2018 and June 2019 NBN Co made nearly 3 million premises Ready to Connect – indicating a monthly RTC run rate of nearly 250,000 premises per month.

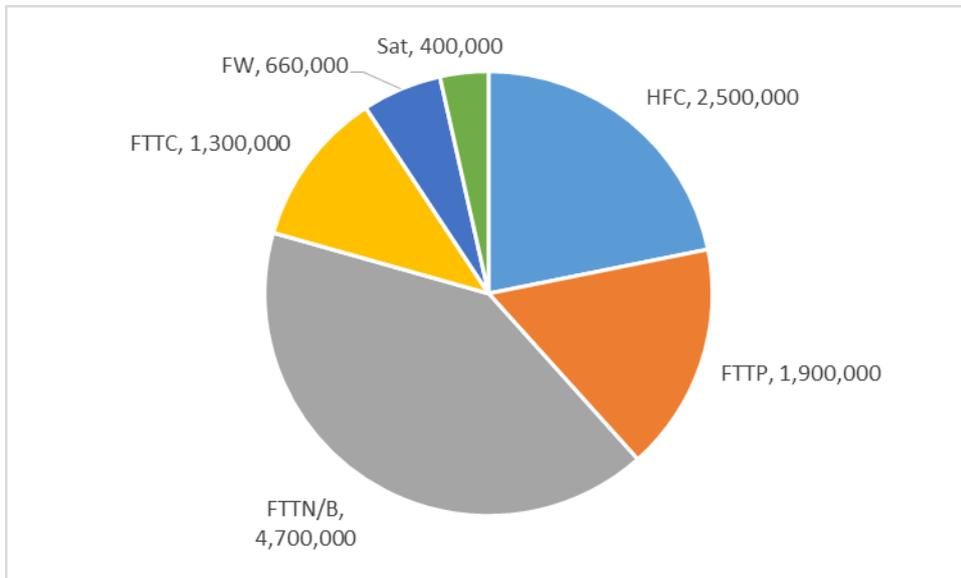
On the activations side between June 2019 and June 2020 NBN Co activated nearly 1.7 million premises to NBN service – averaging around 140,000 activations per month.

To put it another way, between June 2015 and June 2020 NBN Co activated over 6.7 million homes and businesses on the NBN – meaning over half the premises in the country migrated to the network in that relatively short five year period.

These simply incredible figures when compared to the migration rates of other broadband networks deployed around the world and enabled NBN Co to achieve its 2020 RTC and activations targets.

The chart below demonstrates where NBN Co had reached by June 2020.

NBN RTC Premises by technology – June 2020



Source: NBN Co.

So, at the conclusion of the 'volume' rollout of the NBN the central task outlined by the Coalition Government when elected in September 2013 of delivering at least 25Mbps speeds to all Australian homes and businesses has more or less been achieved.

3 - An uneven playing field

The deployment of FTTN technology delivered huge benefits to NBN Co in terms of building the network faster which, in turn, meant getting revenue generating customers onto the network faster – meaning NBN Co could start to return financing to the Federal Government.

In addition, deploying FTTN meant that millions of ADSL premises on sub-10Mbps speeds and a large number of those 700,000 premises with no fixed-broadband could get access to broadband speeds of up to 100Mbps for those close enough to the FTTN cabinet.

However, by their very nature FTTN networks will have winners and losers in terms of outcomes.

Unfortunately an estimated 200,000 to 250,000 homes on the FTTN portion of the network – representing around 6% of all FTTN premises – can only access speeds of between 12Mbps and 25Mbps at peak-time and this is an extremely difficult problem for NBN Co to fix in the short to medium term.

The main reason for these homes being unable to reach 25Mbps is the fact that their copper lines are greater than 1,000 or so metres in length or that the copper line connected to the FTTN cabinet has become too degraded.

VDSL speeds delivered on copper lines are variable and whilst some lines of 1,000+ metres will be capable of delivering 25Mbps – perhaps even more – some lines of the same lengths will not be able to deliver those speeds.

This is tricky problem for NBN Co to solve given that these premises are not located in large geographic clusters that can easily be upgraded, instead they are located all around the country served by many thousands of different FTTN cabinets.

This means that the options to upgrade these FTTN premises to the requisite 25Mbps or even faster speeds are limited and expensive.

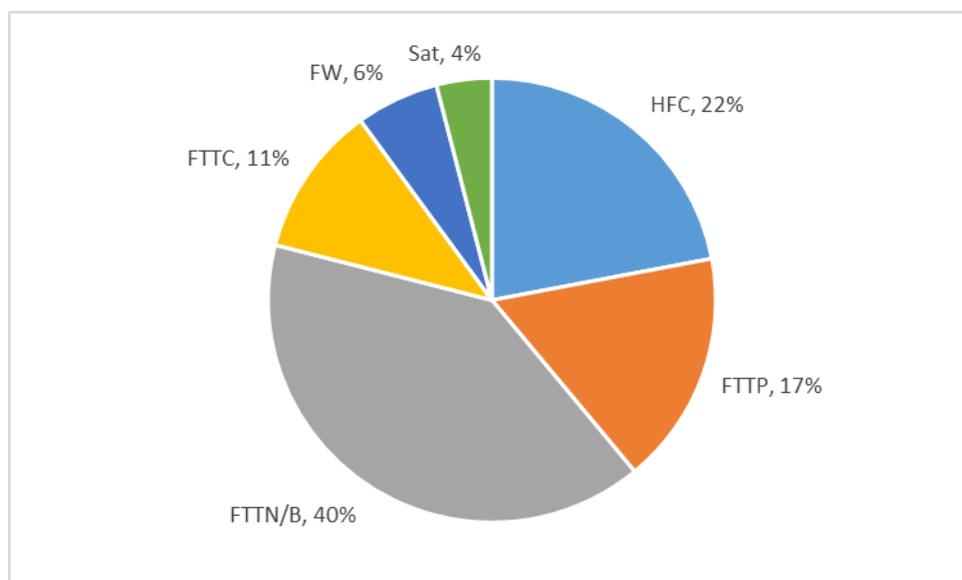
- 1] Deploy new fibre and cabinets to shorten copper lengths on FTTN network
- 2] Convert impacted premises to FTTC/FTTP
- 3] Switch premises to Fixed Wireless (if available) or Satellite

Delivering a level playing field for its NBN end-user premises is clearly the number one long-term issue facing NBN Co – setting aside dealing with issues on its Fixed Wireless network which serves only 315,000 activated end-user premises compared to the nearly 3.5 million activated end-user premises FTTN will eventually have.

However, resolving that problem is going to be an expensive and lengthy process for NBN Co and one to which there is no easy solution and given that these 'long line' premises are typically outer-suburban and semi-rural with low population density then these end-user premises will not usually have any alternative fixed-broadband options.

4 - What did we end up with?

NBN RTC premises by connection type (%) – June 2020



Source: NBN Co

FTTP

For those 1.9 million NBN end-user premises on FTTP technology the speeds they can access are limited only by the technology running over the network with present GPON technology able to deliver 1Gbps downstream speeds to NBN residential and business connections.

However, with a technology upgrade to XG-PON or another future fibre technology then NBN FTTP end-user premises can then access speeds up to 10Gbps and beyond.

Moreover, with future end-user modems inside homes and businesses using next-generation WiFi-6 technology then homes and businesses on FTTP are fully equipped for accessing true Gigabit broadband inside their premises.

HFC

By contrast to FTTP the NBN Co HFC network is far more problematic in terms of its ability to deliver Gigabit speeds to homes and businesses – even after it has been fully upgraded to DOCSIS 3.1 technology across the network.

Although DOCSIS 3.1 is easily capable of Gigabit speeds – and next generation DOCSIS 4.0 can deliver speeds up to 10Gbps downstream – the NBN Co HFC network is almost unique amongst its global peer networks in markets like the USA, Canada and the UK in terms of the network load it must carry.

In other parts of the world HFC networks compete alongside incumbent VDSL/FTTP operators and the local subscribers is typically split between the HFC and VDSL/FTTP network in competing areas with perhaps 40% taking HFC, 40% VDSL/FTTP and the remainder not connected to a fixed-broadband service.

However, in Australia for the vast majority of the HFC network footprint NBN Co is a monopoly operator meaning that its HFC network has to deliver activated services to around 75% of total premises in a Service Area Module (SAM).

This has clear capacity implications on a shared medium like an HFC network – even one that has been engineered to the highest possible standards with extra capacity built in given that even NBN Co can only afford to engineer a certain amount of capacity.

Indeed, the capacity constraints are brought into even sharper focus by the fact that, unlike any other HFC networks around the world, NBN Co is selling wholesale services to RSPs.

This means the network performance being closely monitored by the Australian Competition and Consumer Commission (ACCC) and RSPs themselves to make sure it delivers speeds close to those advertised rates.

NBN Co simply cannot deliver speeds well below advertised rates at peak-time without attracting regulatory and commercial complaints - this makes the delivery of 1Gbps services very complex on an HFC network.

This is because any capacity 'guaranteed' to deliver 1Gbps to an end-user connection cannot therefore be used by other users – thereby potentially degrading their connections by using up already relatively scarce bandwidth.

As a result HFC networks are not typically used for delivery Enterprise-grade 1Gbps services and in other global markets cable operators in recent years have typically deployed FTTP networks to deliver Enterprise-grade services rather than use HFC networks.

From an NBN Co point of view this means that whilst they have made vast improvements to the former Telstra HFC network in terms of network capacity and performance capability that it still cannot deliver the same level of consistent wide-scale ultrafast delivery as the NBN FTTP or even FTTC networks.

As a result NBN Co have already flagged that high-speed products to HFC customers will be capped for the time being at 250Mbps to around 70% of its HFC footprint with only a small percentage of around 7% able to access its ultrafast 750Mbps services on HFC.

Current NBN pricing constraints mean that even if the 750Mbps service were available across the entire NBN HFC footprint that take-up would remain very low – but any future change in pricing and subsequent surge in customer demand for ultra-fast products would have to mean NBN Co seriously considering how best to manage such a demand.

Performing constant 'node splits' to continually increase capacity on the HFC network is an expensive and time-consuming exercise so at some point NBN Co may need to consider either a radical change in architecture on its HFC network to deliver a substantial capacity boost or ultimately replace the network with FTTC or FTTP.

This is a conundrum being faced by HFC network operators all around the world, how long do they keep upgrading their existing HFC networks and how much money do they invest before it would actually make more sense to simply build a new FTTP network to replace it?

FTTC

The NBN Co FTTC network is certainly capable of delivering 1Gbps speeds across the vast majority of the current 1.3 million premises footprint – although commercial ultra-fast services of over 100Mbps have yet to be deployed on the network.

The NBN FTTC network can deliver services over around 200 metres of copper – with the restriction imposed by the need for the copper line to supply ‘reverse power’ to the DPU – but most premises on the FTTC network are suburban premises using copper lengths of well below 50 metres as a lead-in to the premises.

Although Telstra caused some consternation with NBN Co when it claimed that many FTTN, FTTB and FTTC premises could not receive 100Mbps speeds - and subsequently took the decision not to sell 100Mbps to FTTN/FTTB/FTTC end-user premises - the reality is that there will be only a very small number of FTTC premises that cannot support 100Mbps over VDSL and therefore very likely 1Gbps using GFast.

From a global perspective Australia is one of the very few countries to deploy FTTC using reverse-powered DPUs so there are very few global examples to lean on but both Swisscom and BT in the UK have successfully delivered ultra-fast services via GFast.

BT has delivered speeds of up to 330Mbps over up to around 400 metres of copper from its existing FTTN cabinets although recent reports suggest that the operator will now scale back its GFast plans and instead focus on delivering full FTTP instead.

For its part, Swisscom has also delivered speeds of up to 500Mbps via a slightly different network topography, demonstrating that GFast can deliver ultrafast speeds in a real world network environment.

That being the case and with the NBN FTTC network typically using much shorter lengths of copper than being used in Switzerland or the UK then it should certainly be possible for NBN Co to deliver 1Gbps or very close to it to the substantial majority of its FTTC end-user premises.

FTTN

The biggest roadblock to universal 1Gbps on the NBN fixed-broadband network is clearly the FTTN network where current speeds range from the maximum 100Mbps for end-users located within around 200-300 metres of the FTTN cabinet to speeds of below 25Mbps for some unfortunate end-users on copper lengths of over 1000 metres.

From a technical point of view NBN Co could take a leaf out of the BT playbook and deploy GFast technology at its existing FTTN cabinets which would enable speeds of around 330Mbps to end-users located within around 400 metres of the cabinet.

If NBN Co, like BT, were a purely commercial VDSL operator trying to match the high speeds being delivered by a rival cable operator then such a strategy would make sense as a short-to-medium term commercial tactic.

However, NBN Co cannot make such a move that would exclude all premises beyond 400 metres from the cabinet from accessing ultra-fast speeds as it would not only be exclusionary but also be a wasted investment as a future upgrade would be required in any case.

That means that NBN Co's only option for the FTTN network in terms of a network upgrade is to convert the network to either FTTC or FTTP – with the former looking a much more likely scenario - although an FTTP upgrade may make more sense in areas containing a larger number of commercial premises.

Upgrading the entire FTTN footprint, much of which is in regional and outer-suburban areas, to FTTC would likely cost around A\$7-10 billion and would be a very complex exercise given that NBN Co would have to be running new fibre down the same last-mile ducting that house its existing last-mile copper network delivering VDSL services to millions of homes.

As NBN Co found on its initial deployment of the FTTC network – and before that when delivering FTTP in its early years – digging up suburban streets is a painful exercise and is made even more complex when you are having to work around your own active network infrastructure in the field serving millions of premises.

Moreover, many premises on the NBN Co FTTN network are in semi-rural locations so although the current FTTC connection cost is estimated by NBN Co to be only \$3,200 – compared to \$4,400 for Brownfield FTTP – these semi-rural locations would require a lot more fibre to be laid and in challenging conditions meaning the average FTTC connection cost could likely go up significantly.

However, although a full upgrade of NBN's FTTN network to FTTC/FTTP would be expensive and complex, at a time when Australia is clearly in the midst of a serious recession then such an investment could be justified as part of a broader economic stimulus platform.

5 - The global comparison

The total cost of delivering the NBN will be around A\$51 billion by the time the network has been fully completed but this doesn't include separate compensation payments to Telstra and Optus that run into an additional tens of billions of dollars.

So, what did Australia get for its money?

Anecdotal evidence across the country during the COVID-19 isolation period suggests that the NBN performed much better than many of its critics had predicted – with performance clearly helped by NBN Co giving RSPs additional bandwidth to help them meet additional capacity demands on a temporary basis.

Indeed, some may suggest that the performance of the network during the isolation period, when it coped with millions of Australians working from home and generating record amounts of data on the network, means that no substantial upgrade of the network is required.

However, although the NBN held up admirably during the COVID-19 isolation period for the vast majority of end-users the fact remains that at the end of the rollout there is a clear divide on the network between the near 50% of fixed-broadband homes that can access ultrafast speeds beyond 100Mbps and the 50% that cannot.

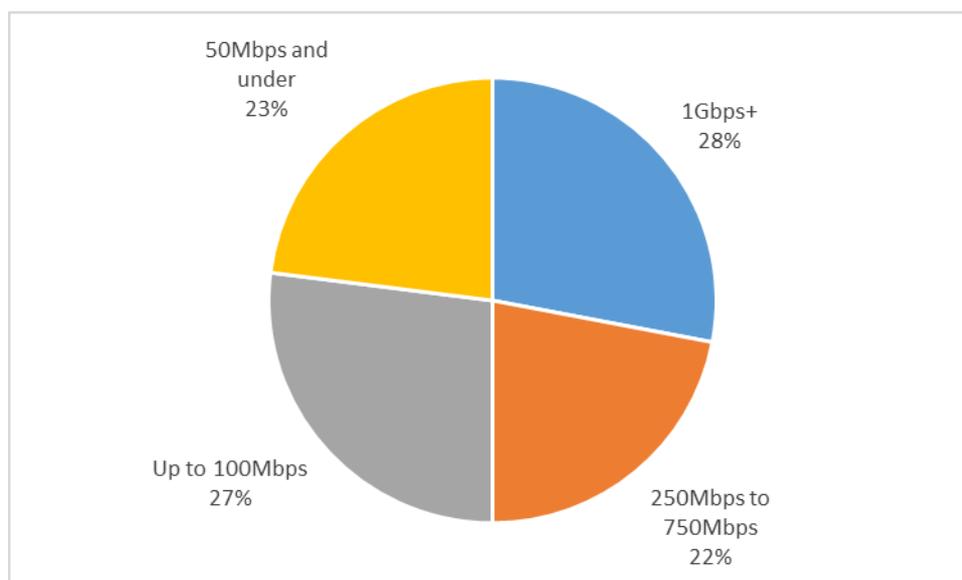
NBN Co's FTTP end-users can already access 1Gbps on their FTTP connections and FTTC end-users have connections via which GFast copper acceleration technology will also be able to deliver 1Gbps speeds in the future - but these two groups represent only 28% of NBN Co's total end-user premises.

At present HFC end-user premises can currently only access a maximum of 750Mbps – and even then only a small portion of the network can currently be able to access those speeds with most of the remainder on a maximum of 250Mbps.

On the FTTN network around two-thirds of end-user premises can access between 50Mbps and 100Mbps downstream speeds with the remainder accessing speeds below 50Mbps.

Although this discussion paper doesn't look closely at the NBN Fixed Wireless and Satellite services these can deliver a maximum at present of around 50Mbps – although NBN Co has previously developed plans for the Fixed Wireless service to deliver speeds of up to 100Mbps.

NBN Co Speed Availability – June 2020



Source: OMDIA

Although it is true to say that there are still no true applications that require Gigabit speeds – even 100Mbps is more than sufficient for even the heaviest residential bandwidth users – the fact remains that Gigabit speeds have become the accepted gold standard for operators across the globe.

Indeed, in many markets operators are now moving beyond Gigabit speed and are moving onto delivering 10Gbps capability and beyond as they take advantage of XG-PON technology.

As the OMDIA data shows below Australia's \$51 billion investment in the NBN – representing a total per household cost of some \$4,500 – has resulted in the country being able to offer true Gigabit capability to only 28% of its total premises, substantially behind its counterparts in Asia Pacific and Europe.

Whilst it is not fair to have direct comparisons with smaller markets like Hong Kong and Singapore these markets set the 'gold standard' for Gigabit coverage with both having above 90% or more Gigabit capability via FTTP networks.

However, Hong Kong and Singapore are not the only countries in Asia Pacific with widespread Gigabit capability already in place with South Korea leading the way amongst the larger Asia Pacific countries with 80%+ Gigabit capability already in place and most major cities also fully covered.

Even in the European markets Gigabit capability has been growing rapidly in countries like Spain with 80% and France with around 40% FTTH capability already in place and FTTH rollout accelerating significantly in both countries with major cities covered and focus now moving to regional areas.

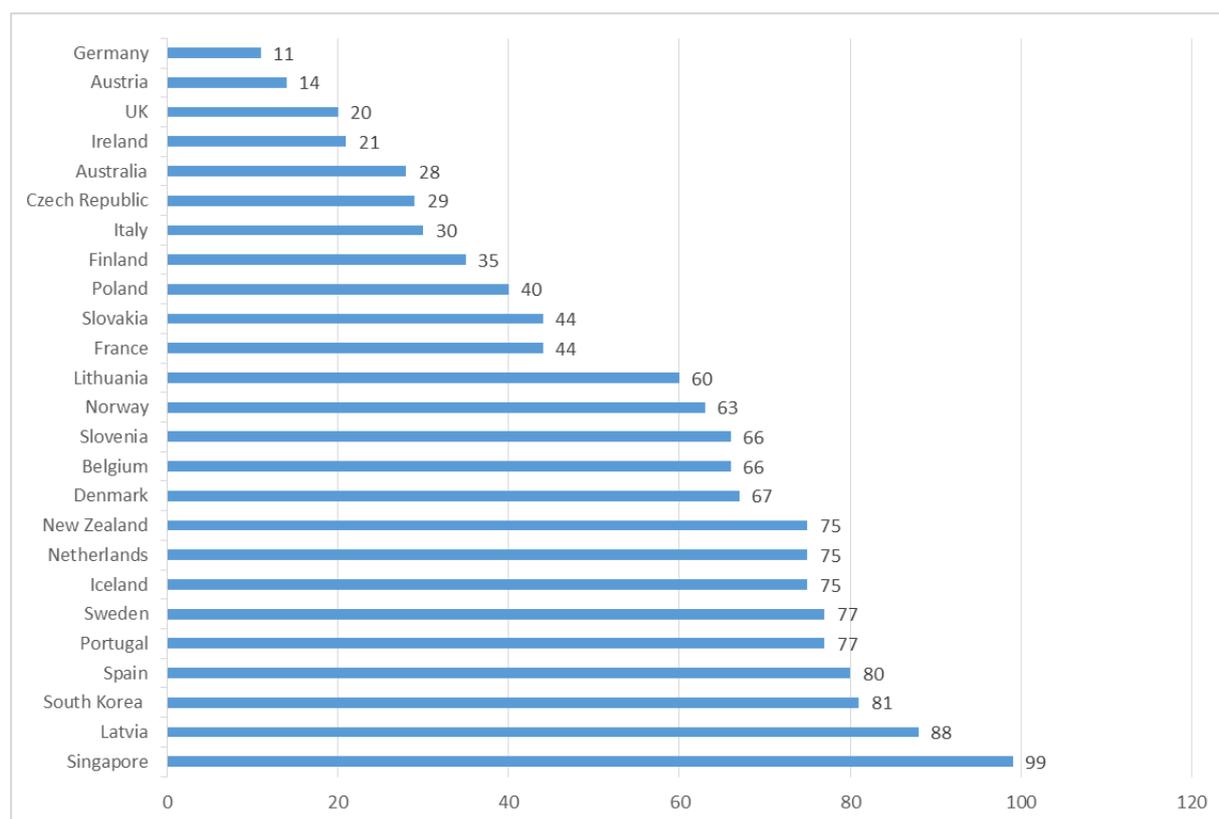
Despite Australia's hefty investment in the NBN the country remains way behind peer markets in Europe and Asia Pacific in terms of the availability of Gigabit broadband.

Perhaps the most troublesome example from an Australian perspective is that New Zealand will reach nearly 90% Gigabit capability by 2022 – despite starting their own Ultra Fast Broadband (UFB) deployment around the same time as NBN Co – and spending significantly less taxpayer dollars.

The pricing model of the NBN which clearly deters end-users from buying higher-speed products clearly means that the NBN network does not perform well in speed ranking metrics delivered by companies such as Ookla and Akamai given that most NBN connections are capped at 50Mbps and therefore record much lower speeds than they are actually capable of.

However, the data here in the Gigabit Gap report shows clearly that Australia is a long, long way behind having access to the kind of Gigabit coverage available in major European and Asia Pacific markets.

Gigabit capability in selected countries (% of premises)



Source: Omdia

The geography of Australia means that delivering Gigabit capability is inevitably going to be considerably more difficult in terms of time and expense compared to the likes of Singapore and smaller states like Latvia.

However, of more concern is the fact that Australia still has no long-term Gigabit plan in place in terms of delivering universal Gigabit access to a set percentage of its citizens.

In the Australian case, even when 5G is deployed, delivering Gigabit capability to the Fixed Wireless portion of the network is unlikely to be possible given the constraints of spectrum and there are no Gigabit services remotely likely on the NBN Satellite service for its 100,000 end-user premises.

That being the case Australia simply cannot ever reasonably be expected to deliver universal Gigabit access via the NBN but the opportunity is clearly there to extend ultra-fast speeds beyond the 28% that can get 1Gbps and the 22% that can get 250Mbps-750Mbps on the HFC network.

Whilst still dwarfed in size by Australia European markets such as Spain and France – and even the UK – have Gigabit targets in place and while they may not be achieved by their still ambitious target dates they do give operators and industry a long-term target to actually meet.

More importantly, the countries below are generally not basis their Gigabit capability targets on purely fixed-broadband networks, markets like the UK are also planning to use 5G technologies to help them reach their Gigabit delivery goals.

At present no such target exists for Australia and given that the current NBN pricing construct means there is very little chance of a consumer-led demand for Gigabit speeds being sparked that makes it even less likely that a full upgrade of the fixed-broadband portion of the network to Gigabit capability will be achieved.

Gigabit capability targets – selected countries

	Gigabit Target (%)
Australia	No target named
Austria	100% by 2030
Belgium	50% by 2020
Czech Republic	No target named
Denmark	No target named
Finland	100% by 2025
France	100% by 2025
Germany	100% by 2025
Iceland	No target named
Ireland	No target named
Italy	No target named
Latvia	No target named
Lithuania	100% by 2025
Netherlands	No target named
New Zealand	87% by 2022
Norway	No target named
Poland	No target named
Portugal	No target named
Singapore	No target named
Slovakia	100% by 2025
Slovenia	100% by 2025
Spain	100% by 2025
Sweden	98% by 2025
Switzerland	99% by 2021
UK	100% by 2025

Source: Omdia

Pricing data

Indeed, although this discussion paper does not intend to cover the complexities of the NBN pricing model it is still worthy of note that Gigabit pricing in Australia – where the speeds are actually available – represent some of the most expensive Gigabit plans in the world.

Again, whilst comparisons to Hong Kong and Singapore are not necessarily useful given the huge population differences the reality is that consumers in those markets and other similar markets like Korea and Japan are accessing Gigabit speeds for very low monthly prices.

The pricing comparisons below should be considered as illustrative as service offerings vary considerably across markets.

The pricing data represents the lowest undiscounted monthly list price for Gigabit broadband services as listed on service provider websites in June 2020.

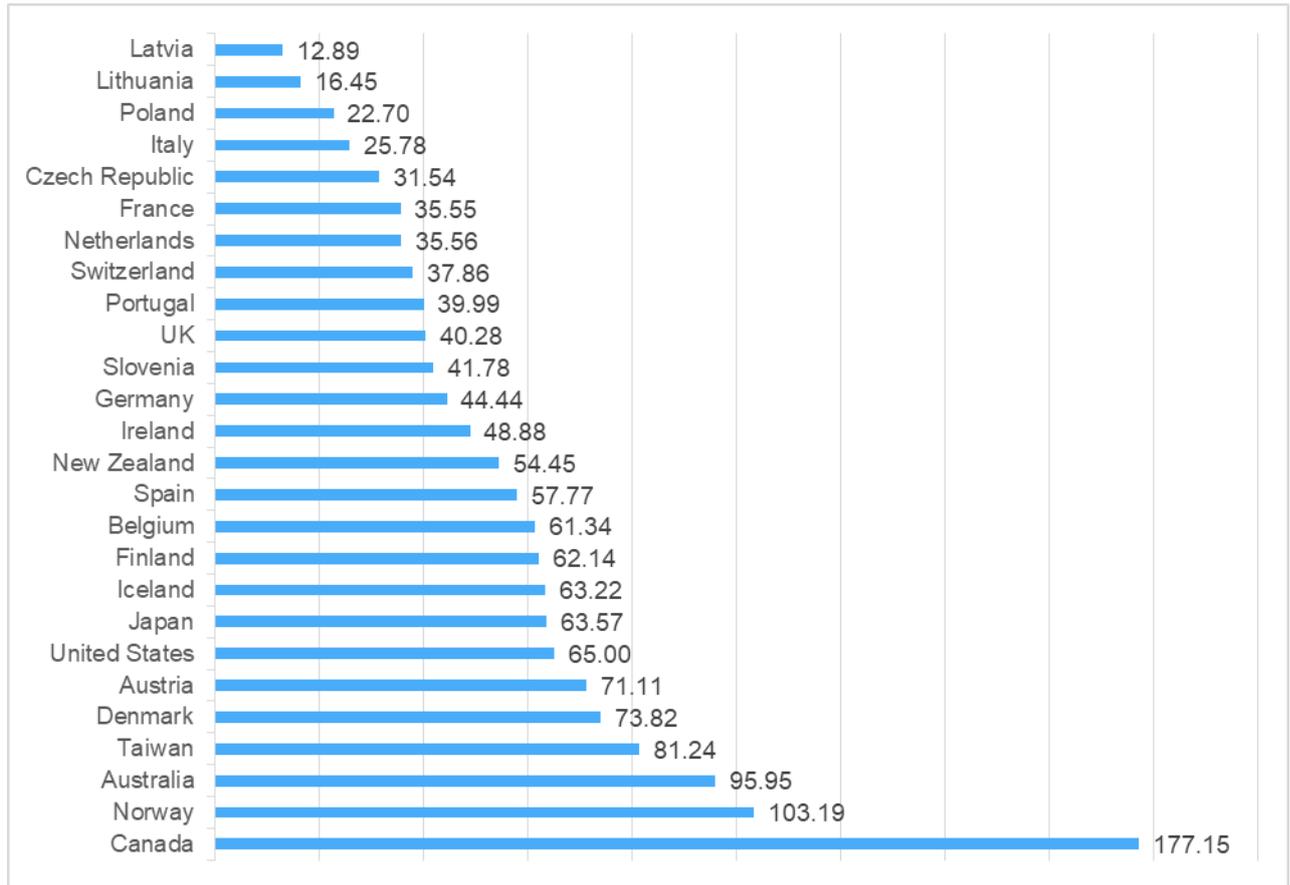
Wherever possible standalone plans with no term commitment were used. Where a contract term was required the shortest available term was used. Where rental of equipment was required, the rental charge was included. Pricing does not include discounts, installation, activation or other one-off charges. Service provider coverage varies, and in some cases provider pricing varies by geography. Exchange rates were as at 25 June, 2020.

Known Gigabit services from fibre and cable network operators were surveyed and this sample is not intended to be a comprehensive review of all plans. Data from 99 plans from 26 markets has been presented in the chart.

The chart below illustrates that in terms of entry-level Gigabit pricing that Gigabit services offered by RSPs on the NBN rank the 3rd most expensive in the 26 countries that were covered by OMDIA research with entry-level prices only more expensive in Norway and Canada.

By comparison entry-level Gigabit prices in the New Zealand market ranked around the mid-point of the 26 markets covered by the OMDIA research.

Entry level Gigabit monthly pricing (US\$/month)



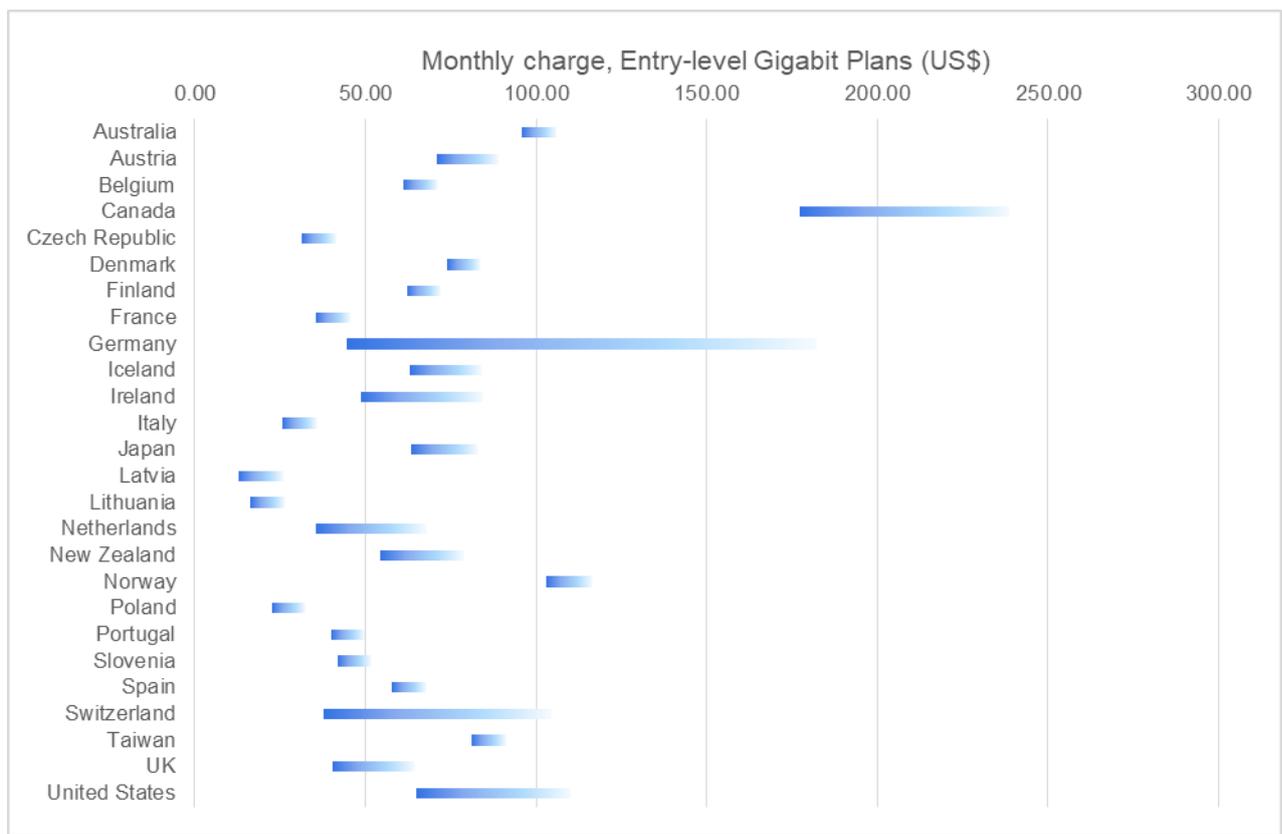
Source: Omdia

The second data chart demonstrates the OMDIA analysis of the 26 markets when analyzing both the entry-level price and the most expensive Gigabit pricing in each market analyzed.

Some global markets, most notably Germany and Canada had an extremely wide range between their entry level Gigabit plans and their most expensive Gigabit plans.

Given the relatively narrow range of Gigabit pricing on the NBN Australia’s position was largely unchanged in the market comparison.

Gigabit broadband pricing in selected countries



Source: Omdia

6 – Why bridge the gap?

The initial question to answer is why should NBN Co have to bridge the gap at all?

There are essentially three core reasons why an upgrade of the network is now needed.

25Mbps won't be enough

Firstly, whilst those end-user premises stuck on speeds of just 25Mbps – and some on less than that – may have been able to get through this recent COVID isolation period with access to those speeds they may not be able to do so for that much longer.

Whilst it is true that around half of homes have only a one or two person occupancy rate, meaning that there is not typically so much bandwidth demand from those homes, any premises with children or young adults accessing educational content whilst their parents or caregivers are working from home may struggle on a 25Mbps service.

There are now an average of well over twenty connected devices in an average Australian home and with an HD Netflix stream taking 5Mbps and Zoom recommending around 2Mbps for HD quality calling the 25Mbps ceiling can quickly get used up – especially with multiple devices being used to stream video simultaneously.

So, whilst 25Mbps may have been a reasonable 'line in the sand' to draw back in 2013 the fact that 80% of new NBN end-user premises are now taking either 50Mbps or 100Mbps plans from their retailers suggests that line has now moved sharply upwards in terms of what people need and will pay for.

Indeed, whilst the BT-Openreach FTTN network in the UK was widely used as a template for the MTM model by former Communications Minister Malcolm Turnbull the reality is that BT-Openreach are now upgrading the network to FTTP in many places.

Having delivered at least 30Mbps VDSL connections to nearly 98% of the UK's 25 million premises BT-Openreach are now embarking on a wide-scale deployment of FTTP technology, potentially covering 50% or more of UK homes by 2025, a huge undertaking given that only around 10% of UK homes can currently access FTTP.

Nonetheless, although the arrival of COVID-19 and the election of a new UK Government – not to mention the implications for the UK of its pending exit from the EU – has delayed the full release of a detailed rollout plan BT-Openreach are clearly intent on a significant network upgrade in the coming years.

Such an upgrade will really leave Germany as the last remaining major European market yet to embark on a substantial migration from VDSL to FTTP with France, Spain and, to an admittedly lesser extent Italy, all embarking on wide-scale FTTP deployment.

Indeed, one of the main reasons for BT-Openreach embarking on the FTTP upgrade has been pressure from UK regulator OFCOM whose outgoing chairperson Sharon White made no secret of her criticism at the low-level of FTTH deployment in the UK market in comparison to its European peers.

The field is uneven

Had the current status of Australian broadband deployment been achieved under the private investment of Telstra, Optus and Vodafone then the current outcome would have been broadly acceptable and roughly in line with what has been achieved in similar countries such as Canada and the United Kingdom.

However, the reality is that as a government funded project that it is broadly expected that there should be something of a broadly equality of outcome from the project and that has not yet been achieved by the NBN at this point.

Whilst the availability of 25Mbps to 99% of premises in Australia and 50Mbps to over 90% of premises in Australia puts the country in a far better position than it was in back in 2009 when NBN was created the present inequitable availability of speeds does present some unfair outcomes.

Why, for example, should Coffs Harbour in northern NSW have full access to Gigabit capable FTTP technology whilst a similar sized town in central QLD such as Bundaberg only has access to FTTN technology delivering speeds below 25Mbps to some end-users?

Whilst FTTN is a clear improvement on the ADSL services previously available in a town like Bundaberg the reality is that the universal availability of FTTP in Coffs Harbour makes it a far more attractive location for a business requiring high-speed broadband to relocate to – giving it a seemingly unfair advantage over towns that did not receive FTTP through no fault of their own.

Market Clarity

The third and final reason why there needs to be a clear message on the NBN upgrade is to enable stakeholders, whether they are rival private network providers, state governments, local governments, businesses or ordinary residential consumers to have some certainty over the future.

The priority for an upgrade, setting aside the much more expensive Fixed Wireless network, is clearly the 4.7 million end-user premises that are served by FTTN technology.

Although the newly legislated Regional Broadband Scheme tax of \$7.10/month per subscription clearly dilutes the business proposition for private investment in fixed-broadband networks there is clearly still private capital interested in investing in fixed-line networks where possible.

Although such private investment may indeed be limited and only ever cover a small portion of that 4.7 million home FTTN footprint it can still help to deliver better broadband services to a significant number of Australian homes and businesses.

Even with a state-owned monopoly in place companies like Uniti are in the market building private network infrastructure – these companies will need some clear guidance from NBN Co and the Federal Government on what the upgrade plans are for the network.

Although companies like Uniti have relatively small-scale network deployments at present compare to the NBN they and other private network operators deserve to know whether or not they have investment possibilities in the FTTN footprint or not.

After all, NBN Co could easily stand accused of anti-competitive behavior if private network operators start investing in building rival networks in FTTN areas only to then see NBN Co announce major FTTN to FTTC network upgrades in those same areas.

By the same token towns and cities across the country that have been delivered FTTN technology, including some important regional centres across the country, also need to have some clarity on future upgrade paths from NBN Co and the Federal Government.

If there are no upgrade plans in place for these FTTN locations then local governments and businesses can start to at least plan for alternative provision, including potential local public investment, but without certainty over NBN Co's longer term plans then it is extremely difficult for them to make such plans.

NBN Co clearly has a commercial interest in not having rival private network operators deliver services on the FTTN footprint but as a state-owned monopoly player its presence in the market should not be allowed to unfairly preclude private investment where it makes economic sense for private players to invest.

7 – Roads to an upgrade

The current indications from both Communications Minister Paul Fletcher and NBN CEO Stephen Rue are that there is no large-scale upgrade planned for end-user premises on the NBN.

Minister Fletcher made it clear in an interview with the Australian Financial Review that there would be “no more handouts” from the Federal Government and that any further upgrades would have to be financed by NBN Co itself.

This clearly puts NBN Co into a position whereby any upgrade to the network can only really be considered if there is going to be a return on the investment for NBN Co.

In further comments to the Sydney Morning Herald Minister Fletcher went even further and said that any future upgrades for NBN would depend on the company seeing increasing demand for ultra-fast speeds beyond the current 50Mbps most popular plan.

Given current pricing levels for those ultra-fast plans it seems unlikely that NBN Co will be able to justify a wide-scale upgrade of FTTN to FTTC – let alone FTTP – because their own lived experience of 10 years as a wholesale network operator demonstrates that Australians are buying their broadband on pricing not speed.

As a result given that close to 70% of FTTN end-user premises are already able to access 50Mbps speeds then where is the ROI for NBN Co in upgrading the entire FTTN footprint at a likely cost of around AUD\$7-10 billion if end-users are very likely going to stay on their existing 50Mbps plans?

NBN Co may gain some incremental revenue from the 30% or so of FTTN end-user premises currently unable to access the 50Mbps and higher speed-tiers but this is not enough to persuade the company to take the plunge on an upgrade of the entire FTTN footprint.

However, NBN Co’s calculations must also take into account that although its extraordinary nationwide engineering operation between 2010-2020 removed the vast majority of copper from the country’s broadband infrastructure that there is still a lot of copper network – on average around 500 metres to each premises – being used on the FTTN network.

Although NBN Co has performed remediation work on some portions on the ‘D-Side’ copper network and some new copper deployed in some scenarios the bulk of ‘D-Side’ copper has been left in place – a factor which enabled NBN Co to deploy the FTTN network so rapidly from 2015-2020.

The downside of that is that the D-Side copper is only getting older and more fault-prone as time goes on meaning that at some point it will need to be replaced anyway – with the only other option being an expensive ongoing remediation program for the copper network with replacing parts potentially becoming an issue as vendors simply cease to supply replacement hardware for copper networks.

That means that NBN Co should be actively planning its copper network replacement strategy already as is being done by other incumbent operators all around the world including Chorus in New Zealand and KPN in the Netherlands.

Financing the upgrade

Federal Government

Previously it had been widely considered that one potential reason that the Federal Government was hesitant in putting further money into NBN Co was because it did not want to have any additional funding to have any impact on the Federal Budget – although NBN Co is currently treated off-budget whilst a Return on Investment is expected to be delivered.

Before the arrival of the COVID-19 pandemic the Federal Government had been predicting that Australia would be ‘back in black’ for the financial year ending in June 2021 – but the financial impact of COVID-19 means that returning the Federal Budget to surplus is now likely decades away.

However, despite the fact that a Federal Budget surplus is now impossible in the medium term the recent comments made by Communications Minister Paul Fletcher confirm the fact that no additional Federal Government money will be committed to NBN Co.

This is despite the fact that NBN is no longer the ‘hot potato’ political football it was whilst Malcolm Turnbull, architect of the MTM model, was Prime Minister and that political blowback from a further extension of the NBN Co budget would be far less than it would have been during that period.

NBN Co

NBN Co has already raised private debt from the market showing that the company is quite able, at least in part thanks to its guarantor being the Federal Government, to raise its own private funding.

However, in his recent media comments NBN CEO Stephen Rue made it clear that even with the recent funding injection that the additional funding would not be used for a wide-scale network upgrade.

In an interview with the *Sydney Morning Herald* Mr. Rue said, ““We have a longer term program which is to refinance the government by the end of June 2024, to do that we need some liquidity in the business. There are also ongoing working capital requirements of the company that will enable us to manage our business smoothly in the next year or two.”

The comments from Mr. Rue suggest that for the short to medium term that NBN Co is now primarily focused on repaying the cash loaned and invested by the Federal Government and has no plans to take on board debt to fund a mass network upgrade.

There may be some specifically targeted upgrades undertaken in some areas, most notably in areas with potential to deliver higher revenue NBN Business services, but no nationwide FTTN to FTTC upgrade is planned.

NBN Business

One potential avenue for NBN Co to use to help lower the cost of future upgrades was to have been the use of the NBN Business FTTP construction program to help lower the cost of then connecting additional residential full-FTTP connections in nearby areas.

Whilst in its early years NBN Co had focused primarily on the residential market the appointment of a specialist role in its Executive Committee of a specialist Chief Customer Officer – Business in early 2018 signaled a much sharper focus on serving the business market.

NBN Co argued that constructing new connections to business customers would help the company reach its long-term ARPU target of A\$51/month and that building new business connections would not delay its main goal of completing the network by June 2020.

However, NBN Co's over-building of existing FTTP networks – owned by its rivals including Telstra, Optus, TPG and Vocus, caused significant disquiet in the marketplace and eventually the company announced it would no longer over-build existing networks owned by rival telcos and would instead buy capacity on those networks.

Although NBN Co will still build out new FTTP networks in unserved locations for business customers the decision to lease capacity on rival networks rather than build new FTTP in competing areas clearly reduces the opportunity to 'piggyback' commercial residential FTTP builds on the back of business rollouts has lessened.

RSP Co-Finance

If NBN Co is unable or unwilling to fund an upgrade of the FTTN network – setting aside the far more expensive upgrade of parts of the Fixed Wireless network – then there may be opportunities for Retail Service Providers to step-in and co-fund upgrades with customers.

One of the problems with the NBN Technology Choice program, where householders can request an upgrade from their FTTN, Fixed Wireless or Satellite technology to an FTTP connection, has been the lack of a central co-ordination point.

With some RSPs, led by Vodafone CEO Inaki Berroeta, calling for an upgrade of the FTTN network to FTTP or FTTC, the possibility exists that RSPs could help co-fund network upgrades in selected areas on a demand-led basis.

Although this would clearly present some challenges in terms of ownership of the 'last-mile' customer access network, would it be owned by NBN Co, the RSP or the householder themselves?, there is clearly some potential for RSPs to play a role in the future upgrade in generating and organizing demand.

The main attraction of this would be the central fact that any future network upgrade really depends on the ability of RSPs to actually persuade end-user premises to pay higher monthly fees for higher speed services in order to help return the cost of the investment.

RSPs have the ability to bundle in the price of an upgrade into a long-term contract with an end-user with, for example, a \$5,000 FTTN to FTTP upgrade paid for over a four-year contract for a 1Gbps service at around \$250/month.

RSPs would be in the best position to persuade end-users to pay for higher-end plans but doing so within the current NBN pricing platform is a significant challenge given the substantial price premium for plans above the 100Mbps platform.

State Government

One of the options previously mooted for a potential collaboration model for an upgrade in certain areas were joint-ventures between NBN Co and State Government's to fund network upgrades in designated areas of commercial value such as industrial and business parks.

However, interest in this model seems to have cooled in recent times with State Government's in New South Wales and Queensland looking to make use of their own fibre networks in order to deliver improved connectivity in less well served parts of their states.

Although there has been little concrete progress in terms of last-mile network delivery for homes and businesses the States now seem less interested in partnering with NBN on network delivery and more intent on their own pathways.

This approach makes sense in terms of avoiding being locked into NBN's high-pricing for ultra-fast products which in turn pushes end-users onto lower-speed plans.

However, it is also high risk in that it would be difficult for State Government's to attract private RSPs to deliver services on disparate networks serving only a relatively low number of homes and businesses even without NBN pricing constraints.

Technology Choice

The other option to deliver a more wide-scale network upgrade would be for NBN Co to use its own Technology Choice program to drive the upgrade forwards.

At present there are three main components of the Technology Choice program:

- **Individual Premises Switch** – Changing a single premises to FTTP.
- **Group Switch** – A group of premises changing to FTTP from the same locality – neighbors etc.
- **Area Switch** – Changing the technology for an entire area that has a defined border such as a regional town centre, a metropolitan suburb, or a Multi-Dwelling Unit (MDU).

Since the introduction of the Technology Choice program by NBN Co after its move to the MTM model under the Coalition Government the program has come under regular criticism in the media, most often for the high prices quoted by program for delivering upgrades.

These high upgrade quotes have typically been provided for individual premises – often served by NBN Co Satellite or Fixed Wireless services – requesting connection to FTTP technology.

Unsurprisingly the quotes for such an upgrade have often run into tens of thousands of dollars – with some quotes well over \$100,000 – which have created negative publicity for NBN Co and the Coalition Government.

However, with NBN Co focused so intently on completing the volume rollout by the end of June 2020 – a task it achieved with time to spare – there has been little thought to ramping up the Technology Choice program to deliver a wide-scale upgrade.

As a result although the Technology Choice program is clearly located on the NBN Co website there has been little appetite from within the company to significantly drive interest in the program, not

least because delivering on Technology Choice applications could easily distract crucial resources from the volume rollout of the network.

However, the Technology Choice program does now have six years of experience in delivering on-demand network upgrades and if NBN Co chose to do so it could increase demand by a significant public awareness campaign perhaps coordinated with local councils.

8 - Conclusion

NBN Co and the Federal Government are in a tight spot when it comes to upgrading the NBN.

Given its present pricing structure – with higher-speed plans substantially more expensive than mid-level plans – it is extremely hard for NBN Co to actually ever generate substantial market demand for those higher-speed services.

With little market demand for higher-speeds than NBN Co – given that the Federal Government has made it clear there will be “no more handouts” is clearly going to be extremely reticent about investing a further \$7-10 billion to upgrade FTTN to FTTC if it cannot generate additional revenues from the upgrade.

However, leaving the network in its current position is hard to justify given that there is a clearly unacceptable divide between those on 1Gbps FTTP connections and others on FTTN lines that in many cases cannot even deliver 25Mbps.

NBN deserves much praise for the successful execution of its goal in delivering the volume rollout by June 2020 with some 11.6 million premises now able to order a service over the NBN.

There will, of course, be huge frustration for the 100,000 hard-to-connect premises that cannot yet order a service on the network but NBN has for the most part hit its target and deserves congratulations for pulling off what was one of the biggest engineering tasks in Australia’s history.

However, there is still clearly much more work to do in order to bring all Australians onto a more level playing field on the NBN network.

It is hard to justify an outcome where tens of thousands of dollars has been spent on some end-user premises – up to \$90,000 in one case - for a 1Gbps capable FTTP connection and others just \$2,200 or even less for an FTTN connection that cannot even deliver 25Mbps in some cases.

A full FTTP network capable of delivering Gigabit speeds across all end-user premises on the NBN fixed-broadband network would obviously have been an incredibly difficult task to accomplish.

However, whilst expensive and complex an all-FTTP network would have delivered an equality of outcome for all Australians and, perhaps even more importantly delivered a platform for almost limitless future growth as fibre technology evolves.

Nonetheless the eggs cannot be unscrambled at this point and some clear direction is needed from the Federal Government on what the plans are for a network upgrade.

One major factor why a clear upgrade plan is needed is that it is hard to envisage a private buyer emerging for the network whilst it still requires a multi-billion dollar upgrade and requires expensive ongoing maintenance.

One of the reasons that investors have been attracted to utility assets on a global basis – especially telecom networks – is because of their ‘set and forget’ nature in not requiring substantial upgrades requiring huge capital expenditure and the NBN is certainly not in that fortunate category at this point.

In addition, certainty is also needed so that Australia’s mobile network operators can better plan their 5G networks – particularly with regard to where they target their 5G Fixed Wireless services.

Whilst NBN Co have repeatedly argued that its services and those of 5G network operators are complimentary there is little doubt that mobile network operators see under-served NBN areas – especially FTTN areas – as ripe for the picking for high-speed 5G Fixed Wireless services.

A game of cat and mouse over where and when an FTTN upgrade may take place may help protect NBN from further competition from 5G Fixed Wireless but it does nothing to help those Australians that are stuck on low-speed FTTN services.

The last ten years of building the NBN has put Australia into a much better position with 99% of premises now able to get a 25Mbps connection via NBN's range of different technologies.

However, whilst universal 25Mbps was a reasonable target in 2013 when the NBN changed design from FTTP to FTTN/HFC it is no longer a speed that can cater for the needs of many residential and business broadband users.

That means that it is time for the Federal Government and NBN Co – whilst getting plaudits for completing the volume rollout – to now begin their plans for the next stage of the network upgrade.

Appendix

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