

# The impact of NBN wholesale pricing on the take-up of NBN services and economic benefits associated with the NBN

Report on behalf of Telstra

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## Public version

[CIC begins] = information not to be released without a confidentiality undertaking

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- Executive Summary
- Social and economic benefits of broadband services
- International benchmarks of broadband take-up, broadband demand and prices in Australia and other leading economies
- The development of broadband demand and its implications for the underlying infrastructures and technologies
- Market model: Forecast of take-up of NBN services until 2024 under different wholesale pricing scenarios
- Estimation of the GDP effects of the different scenarios
- Conclusions and implications

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# Executive Summary (I)

- NBN's inflated wholesale prices have a negative impact on retail prices, broadband take-up in general, and in particular in regard to the penetration of broadband speeds of 100 Mbps and above.
  - The small inclusive data volumes lead to a cycle of rising wholesale prices that goes hand in hand with increasing use and thus creates price-squeeze margins for RSPs or even higher retail prices.
  - NBN's highest priority should thus be to remove CVC charges and create wholesale bundles with unlimited data capacity which enable RSPs to move their customers step by step to high bandwidths.
- ⇒ This would increase NBN's take-up.
- ⇒ This would contribute to reducing the digital gap between Australia and other developed countries.
- ⇒ This would boost social and economic benefits of superfast broadband in Australia.

# Executive Summary (II)

- Future demand for broadband services is driven by a need for rising bandwidth and quality due to growing requirements of applications realised over the Internet.
- Nationwide broadband access enabling very high speeds and superior quality on affordable terms is therefore crucial to realise the economic potential arising from the digitalisation of the economy and society.
- Against this backdrop, NBN's technology and roll-out strategy, and the wholesale conditions ruling access to this network have high relevance for the Australian population and economy.
- The current wholesale regime of inflated wholesale access prices implies the risk that Australia is losing out to the leading nations in terms of the digitalisation.

# Executive Summary (III)

- A benchmark analysis with 9 other leading economies (USA, Japan, France, South Korea, New Zealand, Germany, UK, Italy, Sweden) reveals a weak performance of Australia in several key broadband metrics:
  - Australia ranks behind the United States as the second most expensive market for retail broadband plans with 25-50 Mbps and 50-100 Mbps.
  - At the same time, Australia has the lowest measured average fixed broadband speeds.
  - The uptake of retail plans with bandwidths of 100 Mbps and more is comparably low.
- These results are mainly driven by a wholesale pricing regime which prevents RSPs from marketing commercially attractive superfast broadband products.
- As a result most Australians use broadband products of lower performance at a higher price than in many other developed countries.
- The situation is likely to exacerbate, if NBN retains its practice to offer wholesale products with limited data capacity that lead automatically to higher wholesale prices as data consumption increases.

# Executive Summary (IV)

- In light of NBN's current consultation, WIK has compared
  - the current pricing of NBN (Base case),
  - NBN's proposal from September 2019 (NBN proposal), and
  - the alternative proposal made by Telstra (Telstra proposal).
- The three proposals differ in terms of the basic prices for wholesale access in different speed tiers and the capacity included.
- For these scenarios WIK has calculated
  - the number of users on NBN's platform,
  - the allocation of users to different speed tiers,
  - NBN's revenues and ARPUs, and
  - the impact of the three scenarios on the GDP.

# Executive Summary (V)

- The current consultation shows that the base scenario is not future-proof – or even in the interest of the NBN.
- The new NBN proposal points in the right direction, but misses to introduce unlimited data capacity. It therefore offers no planning security for RSPs and users as data usage is expected to rise further.
- Due to its unlimited data capacities, the Telstra scenario ensures the most efficient usage of the NBN infrastructure:

	Telstra proposal	NBN proposal	Base case
Number of customers on the NBN platform in 2024 (millions)	9.79	8.13	5.84
Percentage of NBN customers with speed tiers of 100 Mbps and above in 2024	73%	52%	17%
Cumulated GDP effect <b>in comparison to the Base case</b> (present value; 2019-2024)	\$18.0 bn.	\$10.2 bn.	-
Cumulated NBN revenues (present value; 2019-2024)	\$20.9 bn.	\$22.4 bn.	\$20.8 bn.



# Executive Summary (VI)

- In order to maximise economic benefits associated with the NBN, NBN should apply wholesale prices with unrestricted data capacity, which creates incentives for RSPs to upgrade their customers.
- The NBN proposal thus points in the right direction but does not go far enough with regard to CVC pricing.
- Even if the cumulated revenues in the NBN proposal exceed the revenues in the Telstra scenario by \$ 1.5 bn., this effect is far exceeded by the cumulated GDP effect in comparison to the base case, which is \$ 7.8 bn. higher in the Telstra proposal.
- The calculation of the GDP effect thereby does not take into account additional welfare effects due the higher number of users on the NBN platform in the Telstra scenario.

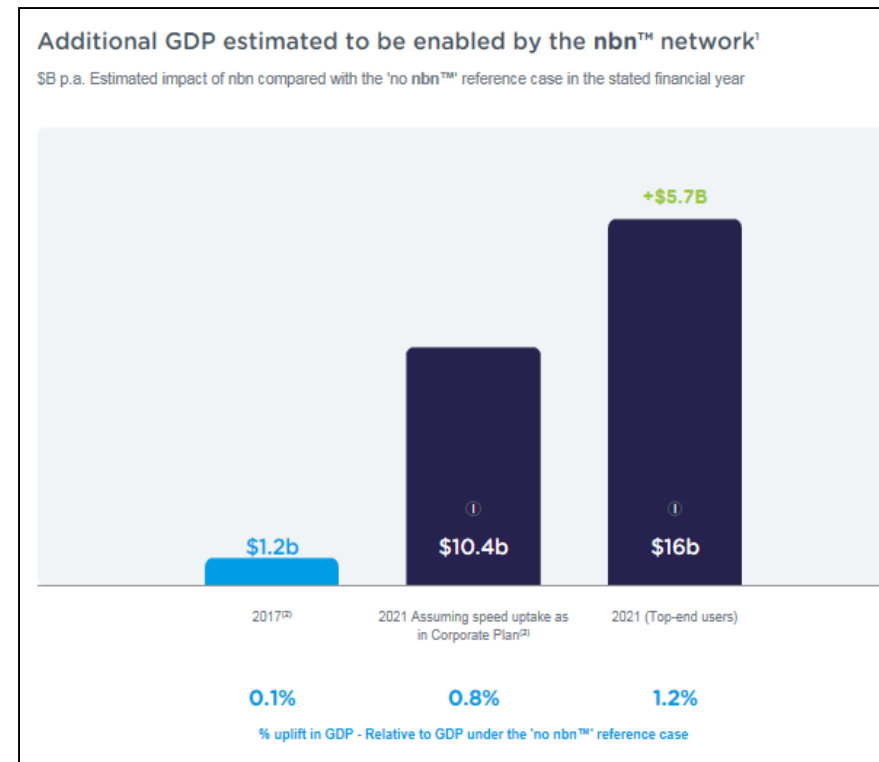
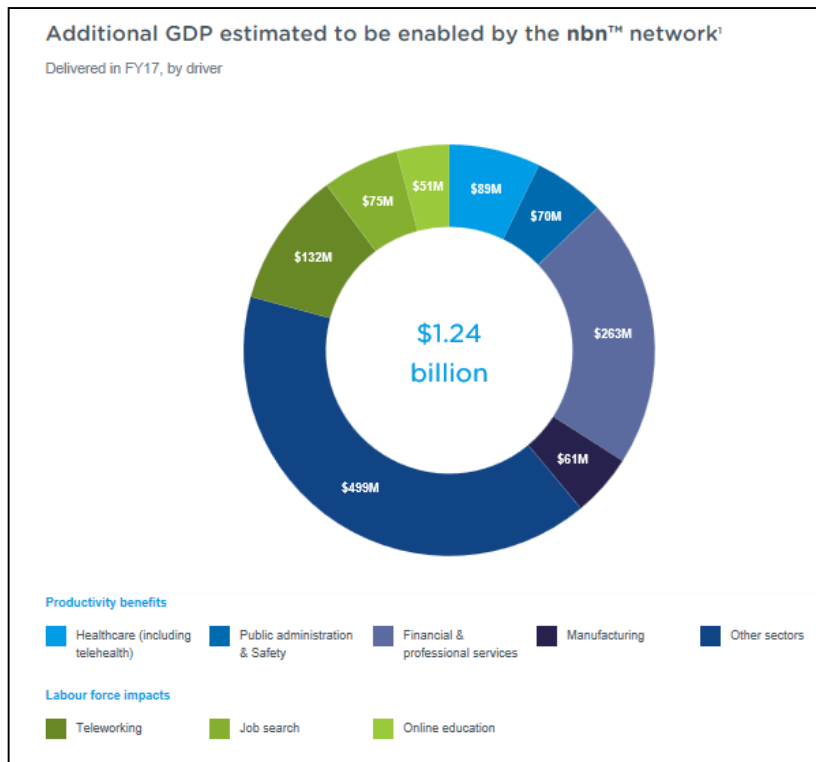
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# Social and economic benefits of fast and reliable broadband access

- The benefits of fast and reliable broadband access are uncontested.
- Econometric analyses reveal positive correlations between broadband availability and GDP, local economic growth, unemployment, environment and society.
- The availability of higher speeds, access to ultrafast broadband and in particular the actual use of advanced broadband products increase these positive effects.
- By deciding to place the roll-out and provisioning of future-proof broadband in the hands of NBN, the responsibility arises for NBN to establish a wholesale environment, which puts RSPs in a position to offer retail products, which contributes to a high uptake of ultrafast products in order to realise these economic benefits at the utmost account.

# Benefits associated with the NBN

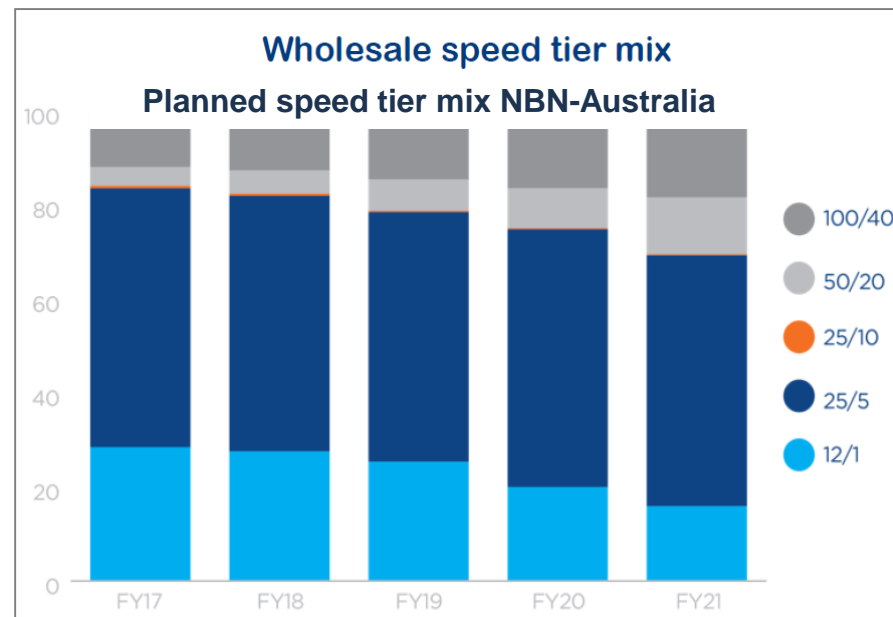
- A report commissioned by NBN estimates the additional GDP enabled by the NBN in 2017 as \$ 1.24 billion.
- Based on two different speed tier mixes, the effect is assessed to increase up to \$ 10.4 billion / \$ 16 billion in 2021. This would represent an uplift of 0.8% / 1.2% of the Australian GDP.



Source: <http://www.connectingaustralia.com.au/#economyresearch>.

# Benefits associated with the NBN

- The wholesale speed tier mix, which is used to calculate the \$ 10.4 billion additional GDP in 2021, contains no take-up of products with bandwidths above 100 Mbps.
- Given the correlation between the adoption of superfast broadband and positive GDP effects, and the share of Australian households connected by the NBN with technologies enabling speeds of 100 Mbps and more, the economic potential of the NBN is not fully used.



Source: NBN Corporate Plan 2018-2021.

# Lessons learned

- Empirical results suggest a positive relationship between the adoption of high speed connectivity and economic growth.
  - As yet NBN has made little efforts to create incentives for RSPs to market products with speeds of 100 Mbps and above.
  - From a socio-economic perspective this strategy bears the risk to give away economic potential of the NBN.
- ⇒ **To realise the potential economic benefits which are associated with advanced communication infrastructures, NBN needs to establish a wholesale price regime, which promotes the uptake of broadband products with superfast speeds.**

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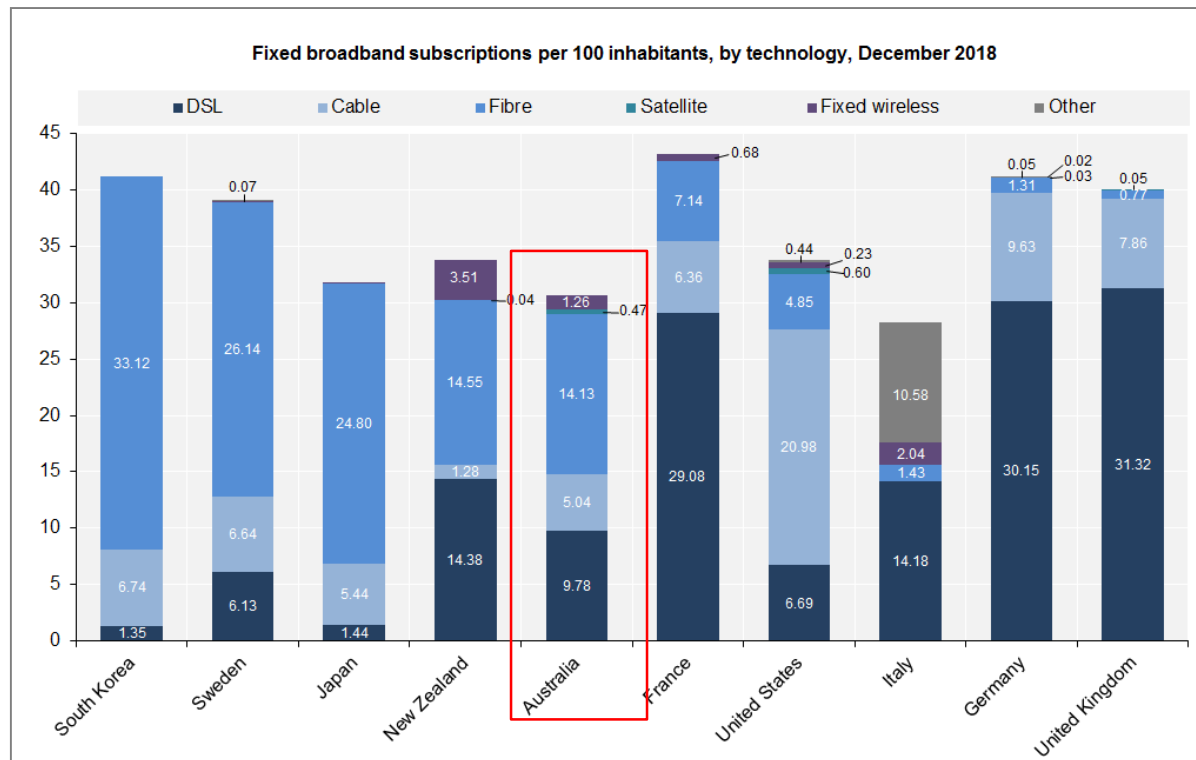
# International benchmark

- Our benchmark analysis combines leading economies (USA, Japan, Germany, France, UK), the digital leader (South Korea), and countries which are comparable to Australia due to a high relevance of wholesale-only in their national broadband market (New Zealand, Sweden, Italy).



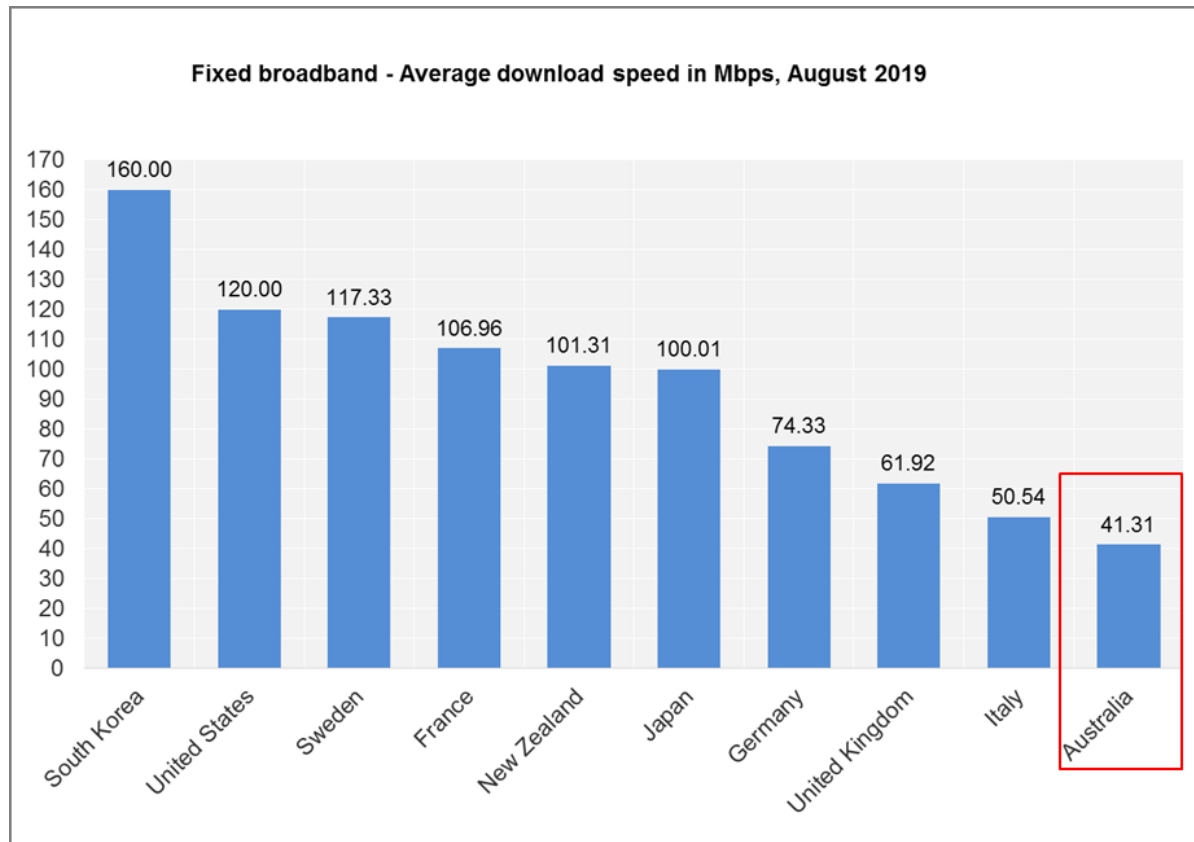
# Fixed broadband subscriptions by technology

- The underlying OECD figures show a relatively high number of fibre subscribers for Australia.
- However, for the fibre indicator, Australia has reported to the OECD all connections realised via FTTP, FTTB, FTTN and FTTC. Therefore, these figures are not comparable with the other countries reporting only FTTP connections to the OECD.
- Only 5.3 of 100 Australians have a fixed broadband subscription based on “real” fibre.



Source: OECD.

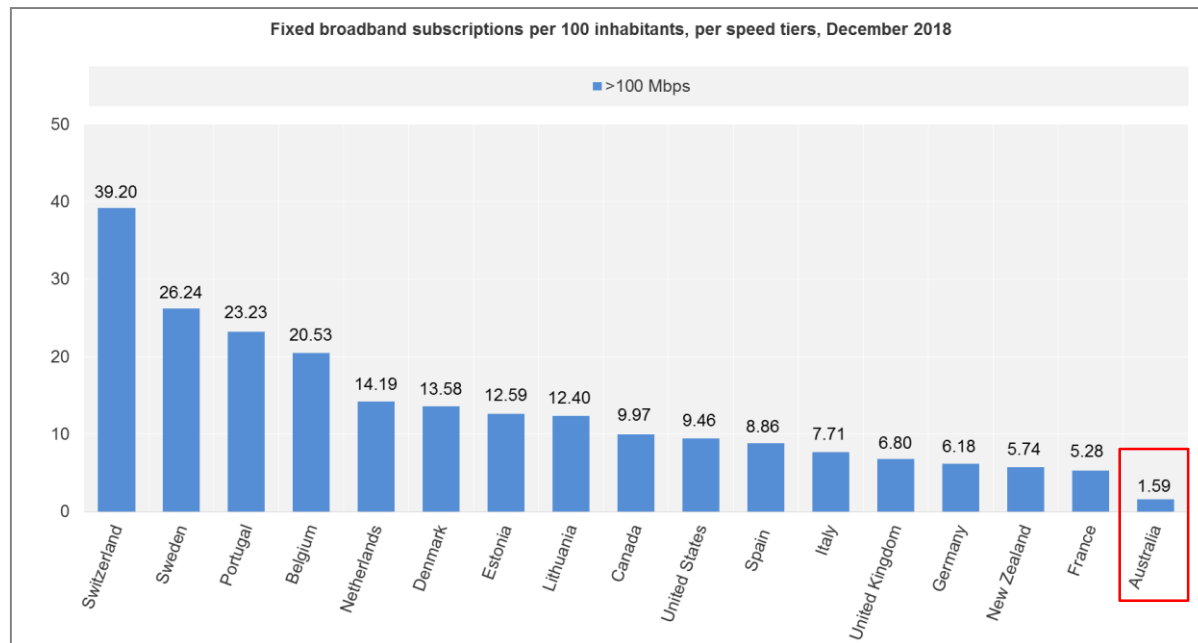
# Fixed broadband average download speeds



Source: Ookla Global Speedtest Ranking, August 2019.

- Australia shows the lowest measured average download speeds of our sample candidates.
- This is due to
  - a lack of retail broadband plans with speeds of more than 100 Mbps,
  - a high fraction of subscribers using broadband plans with speeds of 50 Mbps and below,
  - wholesale prices which incentivise RSPs to market products with low bandwidths,
  - a comparably low availability of FTTP enabling very high bandwidths.

# Fixed broadband subscriptions by speed tiers



Sources:

Data for Australia: NBN Wholesale Market Indicators Report 31 December 2018; Data other countries: OECD.

Note: The number for Australia contains subscriptions greater than or equal to 100 Mbps and includes only connections on the NBN Network. The data used for Australia are wholesale data.

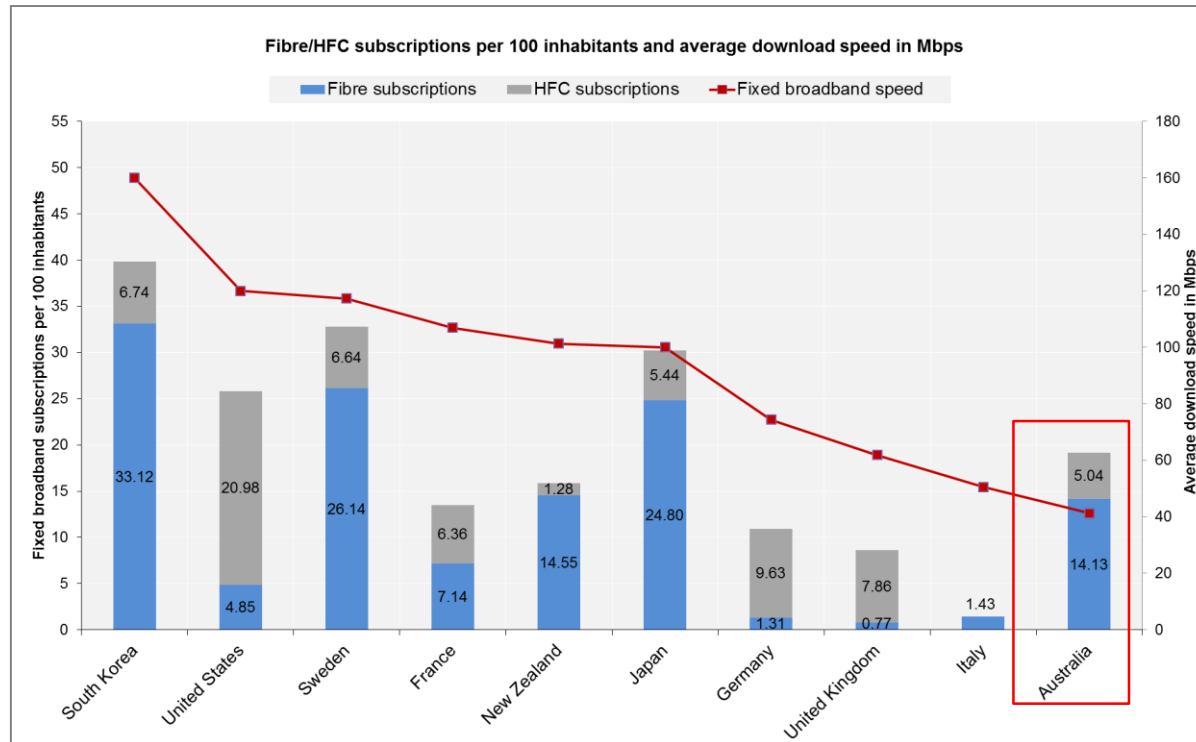
- Australia shows a very low number of  $\geq 100$  Mbps subscriptions per 100 inhabitants.
- There is a substantial need to catch up to induce the additional socio-economic welfare which is associated with the use of higher bandwidths.
- The figures for the Baltic states (Estonia, Lithuania) in particular show how rapidly the demand for high bandwidths can increase as a result of a consistent digitilisation policy.

# Fibre/HFC subscriptions and average download speeds

- The low average download speeds in Australia are particularly striking against the backdrop of the number of subscribers by technology.

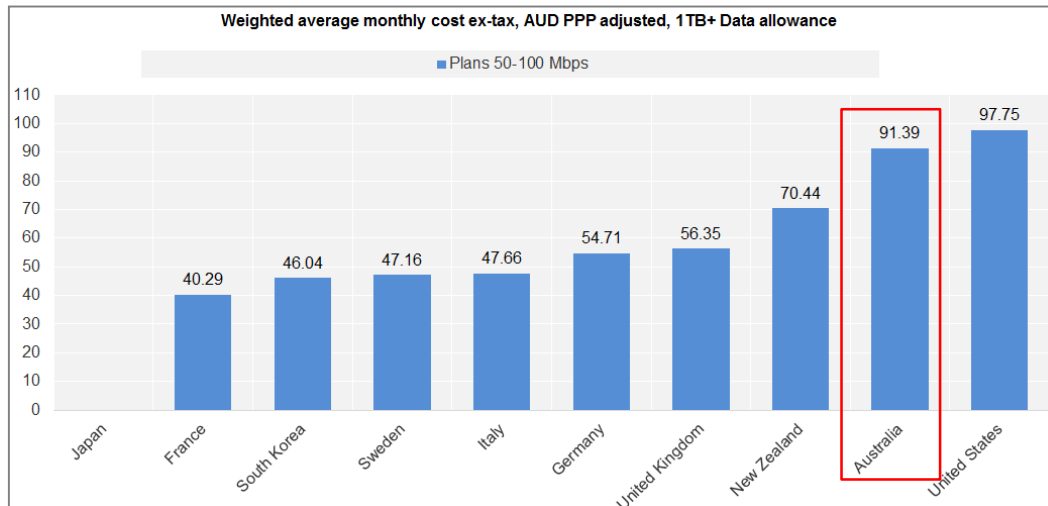
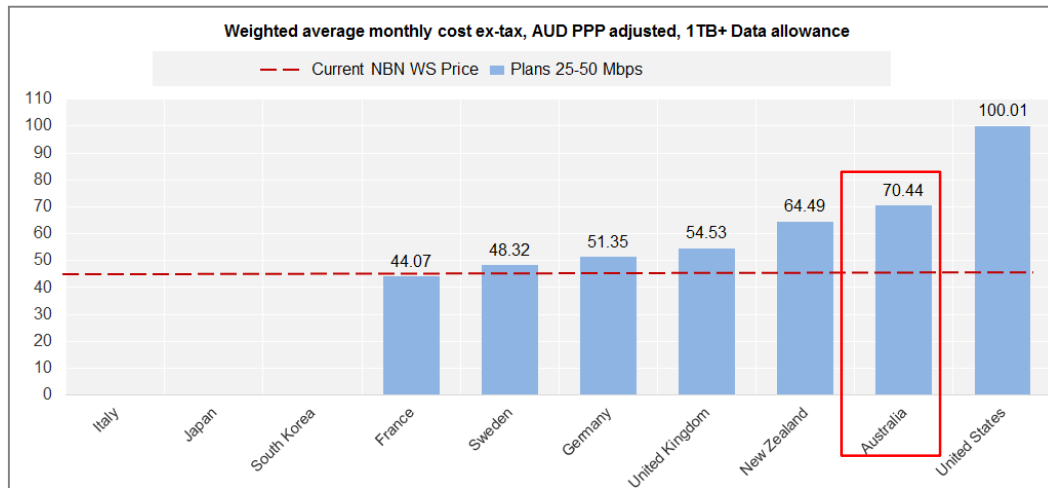
- This applies regardless of the aforementioned fibre definition given that countries such as Germany, Italy and the UK with high shares of FTTC subscriptions show higher average download speeds.

⇒ Under the given technology mix, NBN could contribute to a significant increase of the average download speeds in Australia.



Sources: Speeds: Ookla Global Speedtest Ranking, August 2019; Fibre Subscriptions: OECD, December 2019.

# Retail prices

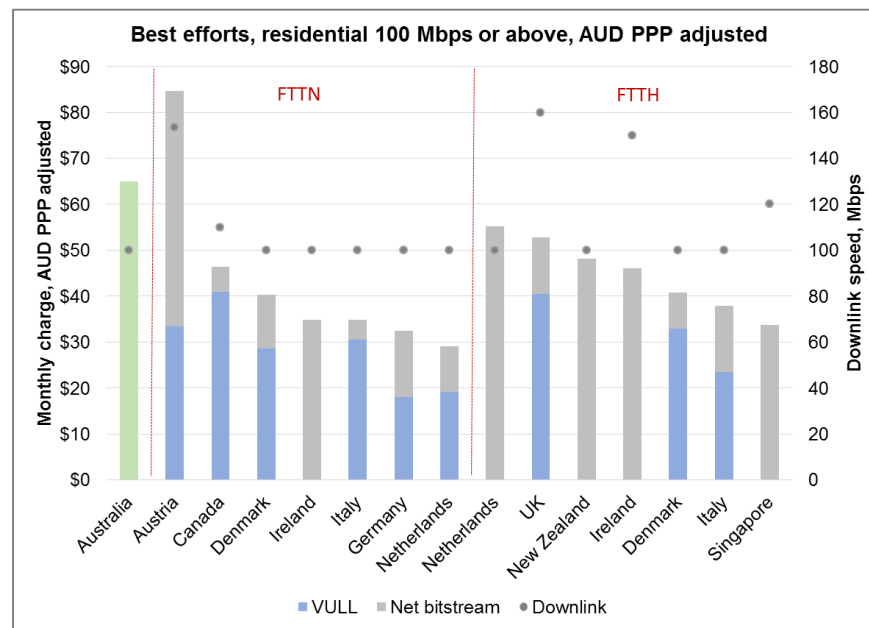
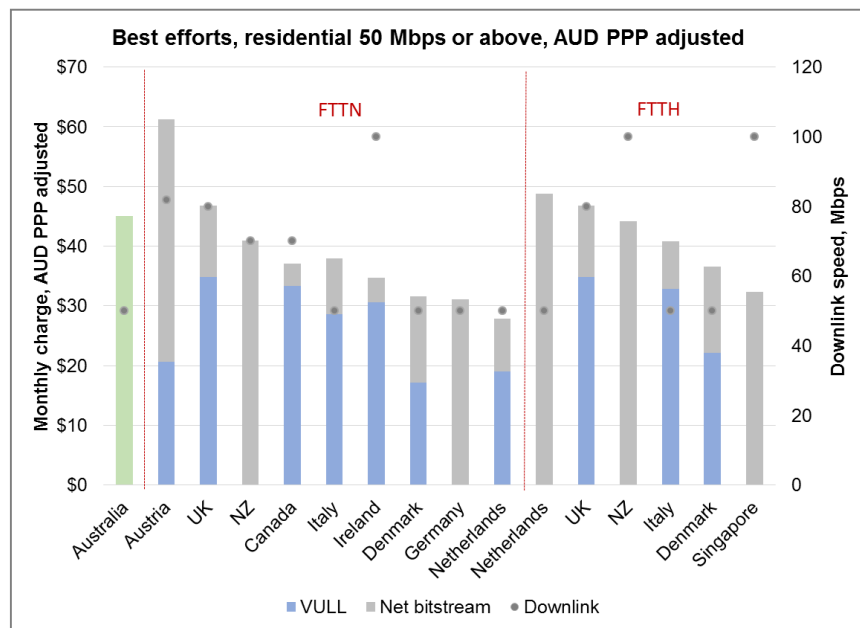


- For both plans with 25-50 Mbps and 50-100 Mbps Australia ranks behind the United States as the second most expensive market.
- In sharp contrast to this in Japan no tariffs are offered in the bandwidth classes 25-50 and 50-100 Mbps.
- With the current NBN wholesale price of \$ 45 in the 50 Mbps plan, it is not possible to replicate the retail prices of other countries without falling into a margin squeeze as the retail prices must cover the wholesale purchasers' own costs (e. g. sales, marketing, overheads).
- This is strengthened by the fact that overusage CVC is not included in this wholesale price of \$ 45, so that the effective average wholesale price may in fact be even higher.

Source: OVUM (2019): NGN Price Benchmarking, A report for Telstra, 8 July 2019.

Remark: The data represents plans evaluated in the second and third weeks of June 2019. Japan: No tariffs are offered in the bandwidth classes 25-50 and 50-100. The focus is on tariff classes between 1000 and 10000 Mbps (symmetrical). Italy: No tariffs are offered in the 25-50 Mbps bandwidth class. In addition to 20 Mbps tariffs, only tariffs from 100 Mbps upwards are available. South Korea: No tariffs below 100 Mbps are offered.

# Wholesale prices



Source: Link Economics (2019): High Speed Broadband: wholesale price comparison, a report for Telstra, 19 February 2019.

- A different sample of countries provided by Link Economics underlines the high level of wholesale prices in Australia.
- Given the role of NBN as the national broadband infrastructure operator in Australia, the connection to the level of retail prices is obvious.

# Lessons learned from the international benchmark

- The Australian broadband market is characterised by a very low usage of advanced ultrafast broadband products and comparably high wholesale and retail prices.
- Given the emphasised role of NBN as the national broadband operator, the connection between wholesale and retail prices is striking.
- It is highly likely, that the comparably low availability of “real“ fibre in combination with NBN’s wholesale pricing strategy contribute detrimentally to the state of the Australian broadband market in comparison to other leading economies.

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# Alternative technologies in the provision of broadband services

Transmission technology	FTT...	Bandwidth down	Bandwidth up	Bandwidth effective down	Bandwidth effective up	individual/shared	symmetr./asymmetr.	Ultrafast BB	Standard	Maturity
<b>Copper pair</b>		[Gbit/s]	[Gbit/s]	[Gbit/s]	[Gbit/s]	300M - 1G				
ADSL2+	FTTC	0.01	0.004	2.5	0.01	i	a	n	2003	y
VDSL2	FTTC	0.05	0.015	0.05	0.015	i	a	n	2006	y
VDSL2 Vectoring	FTTC	0.09	0.04	0.09	0.04	i	a	n	2010	y
VDSL2 Supervect.	FTTC	0.25	0.1	0.25	0.1	i	a	n	2015	y
G.fast	FTTS/dp	0.5	0.5	0.5	0.5	i	a/s	?	2014	y
XG.fast	FTTB	5	5	5	5	i	a/s	y	2016	+ 2 Y
<b>Coax</b>										
Docsis 3.0	fibre node	1.2	0.12	0.12	0.012	s	a	?	2006	y
Docsis 3.1	fibre node	10	1	1	0.1	s	a	y	2013	y
Docsis 3.1 FD/XG-Ca.ble	deep fibre	10	10	1	1	s	s	y	2020	+ 4 Y
<b>Fibre</b>										
GPON (PMP)	FTTH	2.5	1.25	0.4167	0.2083	s	a	y	2003	y
XG-PON	FTTH	10	2.5	1.6667	0.4167	s	a/s	y	2008	y
XGS-PON	FTTH	10	10	0.5	0.5	s	s	y	2015	y
TWDM GPON	FTTH	4 - 8 x 10	4 - 8 x 10	0.5	0.5	s	a/s	y	2013	y
DWDM GPON	FTTH	1 x 1	1 x 1	1	1	i	s	y	2020	+ 4 Y
Ethernet P2P	FTTH	n x 10	n x 10	10	10	i	s	y	1998	y
<b>Mobile</b>										
LTE adv.	?	1	0.15	0.125	0.01875	s	a	?	2012	y
5G	?	50	0.5	6.25	0.0625	s	a	y	2020	+ 3 Y

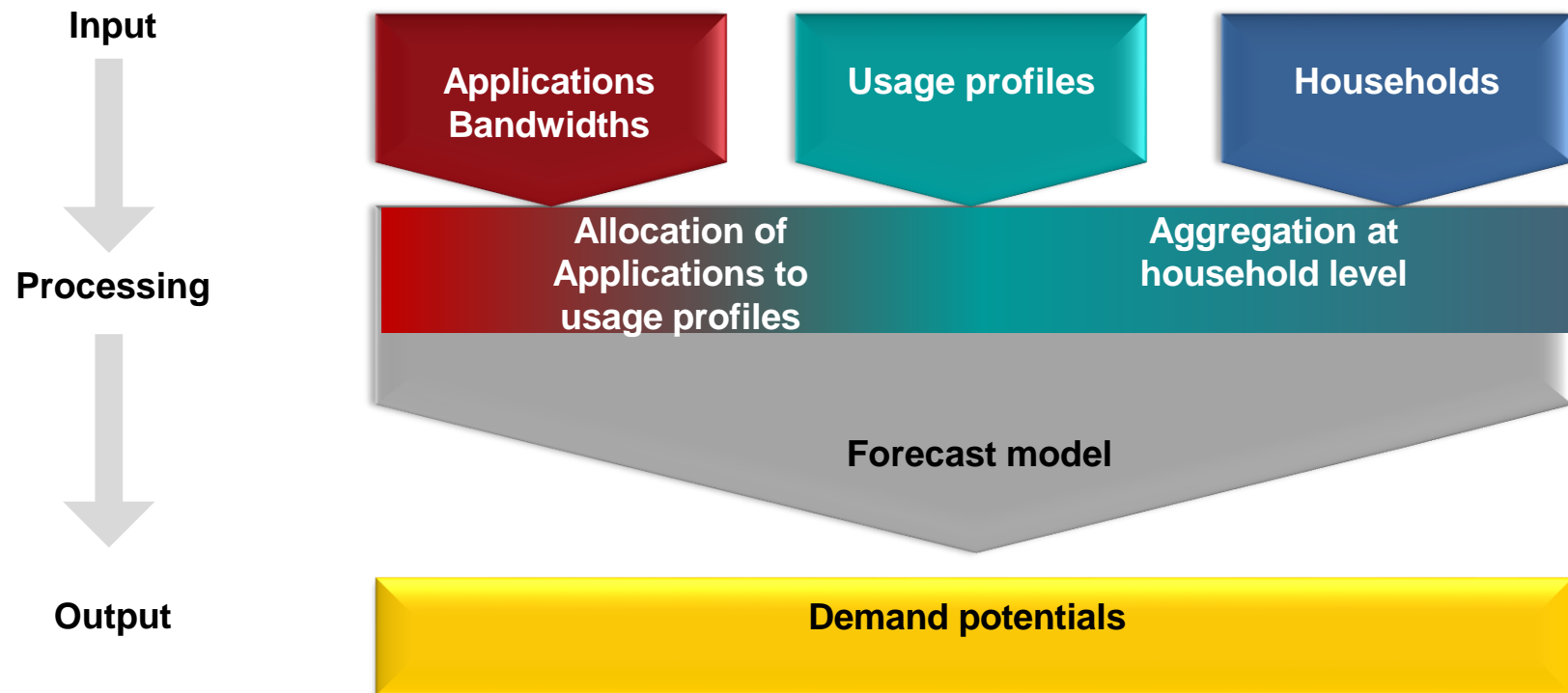
Source: WIK.

- NBN relies on a multi-technology approach.
- Out of these platforms only NBN's FTTP infrastructure (18%) can be classified as gigabit ready today.
- The upgrade of HFC could be realised by node splitting and an upgrade to DOCSIS 3.1.
- Upgrading FTTN/B/C to FTTP would require significant investment for digging.
- Both upgrades are not seen in the current corporate plan of NBN, however.

# WIK's market potential model to forecast the demand for bandwidth

## WIK's-market potential model

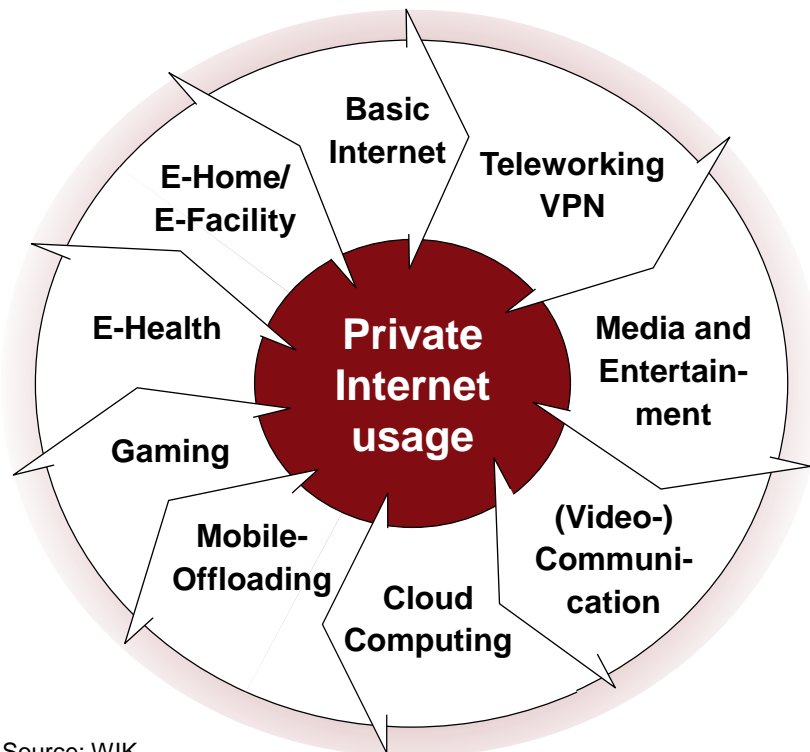
- is based on “optimal user experience“, i. e. demand is not subject to technical or commercial restrictions;
- is oriented on user expectation;
- emphasizes the economic benefits of broadband roll-out;
- has been applied in projects on behalf of OFCOM, the EU-Commission and for commercial clients in Germany and Belgium.



Source: WIK.

# Future demand for Internet services

- Demand for bandwidth will be driven by the parallel usage of several applications.
- In comparison to today, future applications will be characterised by higher requirements for down-, upload and quality parameters. This accounts for existing applications as well.



Application Categories	Examples
Basic Internet	News/Mail, Photo, Downloads, Web-TV, Social Networks, Online Storage, ...
Media and Entertainment	Video/Film, Web-TV, HD-TV, 3D-TV, ... Ultra-HD-TV, 4k, 8k
VPN	Teleworking
(Video-) Communication	Telephony, Chats, IM, ... Video-telephony, Videoconferencing, E-Learning, Teleworking, ..
Cloud Computing	SaaS, IaaS, PaaS, ...
Gaming	Online-Gaming, MMOG, virtual reality, ...
E-Health	Monitoring, Remote diagnostics, AAL, ...
E-Home/E-Facility	Smart Meter, Home Networks, Smart Grid, Security, ...
Mobile	Location-based Services, Mobile Business, Apps, WiFi-Offloading, ...

Source: WIK.

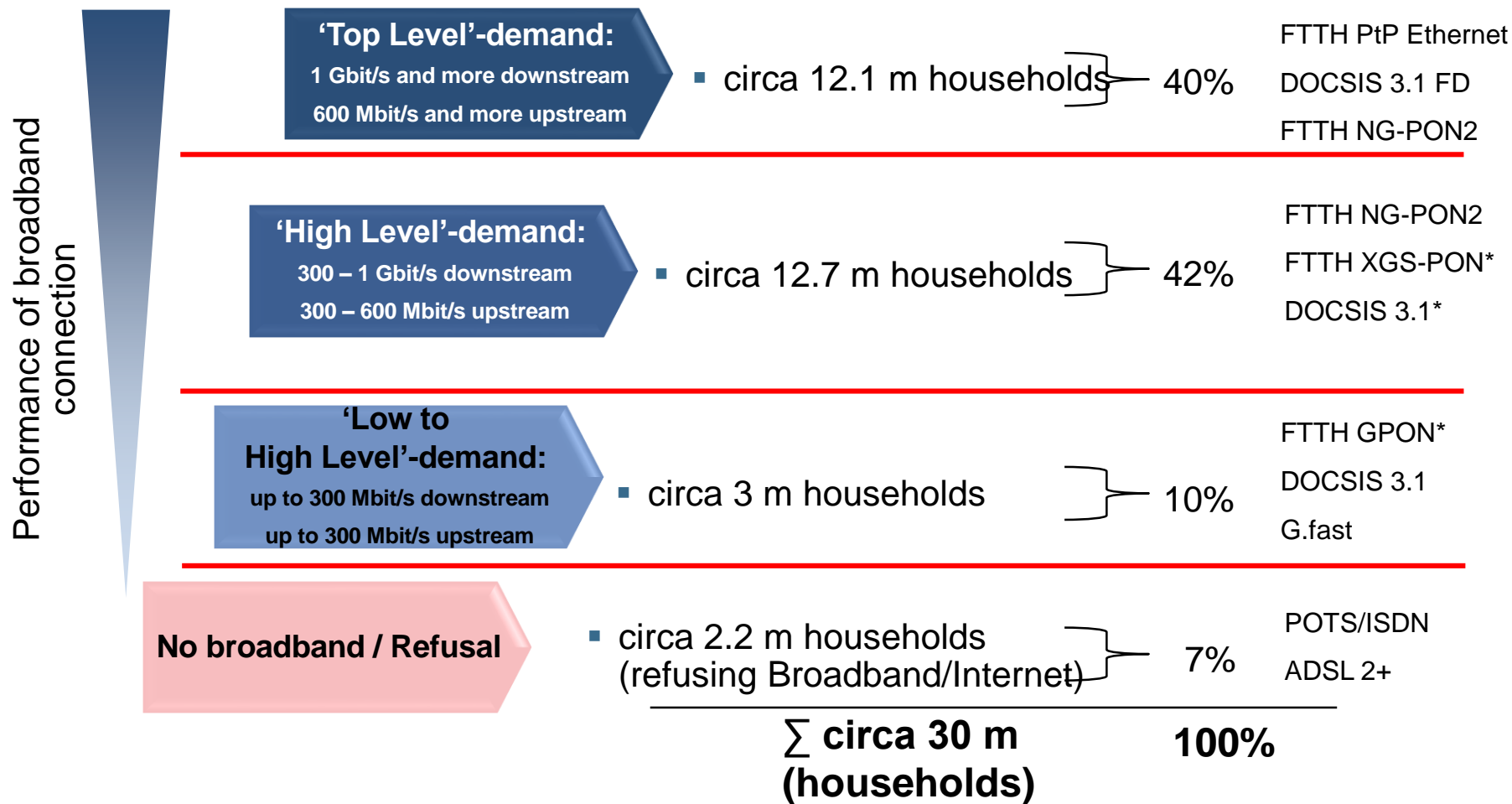
# Estimation of bandwidth and QoS requirements for individual applications in 2025

Application category	2015 Downstream bandwidth (Mbit/s)	Assumed CAGR in%	Downstream (Mbit/s) in 2025	Upstream (Mbit/s) in 2025	Packet loss	Latency
Basic Internet	2	25	≈20	≈16	o	o
Homeoffice/VPN	16	30	≈250	≈250	+	+
Cloud Computing	16	30	≈250	≈250	+	++
State of the Art Media and Entertainment (4k, 3D, UHD)...	14	20	≈90	≈20	++	+
Progressive Media and Entertainment (8k, Virtual Reality)	25	30	≈300	≈60	++	+
Communication	1.5	20	≈8	≈8	++	+
Videocommunication (HD)	8	15	≈25	≈25	++	++
Gaming	25	30	≈300	≈150	++	++
E-Health	2.5	30	≈50	≈50	++	+
E-Home/E-Facility	2.5	30	≈50	≈50	o	o
Mobile Offloading	2	30	≈15	≈12	o	o

Source: WIK report on behalf of Ofcom.

o = Low specific importance  
 + = High importance  
 ++ = Very high importance

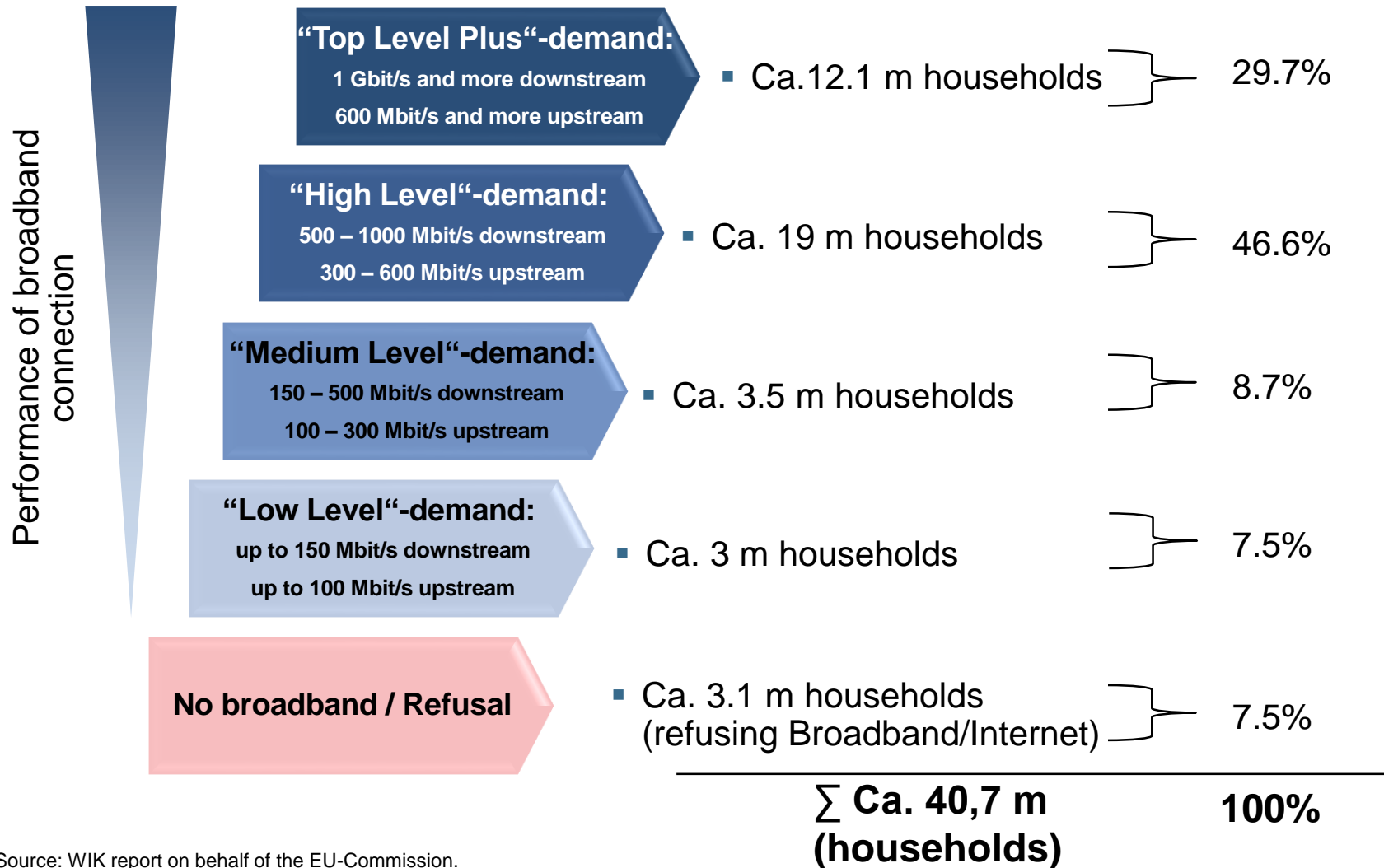
# Bandwidth demand forecast for fixed broadband access in 2025 - UK



Source: WIK report on behalf of Ofcom.

\* Capacity strongly depends on sharing/splitting factor and user behavior during busy hour.

# Bandwidth demand forecast for fixed broadband access in 2025 - Germany



Source: WIK report on behalf of the EU-Commission.

# Lessons learned

- Future demand is driven by parallel usage of various applications within a household.
- Given comparable demand patterns as in Germany and the UK, NBN would be able to serve only a fraction of Australia's population with services provided under the optimal user experience in 2025.
- Beside the limited availability of future proof infrastructure, NBN's wholesale prices discourage RSPs from offering plans for "top" or "high-level" demand customers, where this is possible.
- This hampers the diffusion of advanced digital services and attributed economic benefits and constitutes a risk of migration to alternative fibre and 5G.

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# The scenarios under observation

- Due to industry concerns with the current pricing regime (Base case), NBN published a new pricing regime (NBN proposal) which adapts CVC inclusion rates and introduces new products (100/20, 250/25, 1000/50).
- In the consultation Telstra has submitted its own proposal with wholesale prices without CVC extra costs, a cancellation of the 12/1 and the 25/5 product and adapted prices for the 50/20, 100/40, 250/25, and the 1000/50.
- Our market model analyses these three scenarios:
  - **Base Case (according to NBN's current wholesale pricing regime).**
  - **NBN proposal (as of September 2019).**
  - **Telstra's proposal for a consistent wholesale pricing regime.**

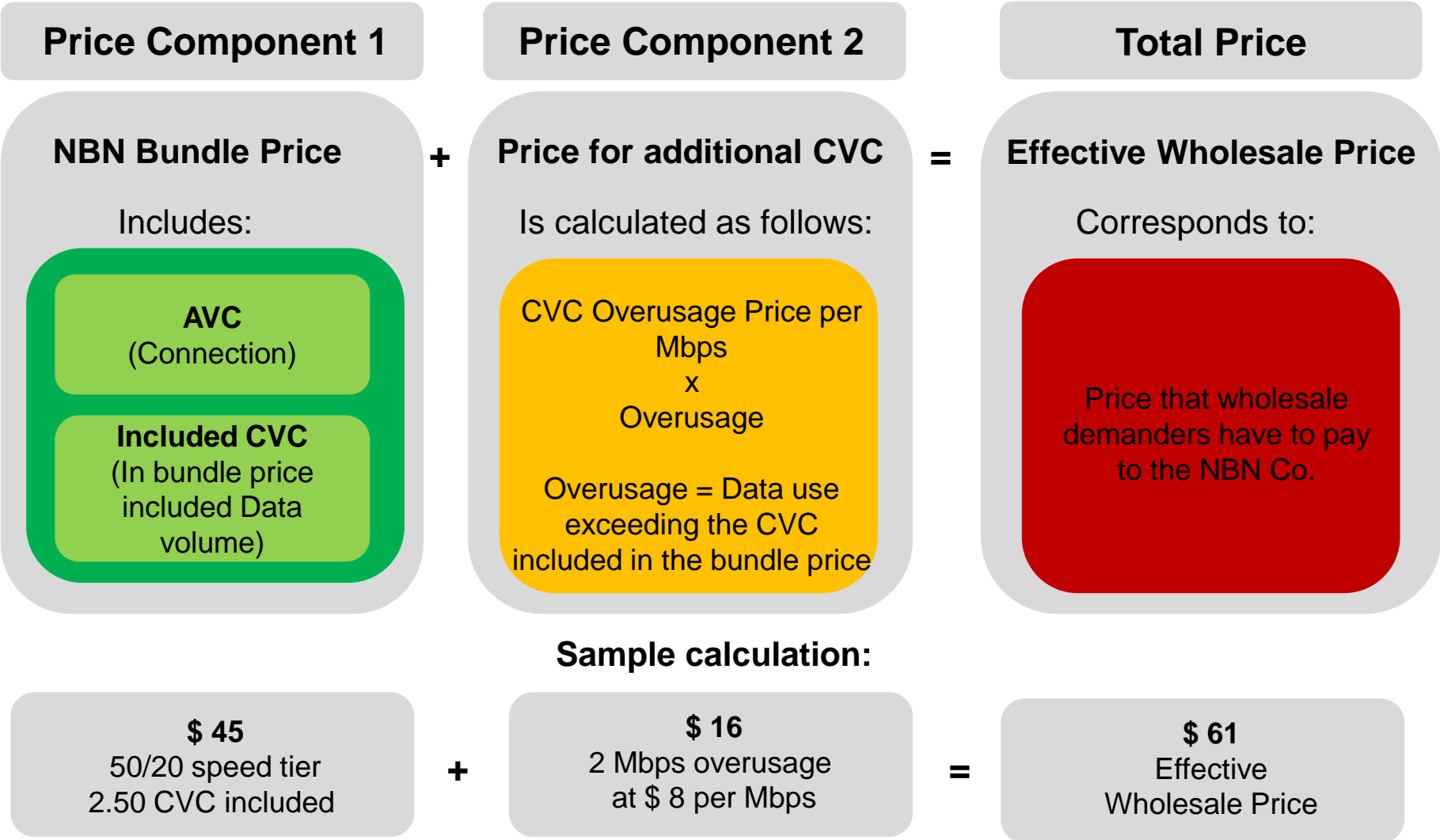
# List prices of the three scenarios

- Effective prices in the Base Case and the NBN proposal may differ from list prices due to the limited capacity included.
- Possible adaptations of the included volumes in the future cannot be considered in our analysis – therefore NBN’s revenues and ARPUs in the “base case” and the “NBN proposal” might be lower than our modelling suggests. Furthermore, we only consider recurring monthly revenues and no one-off revenues\*.

Prices 2020-2024			
Speed tier	Base case	Nbn proposal	Telstra proposal
voice-only	\$22.50	\$22.50	\$10
12/1 low usage internet	\$22.50 / 0.15 Mbps CVC	\$22.50/ 0.15 Mbps CVC	n. a.
25/5	\$45 / 2.0 Mbps CVC	\$37 / 1.25-1.5 Mbps CVC	n. a.
50/20	\$45 / 2.0 Mbps CVC	\$45 / 2.25-2.5 Mbps CVC	\$35 / CVC unlimited
100/20	n. a.	\$58 / 3.75-4.0 Mbps CVC	n. a.
100/40	\$65 / 3.0 Mbps CVC	\$65 / 3.75-4.0 Mbps CVC	\$58 / CVC unlimited
250/25 Mbps	n. a.	\$68 / 4.75-5.0 Mbps CVC	\$68 / CVC unlimited
250/100 Mbps	\$100 / 3.0 Mbps CVC	\$100 / 3.25-3.5 Mbps CVC	n. a.
1000/50 Mbps	n. a.	\$80 / 5.75-6.0 Mbps CVC	\$80 / CVC unlimited
1000/400 Mbps	\$180 / 3.0 Mbps CVC	\$180 / 3.0-3.5 Mbps CVC	n. a.

\* This is a reason for deviations in the expected ARPUs in our model and in NBN’s corporate plan. Another reason may be different forecasts on the development of the requested data capacities.

## General pricing structure in NBN's pricing regime



# NBN Pricing Regime

## Implications of the NBN pricing structure

- In the past, the volume of data included in NBN's wholesale bundles was mostly sufficient to map the data usage of the average end user.
  - However, due to the ever-increasing use of data, effective wholesale prices rise at the expense of RSPs.
  - RSPs cannot easily pass these costs on to their end customers given that the majority of retail offers are based on unlimited data packages.
  - The threat of increasing capacity costs must therefore be taken into account and priced in at the retail level.
  - Unlimited data packages for retail customers are an important precondition for an intensive usage which again is necessary to realise the economic benefits associated with the NBN.
- ⇒ An optimal price system that aims to derive the greatest economic benefit from the NBN should contain wholesale bundles without restrictions on the included data volumes (CVC) or at least generously dimensioned glide paths taking the growing demand for bandwidth into account.

# Methodology (I)

1. Estimation of fixed-network subscriber up to 2024 on the basis of
  - Number of households in 2024
  - Development of „mobile-only households“
  - Unconnected households
  - Households with no demand for an Internet connection.
2. Assessment of homes passed and take-up of alternative FTTP network operators.
3. Calculation of fixed net subscribers using the NBN network.
4. Allocation of NBN customers on different speed tiers (see slide 37)
5. Calculation of NBN revenues (and ARPU) for the different scenarios as the product of effective wholesale prices (taking extra costs for CVC into account) and number of customers per speed tier by year.
  - **Please note:** Differences between the revenues in our base case scenario and the NBN corporate plan result from one-off revenues, revenues from backhaul and leased lines services as well as revenues with large business customers which are not considered in our model as well as from different assumptions regarding future effective capacity costs.

# Methodology (II)

- Allocation of NBN customers on different speed tiers:
  - Starting point is the customer distribution in 2019.
  - We assume that retail prices are at least 30% above wholesale prices.
  - We further assume a non disruptive continuous retail price-setting behaviour.
  - If retail prices exceed existing price levels due to rising wholesale prices, we expect price increases at retail level. This leads to switching behaviour to other tariffs and alternative technologies (mobile broadband).
  - The modelling of switching behaviour to higher bandwidths is based on the assumptions of market research commissioned by Telstra, saying that 30% of 50 Mbps customers are open to pay additional \$ 10 for an upgrade to a higher speed tier and 31% of 100 Mbps and more customers are open to pay additional \$ 10 for an upgrade to a higher speed tier.
  - For our analysis we assume a lower share of upgrading customers in comparison to the Telstra commissioned research since in our experience many customers tend to be more sluggish than surveys suggest.

# Methodology (III)

- The effective wholesale charges are calculated based on an industry forecast on CVC usage for the years 2019 to 2022. Values for 2023 and 2024 have been calculated based on a CAGR.

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# Base Case (I)

## Effective wholesale prices

- Due to a growing CVC usage and constant capacity included in the Base Case, wholesale prices increase significantly over time.

[CIC begins]



[CIC ends]



## Broadband Internet speed tier mix – subscriber per product

- Due to the continuously rising wholesale prices, RSPs have to increase their retail prices over time.
- This leads to customers migrating to alternative technologies (the share of mobile-only users rises and the nbn take-up decreases), on the other hand, a small part of the customers willing to use fixed broadband switches to the 25 Mbps product (backsliding effect).
- The share of 100, 250 and 1000 products is limited to a small fraction of households with a high willingness to pay.

[CIC begins]



[CIC ends]

	2019	2020	2021	2022	2023	2024
NBN TakeUp	57.4%	63.0%	64.2%	61.6%	55.6%	48.7%

Note: Take-up calculated in % of premises ready to connect on NBN network.

# Base Case (III)

## Financial indicators for years 2020-2024

- Between 2019 and 2021 revenues increase due to higher ARPUs and an increasing number of platform users.
- In 2022 and 2023 increasing ARPUs (driven by CVC extra costs for increasing data consumption) exceed revenue losses due to the decline in the number of customers.
- In 2024 this relationship reverses and we see declining revenues.
- Overall, such a scenario would have very negative effects on the Australian broadband market, the Australian economy and the Australian consumers.
- This is underlined by the current consultation aiming to update the existing regime.

[CIC begins]



[CIC ends]

# NBN proposal (I)

## Effective wholesale prices

- The NBN proposal initiates new products with higher inclusive volumes.
- Nevertheless, based on industry forecast of capacity usage, effective wholesale charges will increase from 2020 on in the 50 Mbps tier, and from 2023 on in the 100 Mbps tier.

[CIC begins]



[CIC ends]

# NBN proposal (II)

## Wholesale Internet speed tier mix – subscriber per product

- We expect a fast decline of the 12 Mbps tier.
- The 25 Mbps tier is commercially attractive and is therefore maintained at a relatively constant level. However, growth in this segment is not possible due to the increasing need for bandwidth.
- We expect RSPs to increase their retail prices for 50 Mbps products due to rising effective wholesale costs from 2022 on. This should have large impacts on the market:
  - Customers with a higher willingness to pay for faster speed will upgrade to higher bandwidths
  - At the same time a smaller share of price sensitive customers will migrate to relatively cheaper mobile-only broadband access.
- Consequently, the NBN take-up decreases in 2023 and 2024.

[CIC begins]



[CIC ends]

	2019	2020	2021	2022	2023	2024
NBN TakeUp	57.4%	64.5%	70.1%	72.0%	69.8%	67.8%

Note: Take-up calculated in % of premises ready to connect on NBN network.

# NBN proposal (III)

## Financial indicators

- In the period of observation revenues rise continuously.
- Between 2019 and 2022 NBN benefits from increasing take-up and higher ARPUs.
- In 2023 and 2024 the effect of rising ARPUs (driven by CVC extra costs and the take-up of higher speed tiers) exceeds the negative revenue effect resulting from NBN customers switching to mobile-only broadband connections.

[CIC begins]



[CIC ends]

# Telstra proposal (I)

## Wholesale costs

- The Telstra proposal uses a price regime without any additional capacity costs for the RSPs.
- Prices therefore remain on a stable level through the whole period under observation.
- The 12/1 and 25/5 products are removed to support customer migration in higher bandwidths and create a jump basis for high speed tariffs.

	2019	2020	2021	2022	2023	2024
voice-only	\$ 22.50	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00	\$ 10.00
50/20	\$ 45.00	\$ 35.00	\$ 35.00	\$ 35.00	\$ 35.00	\$ 35.00
100/40	\$ 65.00	\$ 58.00	\$ 58.00	\$ 58.00	\$ 58.00	\$ 58.00
250/25	\$ 107.18	\$ 68.00	\$ 68.00	\$ 68.00	\$ 68.00	\$ 68.00
1000/50	\$ 193.75	\$ 80.00	\$ 80.00	\$ 80.00	\$ 80.00	\$ 80.00

# Telstra proposal (II)

## Broadband Internet speed tier mix – subscriber per product

- We have modelled a complete migration of 12 Mbps and 25 Mbps tier customers in 2020.
- The 50 Mbps tier with a share of 75% represents the jump basis for upgrades to higher tariffs in the following years.
- This is in accordance with market studies saying that customers using broadband products with 50 Mbps show a higher additional willingness to pay for even faster products in comparison to users with lower bandwidths.
- Due to constant prices, we expect declining market shares for mobile only broadband, the NBN take-up thus increases.

[CIC begins]



[CIC ends]

	2019	2020	2021	2022	2023	2024
NBN TakeUp	57.4%	66.5%	73.9%	78.6%	79.4%	81.6%

Note: Take-up calculated in % of premises ready to connect on NBN network.

# Telstra proposal (III)

## Financial indicators

- We expect rising revenues in the period of observation despite a significant ARPU decline in 2020.
- The current ARPU level will not be achieved before 2023 again, but the associated losses in turnover are offset by the growth of NBN users.

[CIC begins]



[CIC ends]



# Comparison of results (I)

## Telstra – NBN

- The Telstra and the NBN proposal from September 2019 represent the two most relevant scenarios.
- Their main differences are
  1. the included data capacities (Telstra: unlimited data capacities, NBN: CVCs differing from speed tier to speed tier),
  2. the removal of the 12/1 and the 25/5 tier in the Telstra scenario, and
  3. the pricing of the 50 Mbps tier.

### Unlimited data capacities...

- create higher planning security for RSPs and end consumers.
- ban the risk of retail price margin squeezes due to increasing usage under stable retail prices or increasing retail prices due to rising wholesale costs.
- reduce the risk for end customers that retail prices are set ex ante at excessive levels by the RSPs to protect against additional wholesale costs resulting from higher usage;
- reduce the incentives for RSPs to develop broadband products over alternative platforms (mobile, alternative fibre) and thus further the utilization of the NBN.

# Comparison of results (III)

Telstra – NBN

## The removal of the 12/1 and the 25/5 tier in the Telstra scenario

- 12 Mbps and 25 Mbps speed tiers lose importance due to the increasing need for bandwidth.
- The removal of these speed tiers creates the possibility for the general public to get to know the advantages of fast Internet.
- Market research indicates that customers with higher bandwidths show greater willingness to pay for even faster products.
- In a well coordinated retail price regime, the 50 Mbps tier could represent a jump base for faster broadband products.

# Comparison of results (IV)

Telstra – NBN

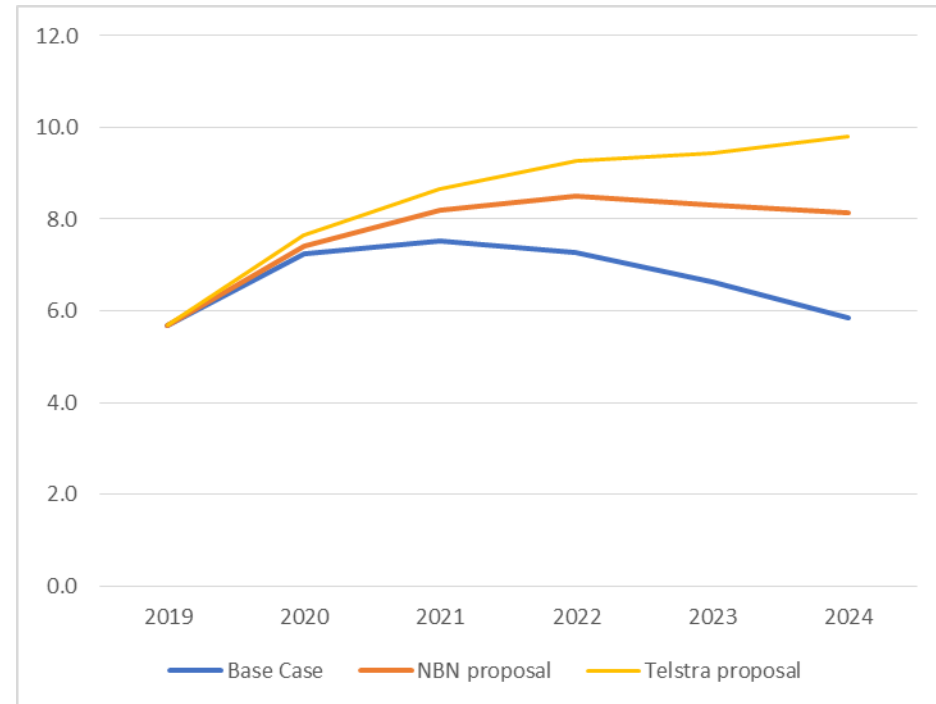
## The pricing of the 50 Mbps tier in the Telstra scenario

- The pricing of the 50 Mbps tier might have different effects:
  - We have modelled a scenario where the wholesale price reduction in the 50 Mbps tier is not (entirely) passed through to end customers. Given the current level of retail prices in combination with the suggested wholesale prices for faster speed tiers, the 50 Mbps tier could form a jump base to higher tariffs.
  - If we consider a pure cost plus scenario where retail prices tend to fall significantly in the 50 Mbps speed tier, the price differences between the 50 and the faster products could be too high to realise the aforementioned jump base effect.

# Comparison of results (I)

## Customers on the NBN

- In the Telstra scenario the number of customers on the NBN is significantly higher than in the two other scenarios.
- We expect no substitution by other technology platforms.
- This ensures the most efficient usage of the NBN infrastructure.



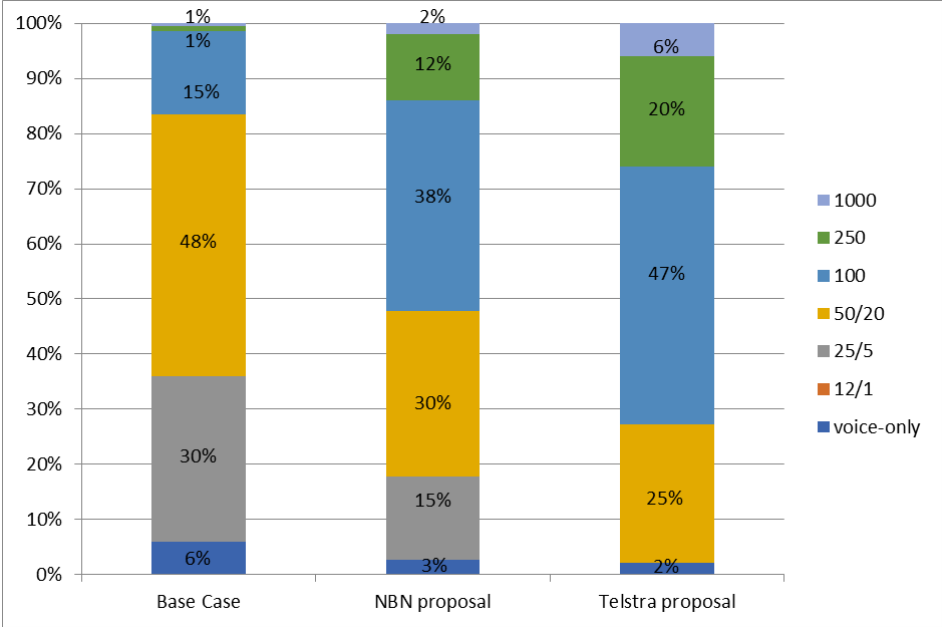
### NBN - Wholesale Line Demand in millions

	2019	2020	2021	2022	2023	2024
Base Case	5.68	7.25	7.52	7.27	6.62	5.84
NBN proposal	5.68	7.42	8.20	8.50	8.31	8.13
Telstra proposal	5.68	7.65	8.65	9.28	9.45	9.79

# Comparison of results (II)

## Wholesale product tier mix in 2024

- The Telstra proposal triggers the uptake of high bandwidths much stronger than the NBN proposal.
- 73% of NBN customers choose products with 100 Mbps and more, in comparison to 52% in the NBN proposal.



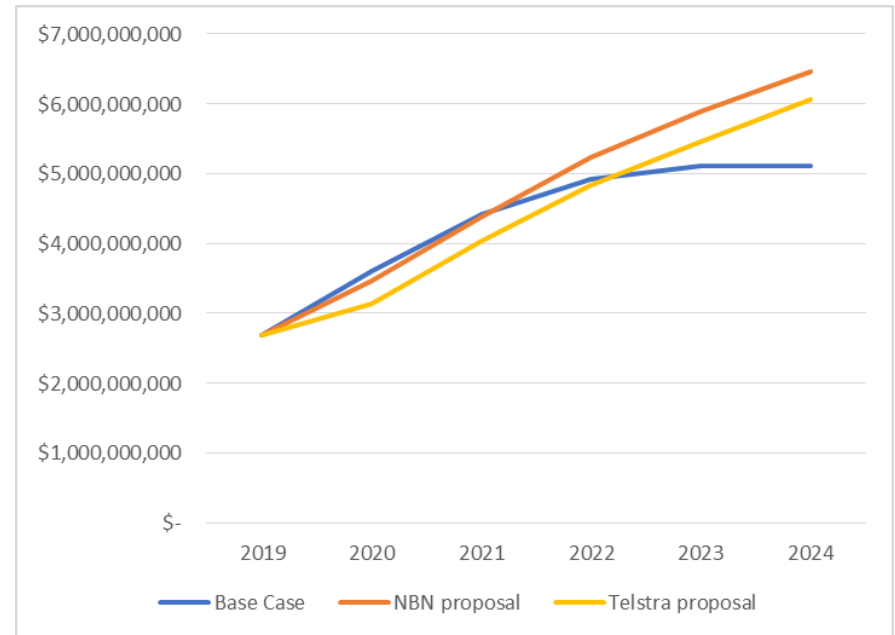
NBN - Subscriber 2024 in millions

	Base Case	NBN proposal	Telstra proposal
voice-only	0.35	0.22	0.22
12/1	0.00	0.00	0.00
25/5	1.75	1.22	0.00
50/20	2.77	2.44	2.45
100/20		3.11	0.00
100/40	0.88	0.00	4.58
250/25		0.98	1.96
250/100	0.06	0.00	0.00
1000/50		0.16	0.59
1000/400	0.03	0.00	0.00
<b>Total</b>	<b>5.84</b>	<b>8.13</b>	<b>9.79</b>
<b>Share &gt;=100 Mbps</b>	<b>17%</b>	<b>52%</b>	<b>73%</b>

# Comparison of results (III)

## Financial indicators

- Both the NBN and the Telstra proposal ensure steady revenue growths for the NBN.
- In the Telstra proposal growth is driven by a rising number of NBN users and the take-up of higher speed tiers.
- In the NBN proposal NBN take-up declines from 2022 on. This negative effect is exceeded by rising ARPUs (partly due to higher CVC costs caused by more intensive usage).
- Overall the NBN proposal achieves slightly higher cumulated revenues than the Telstra proposal



### NBN - Annual Revenue

	2019	2020	2021	2022	2023	2024	Cumulated NBN Revenues (present value; 2019-2024)
Base Case	\$ 2,690,321,267	\$ 3,607,403,174	\$ 4,425,983,249	\$ 4,923,943,501	\$ 5,115,020,025	\$ 5,104,793,448	\$ 20,785,898,708
NBN proposal	\$ 2,690,321,267	\$ 3,472,800,984	\$ 4,390,068,697	\$ 5,226,044,495	\$ 5,888,997,034	\$ 6,459,770,503	\$ 22,408,806,973
Telstra proposal	\$ 2,690,321,267	\$ 3,129,615,069	\$ 4,037,175,011	\$ 4,838,621,370	\$ 5,463,500,250	\$ 6,058,527,179	\$ 20,899,384,325

### NBN ARPU

	2019	2020	2021	2022	2023	2024
Base Case	\$ 46	\$ 46	\$ 50	\$ 55	\$ 61	\$ 68
NBN proposal	\$ 46	\$ 44	\$ 47	\$ 52	\$ 58	\$ 65
Telstra proposal	\$ 46	\$ 39	\$ 41	\$ 45	\$ 49	\$ 52

- Executive Summary
- Social and economic benefits of broadband services
- International benchmarks of broadband take-up, broadband demand and prices in Australia and other leading economies
- The development of broadband demand and its implications for the underlying infrastructures and technologies
- Market model: Forecast of take-up of NBN services until 2024 under different wholesale pricing scenarios
- **Estimation of the GDP effects of the different scenarios**
- Conclusions and implications



# Implications for Australian GDP

## Methodology to estimate the effect on GDP

We refer here to the scientific study by Rohman and Bohlin (2011) and apply their model to Australia. This study is highly regarded among experts and is frequently quoted and applied to similar questions:

1. We calculate the averages of the speed growth rates in Australia between 2019 and 2024 based on the assumed NBN speed tier mixes in each of the three scenarios.
2. We assume that on average 90% of the maximum speed according to the tariffs subscribed to in each case is achieved and that the speeds achieved over the NBN are representative for the overall market.

Estimated speeds

	2019	2020	2021	2022	2023	2024	CAGR 2019-2024
Base case scenario	40.25	43.64	45.61	47.13	49.33	51.46	5%
NBN scenario	40.25	47.86	51.15	59.15	78.60	99.02	20%
Telstra scenario	40.25	60.68	83.06	104.31	125.04	155.80	31%

# Implications for Australian GDP

## Methodology to estimate the effect on GDP

3. We multiply these growth rates with the broadband speed elasticities estimates by Rohman and Bohlin (2011).
4. We assume a GDP growth rate of 2.61 % p. a. in the baseline. This corresponds to the Australian Real GDP CAGR 2008-2018.
5. We add the outcome of step (3) to 2.61 %.
6. We take the real 2018 Australian GDP as a starting point and calculate respective trajectories for the annual GDP between 2019 and 2024 by applying the aforementioned different growth rates across the four scenarios.
7. We calculate the difference of the 2024 (nominal) values for GDP in the Telstra and NBN scenario in comparison to the Base case scenario and the differences over the entire period 2019-2024 (present value). Our calculations of the present value are based on a discount rate of 6%.

# Implications for Australian GDP

## Results

- Due to the higher average speeds, the Telstra scenario is likely to realise a higher GDP effect in comparison to the NBN scenario.

### Comparison with GDP in base case scenario, in \$ millions

	GDP in 2024 (nominal) compared to base case	GDP (present value) 2019-2024 compared to base case
<b>NBN scenario</b>	4,611	10,188
<b>Telstra scenario</b>	8,183	18,074

# Implications for Australian GDP

## Significance of the results

- The Rohman and Bohlin (2011) study relies on the assumption that past relationships between speed and GDP will continue to hold in the future. However, other scenarios are also possible:
  - If building ultra-fast networks empowers applications that have a significant impact on productivity, there may also be a significant change or increasing returns.
  - However, it is also conceivable that the positive effect will decrease as the bandwidth increases.
  - While there is some evidence that rising speeds are associated with an increase in GDP, we cannot make a concrete statement about the extent of the GDP effects resulting from the additional ultra-fast broadband adoption.
- In addition, however, it can be said that the higher take-up rate on the NBN platform in the Telstra scenario compared to the NBN scenario also has positive welfare effects.

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- **Conclusions and implications**

# Conclusions (I)

- Australia shows a relatively poor performance in broadband key metrics such as take-up of very high broadband bandwidths, average download speeds, and retail prices.
- These results are mainly driven by a wholesale pricing regime which prevents RSPs from marketing attractive superfast products.
- The situation is likely to exacerbate if NBN retains its practice to offer wholesale products with limited data capacity that lead to higher wholesale prices as data consumption increases.
- It is therefore necessary to shift to a new wholesale regime with wholesale prices with unlimited data capacities and incentives for RSPs to upgrade customers to products with high bandwidths.

# Conclusions (II)

- Our analysis compares the three relevant scenarios for NBN pricing (base case, NBN proposal, Telstra proposal).
- The base case scenario performs worst in all metrics under observation.
- Comparing the NBN and the Telstra proposal, the Telstra scenario ensures a more efficient usage of the NBN infrastructure (despite higher cumulated revenues in the NBN proposal in the period under observation):
  - The number of customers on the NBN is significantly higher.
  - The number of subscribers to broadband products with 100 Mbps and more is higher.
  - The positive economic impact on the Australian GDP is higher.

# Recommendations

- In order to maximise economic benefits associated with the NBN, NBN should apply a wholesale pricing regime with unlimited data capacities, and incentives for RSPs to upgrade their customers.
  - Such a regime inhibits several advantages:
    - RSPs face less uncertainties on wholesale costs and thus can concentrate on the design of attractive product bundles.
    - The risk of use-induced price increases in the retail market is decreasing.
    - Incentives for RSPs to develop broadband products over alternative platforms (mobile, alternative fibre) are reduced.
- ⇒ Such a wholesale pricing regime contributes to maximise the take-up of the NBN and thereby to raise its full economic potential.





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# ANNEX I: Literature Review

# Literature Review

## Economic impacts of ultrafast broadband on GDP

- **Briglauer & Gugler (2019)** estimate the incremental economic benefits of ultra-fast fiber technologies and basic broadband in a comprehensive panel dataset of EU27 member states for the period 2003-2015.
  - They identify a small but significant effect of end-to-end fibre-based broadband adoption over and above the effects of basic broadband on GDP.
  - A 1% increase in the adoption of fiber-based broadband leads to a GDP increase, which is 0.002-0.005% higher than that of basic broadband.
- **Kongaut et al. (2014)** study the impact of broadband speed on GDP per capita in higher and lower income countries.
  - They show, that estimated elasticities for speed are positive and statistically highly significant.
  - A 1% higher broadband speed leads to a 0.0591 % increase in GDP per capita for higher income countries and to an increase in GDP per capita of 0.0975% in countries with lower income.

# Literature Review

## Economic impacts of ultrafast broadband on GDP

- **Rohman & Bohlin (2011)** study the impact of broadband speed on economic growth in the OECD countries with balanced panel data for 33 OECD countries during the period 2008-2010.
  - A 1% higher speed leads to a 0.003 % additional GDP mean growth from base year. This implies that, if the speed level is doubled (100% higher), GDP growth would increase by 0.3% (relative to the growth in 2008).
  - The variables are used in the regression equations in the form of natural logs which means that the estimated coefficients express elasticities.

# Literature Review

## Economic impact of very high-speed broadband on local economic growth and employment

- **Briglauer et. al (2019)** conduct a study on the economic benefits of high-speed broadband networks within and across neighboring counties in Germany.
  - Their results show that:
    - availability of high-speed broadband (which enables transfer rates of 50 Mbps and higher) has a small but significant positive effect on regional GDP growth in the average German county, when compared to normal broadband availability;
    - broadband deployment in German counties induces substantial economic benefits in terms of direct effects and regional externalities;
    - a 1% increase in the availability of bandwidths of at least 50 Mbps leads to a GDP growth of 0.05%. This effect is almost doubled if externalities are taken into account as well. This is of particular relevance for urban counties.
- **Hasbi (2017)** studies the impact of very high-speed broadband on local economic growth (number of firms operating locally, creation of new businesses, unemployment) based on panel data covering the time period 2010-2015 and 4,933 municipalities located in metropolitan France.
  - She identifies a positive impact on the number of companies of all non-primary sectors, on company creation and, finally, in terms of unemployment reduction.

# Literature Review

## Economic impact of very high-speed broadband on local economic growth and employment

- **Sosa (2015)** studies the impact of availability of gigabit broadband on GDP per capita in 14 communities in nine US states
  - He finds a 1.1% higher GDP in 14 communities with widespread availability of gigabit broadband (more than 50% of households with access to gigabit services) than in the 41 similar communities with little to no available gigabit broadband (on average, one percent of households in these communities had access to gigabit broadband).
- **Mölleryd (2015)** estimates the socio-economic effects of fibre networks in 290 municipalities in Sweden by a regression analysis of 290 municipalities based on data for a 3-year period from 2010 to 2012.
  - The results show that a 10% higher fiber penetration is correlated with 1.1% higher employment (1.7% for highly urbanized municipalities) and increased business creation by one additional company per 12000 inhabitants per year.
- **Forzati & Mattson (2011)** analyze the socio-economic effects of fiber roll-out in Sweden based on a sample of 290 Swedish municipalities for the period 2007 – 2010
  - They find that a 10% increase in the proportion of the population with access to FTTP/FTTB was associated with a positive change in municipality-level employment after 2.6 years of up to 0.2%.

# Literature Review

## Economic impact of very high-speed broadband on local economic growth and employment

- **Lapointe (2015)** investigates the relationship between employment growth and access to fiber internet based on a panel of 3,142 U.S. counties for the period 2001-2013.
  - He shows that a 10 % increase in the percentage of households with access to fibre (FTTP/B) networks is associated with a 0.13% increase in total employment and a 0.1% increase in the number of firms at county-level.
- **Singer et al. (2015)** study the effect of FTTP deployment on employment on the basis of the deployment experiences in 39 regions between 2009 and 2014 in Canada.
  - They find that fiber deployment to 100% of a region is associated with an increase in employment of about 2.9%, even if the region had already been connected to inferior broadband infrastructure.

# Academic literature on the economic benefits of broadband infrastructure

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