



Measuring Broadband Australia



Report 19, December 2022

The Measuring Broadband Australia program provides information on the real-world performance of broadband plans. The program aims to better understand how Australians are experiencing internet performance in their homes, provide Australian consumers with accurate and independent information about broadband performance to assist their purchasing decisions, and encourage greater performance-based competition and better internet performance.

These reports are prepared quarterly by SamKnows, an independent testing provider appointed by the Australian Competition and Consumer Commission (ACCC). The metrics are also presented in a public dashboard at www.accc.gov.au/consumers/internet-landline-services/broadband-performance-data. Report 19 is based on data measurements taken from 1 to 31 August 2022.

The program relies on volunteers who host a testing device called a Whitebox on their broadband connection. The Whiteboxes, which are supplied by SamKnows, perform tests to measure internet performance using test servers maintained by SamKnows and hosted in Australia.

More information about the program is available at www.accc.gov.au/broadband. Underlying data for this report can be found at www.data.gov.au

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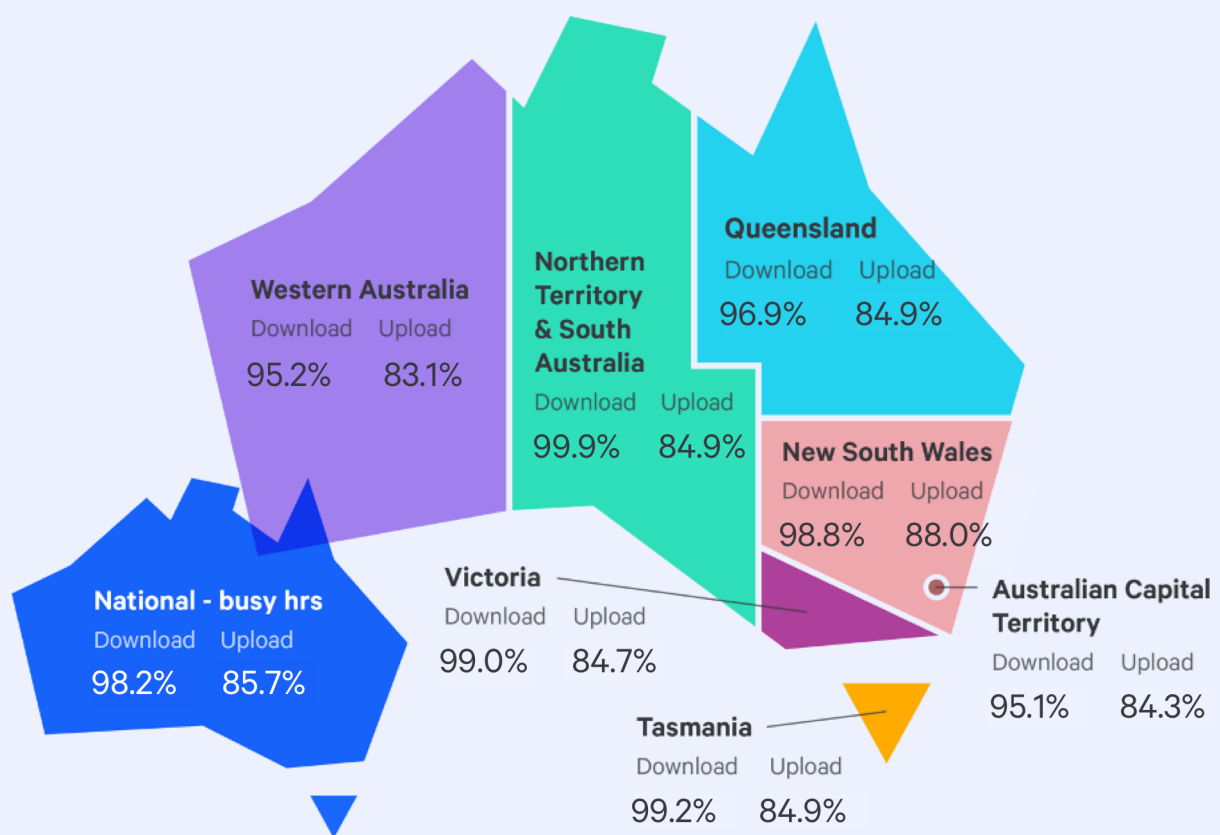
Key results - August 2022

Performance during busy evening hours by state and territory

Average NBN fixed-line performance during busy hours (7-11 pm, Monday to Friday) by state/territory. Including underperforming and impaired services.

The speeds ranged from 95.1%-99.9% for download and 83.1%-88.0% for upload.

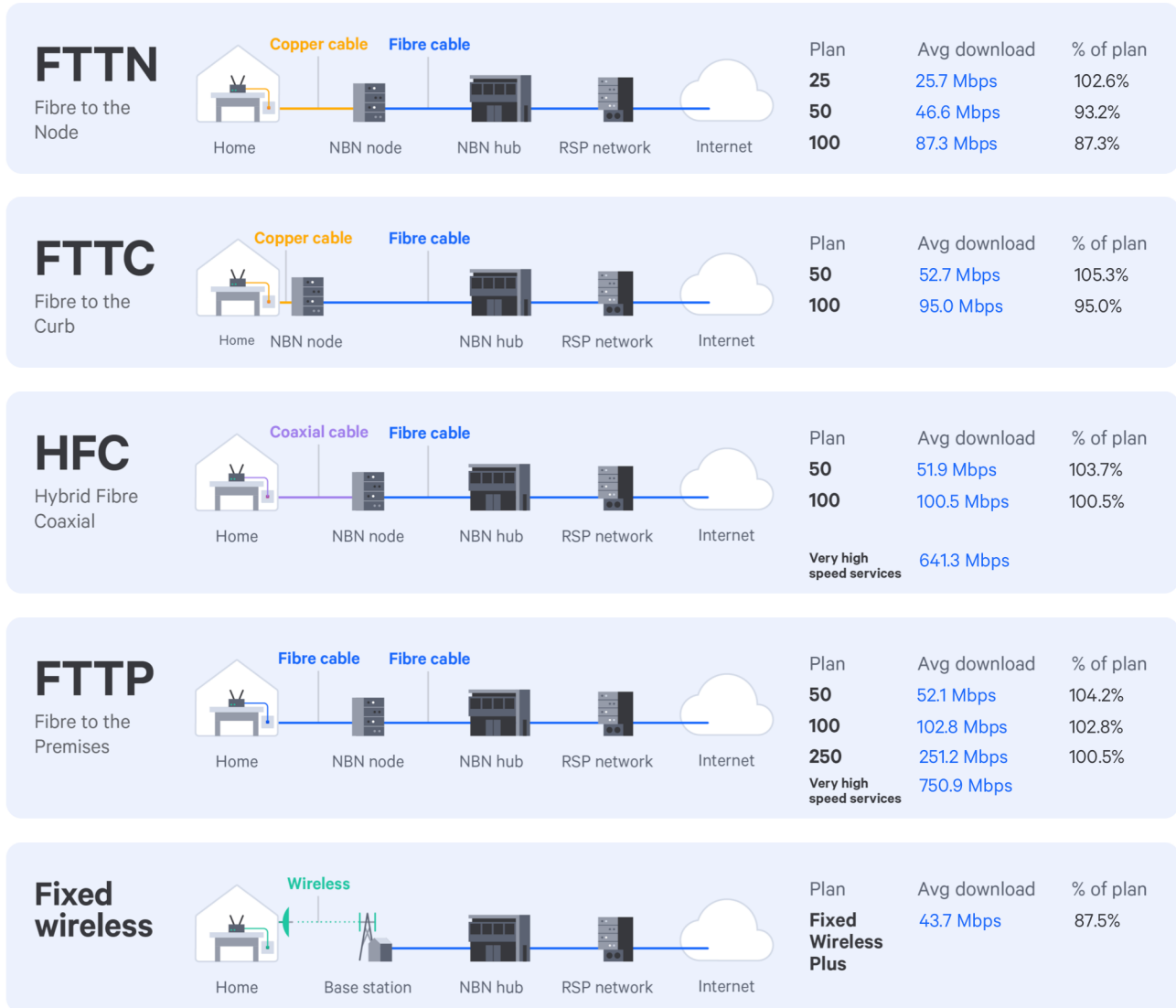
Download and upload speeds as a % of plan speed



NBN access technology

Download speeds during busy hours (7-11pm, Monday to Friday), August 2022. Including underperforming and impaired services.

Results are presented only for speed tiers and technologies having a sufficient panel size.



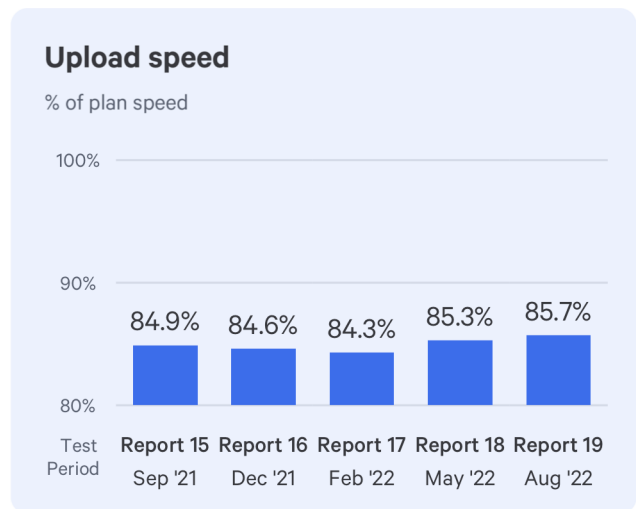
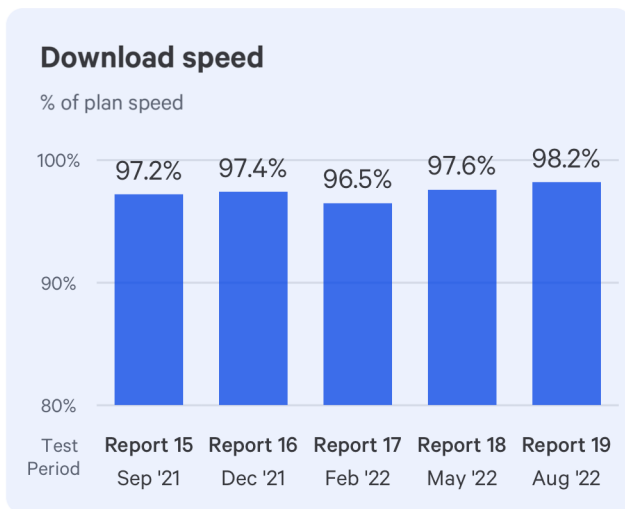
Quality of experience

Streaming high definition (HD) and ultra-high definition (UHD) video during busy hours (7-11 pm, Monday to Friday), August 2022. Including underperforming and impaired services.

NBN plan speed	% that can reliably stream HD & UHD videos from Netflix							
25	HD	HD	HD	HD	HD	HD	HD	7+ Concurrent HD video streams
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	97.6%	96.5%
50	UHD	UHD	UHD	UHD	UHD	UHD	UHD	1-2 Concurrent UHD video streams
	100.0%	76.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
100	HD	HD	HD	HD	HD	HD	HD	7+ Concurrent HD video streams
	100.0%	100.0%	100.0%	100.0%	100.0%	99.8%	97.1%	97.1%
250	UHD	UHD	UHD	UHD	UHD	UHD	UHD	3-4 Concurrent UHD video streams
	100.0%	95.5%	85.0%	64.1%	0.0%	0.0%	0.0%	0.0%
Fixed Wireless Plus	UHD	UHD	UHD	UHD	UHD	UHD	UHD	6-7 Concurrent UHD video streams
	99.7%	98.7%	91.9%	89.1%	86.2%	78.7%	68.6%	45.5%
Fixed Wireless Plus	UHD	UHD	UHD	UHD	UHD	UHD	UHD	7+ Concurrent UHD video streams
	100.0%	98.8%	97.5%	97.5%	95.0%	93.8%	92.5%	88.7%
Fixed Wireless Plus	UHD	UHD	UHD	UHD	UHD	UHD	UHD	1-2 Concurrent UHD video streams
	91.0%	59.7%	25.4%	11.9%	3.0%	1.5%	0.0%	0.0%

Long-term trends

NBN fixed-line services.¹ During busy hours. Including underperforming and impaired services.



¹ The figures for September 2021 include only NBN12 to NBN250 plans. The figures for December 2021 to August 2022 include data for plans with a retail download speed above 250 Mbps but under 1000 Mbps.

Overview

Testing period

This report is based on measurements collected from 1 to 31 August 2022.

Idle and working latency

Usually, our reports measure latency only under “idle” conditions; however, this report also includes latency figures measured under heavy working conditions (download and upload). Latency under load tests may provide a more realistic measure of the user’s experience than the idle latency tests as they show how heavy usage can impact latency.

Volunteers using speed constrained in-home equipment

As with previous reports, this report also includes all services and plans that may be affected by a 100 Mbps link within the volunteers’ homes. A common cause of this is customer premises equipment² (CPE) or other network devices that have Ethernet ports with a physical limit of 100 Mbps. Other potential causes are damaged Ethernet cables, intermediate devices that only support 100 Mbps (such as old switches and hubs) and configuration of network equipment within the home. Consumers affected by this issue are unable to receive the full benefit of plans with download speeds above 100 Mbps. The ACCC encourages retail service providers (RSPs) to reach out to their customers who may be using a constrained network device.

For further information on what to do if you are experiencing reduced speeds, see

www.accc.gov.au/consumers/internet-landline-services/home-broadband-for-consumers

Changes to the report

Several metrics contained in previous reports are not included in this report as they tend to be relatively stable between reports. They may be reintroduced if they change significantly. These metrics are available on the broadband performance data dashboard at www.accc.gov.au/consumers/internet-landline-services/broadband-performance-data

Other superfast networks are omitted from this report due to a reduction in the panel size during August 2022. Download and upload results are presented in the appendix.

² Network equipment provided by an RSP (generally including a home router/gateway).

Important terms

Term	Definition	Significance
Advertised speed	The speed claim made by a retail service provider (RSP) for a given plan during a Measuring Broadband Australia reporting period. May be the same as or lower than the plan speed.	This report presents download speed results against RSPs' advertised speed claims for NBN50 and NBN100 plans. This metric shows consumers whether, and how often, units on our panel achieved the speed advertised by their RSP.
All hours	Data labelled "all hours" includes tests conducted at any time of the day.	
Busy hours	Data labelled "busy hours" includes only tests conducted between 19:00:00 and 22:59:59, Monday to Friday.	Networks experience higher user activity during busy hours. As a result, network performance can deteriorate compared to other times of the day.
Busiest hour	The fifth-lowest hourly average download speed across each busy hour by RSP during the monitoring period. For this calculation, busy hours include tests conducted between 19:00:00 and 22:59:59, Monday to Sunday.	The busiest hour indicates the performance of each RSP when its network is under the highest levels of demand. When the busiest hour speeds are significantly lower than the average busy hour speeds, then the service may be more affected by particularly high demand peaks.
Confidence intervals	Indicates how certain we are that the true average download speed lies between the upper and lower boundary indicated by the thin black lines. For example, if an RSP had an average download performance of 99.3% with a 95% confidence interval of $\pm 2.2\%$, this means that if we were to repeat our sampling 100 times, we would expect the average performance to fall between 97.1% and 101.5% in at least 95 cases.	Narrower confidence intervals indicate a more stable estimate than larger ones.
Download and upload speed	Download speed is the speed at which data can be transferred from the SamKnows test server to the consumer's computer, measured in megabits per second (Mbps). Upload speed is the speed at which information is transferred from the consumer's computer to the SamKnows test server, measured in Mbps.	The download and upload speeds associated with each retail plan are used by consumers to select a plan. Upload speed is especially relevant for applications where a user sends significant amounts of data to the internet, for example uploading files to cloud storage or running multiple simultaneous video conferencing sessions.

Term	Definition	Significance
Download and upload performance	Measured download or upload speed expressed as a percentage of plan speed. e.g. for an NBN50 service, 100% download performance would be 50 Mbps.	This metric expresses how well a unit performs compared to the plan speed. Expressing results as a percentage of plan speed also allows results across different plan speeds to be aggregated. Prior to NBN Co overprovisioning the downlink, both the download and upload speeds were capped at 100% for the fixed-line plans. Since NBN Co began overprovisioning the downlink for fixed-line services, download results above 100% are common.
Impaired services	Fibre to the node services where the maximum attainable download speed measured by NBN Co is below the plan download speed.	Consumers on an impaired service are unable to achieve the full download speed of their plan (see "underperforming services"). These services require rectification of technical issues to improve performance. If this is not possible, it may be advisable for the consumer to move to a lower speed plan that is achievable. This report presents results both including and excluding impaired and underperforming services. This information allows consumers to better understand the reported download and upload speed measures by removing the effect of services which, due to physical limitations, would be better assigned to another plan. At the same time, this comparison provides stronger incentives for service providers to improve service quality for customers on underperforming services.
Latency	The average time required to send a packet of data to the SamKnows test server and back to the consumer's computer, measured in milliseconds (ms).	The lower the latency, the better. Lower latency results in faster responses, providing a more reliable experience when using real-time applications such as video conferencing and online gaming. High latency may result in a lag or delay when using real-time applications.
Latency under load	The average time required to send a packet of data to the SamKnows test server and back to the consumer's computer while a download or upload test is running, measured in milliseconds (ms).	The test shows how latency is impacted when the internet connection is under heavy usage, for example, if a user were trying to use the connection while a demanding download or upload is running (imitated by the download or upload test running while the latency measurements take place).

Term	Definition	Significance
NBN fixed-line	Monitored connections on NBN Co's fixed-line footprint, that is to say, households served via fibre to the premises (FTTP), fibre to the curb (FTTC), fibre to the node (FTTN), fibre to the building (FTTB) and hybrid fibre-coaxial (HFC) access technologies. In this report, the NBN fixed-line section includes results for major NBN plans up to 500 Mbps download speed. It excludes results from very high speed services, which are presented separately. FTTN and FTTB access technologies are treated as identical.	
NBN fixed wireless	Monitored connections on NBN Co's fixed wireless footprint.	Fixed wireless allows households to be connected to the internet without having to establish a physical, wired connection. This type of service is more prevalent in regional and remote areas, but consumers in outer metropolitan centres may also use this service.
NBN very high speed services	Services on the NBN Ultrafast plan, which has a download/upload speed range of 500-990/50 Mbps.	
Other superfast access networks	Refers to households served by fixed-line networks other than NBN, for example, Uniti Group's LBNC0 and OptiComm fixed-line networks.	
Outages	This metric tracks how many times per day a broadband connection goes offline for at least 30 seconds. Outages between 12am and 5am are excluded, as this is when network maintenance typically occurs.	Outages can impact user experience, subject to their frequency and duration.
Overprovisioning	Refers to NBN Co providing higher data rates than the plan speed.	The purpose of overprovisioning is to accommodate protocol overhead. The protocol overhead contains address and other information required to enable data transfer to/from the end user and the internet. Overprovisioning compensates for the bandwidth taken up by protocol overhead, as it enables consumers to experience speeds closer to the maximum of their plan. Currently, NBN Co overprovisions certain plans on the downlink only. Hence download speeds may be closer to, or above plan speed, whereas upload speeds remain below plan speeds.
Packet loss	Packet loss counts packets that are sent over a network and don't make it to their destination, measured as a percentage of packets lost out of all packets sent.	At levels above 1%, packet loss can cause issues for certain types of applications. This may be detrimental to user experience.

Term	Definition	Significance
Plan and plan speed	Plan refers to the retail broadband product. Each plan has an associated download and upload speed. For example, plan speeds for NBN50 are 50 Mbps down and 20 Mbps up (sometimes referred to as a 50/20 Mbps plan).	RSPs may advertise a maximum attainable speed and also state a different typical busy period speed that consumers are likely to experience, which may be the same or lower than the maximum attainable speed.
Underperforming services	Services that reach above 75% of plan speed in no more than 5% of download tests. These are services which rarely or never attain plan speed.	This metric effectively identifies services with maximum attainable speeds that fall closer to the maximum speed of a lower plan than to the maximum speed of the consumer's current plan. This is often, but not always, caused by a known physical impairment to FTTN services (see impaired services).
Video streaming (Netflix)	The number of Netflix videos at High Definition (HD) and Ultra High Definition (UHD) that can be streamed on a certain plan simultaneously.	
Webpage loading time	The time it takes for a specific webpage to fully load. This is a combination test that includes download, latency and DNS in one test that accurately mimics real-world usage. This metric combines test results for eight popular Australian-based webpages.	

NBN fixed-line services

Download speed test results

This section includes results for major NBN plans up to 500 Mbps. It excludes results from very high speed services, as these are presented separately.

Figure 1: Average download speed by RSP

NBN fixed-line plans. Including underperforming services. Error bars indicate 95% confidence intervals of the mean.

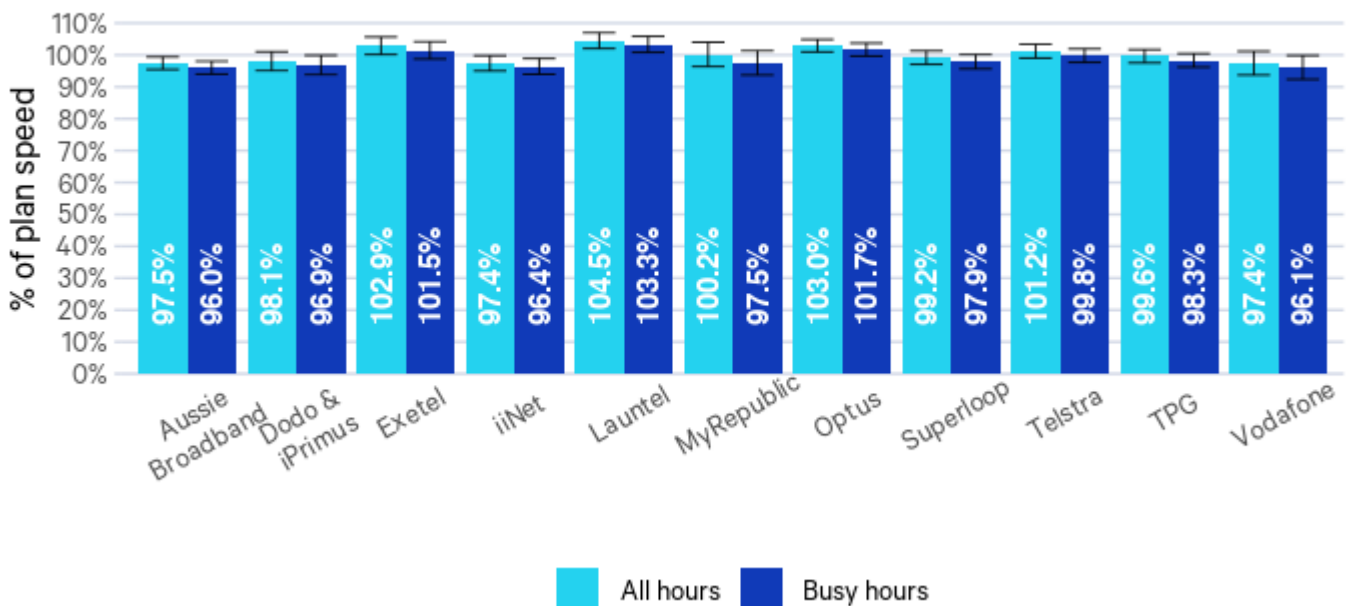
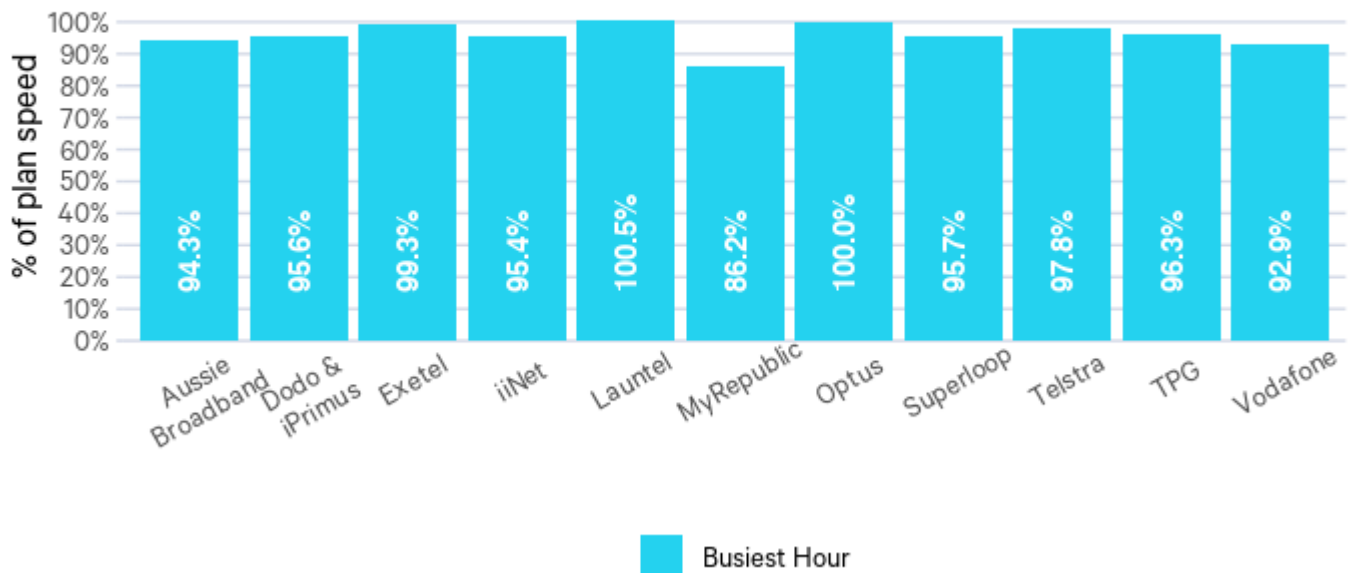


Figure 1 shows that, during the August 2022 measurement period, users on NBN fixed-line services attained an average download performance of 99.7% of plan speed during all hours. This decreased to 98.2% during busy hours. These results are similar to the previous report,

where the corresponding figures were 99.3% of plan speed during all hours and 97.6% during busy hours.

Figure 2: Busiest hour average download speed by RSP

NBN fixed-line plans. Including underperforming services.



The August 2022 measurement period had a total of 31 days with 4 busy hours each, totalling 124 busy hours in the month. The busiest hour download speed results in Figure 2 are lower than the busy hour download speeds shown in Figure 1. This indicates that periods of higher demand affected network performance.

The range of speeds in Figure 2 varied from 86.2% to 100.5% of plan speed. This is a wider range of results compared with the download metrics for all hours and busy hours metrics shown in Figure 1. Some RSPs were more affected by high demand peaks than others. Most RSPs achieved busiest hour speeds above 90% of plan speed, which is in line with the previous report.

Figure 3: Average hourly download speed by plan

NBN fixed-line plans. Including underperforming services.

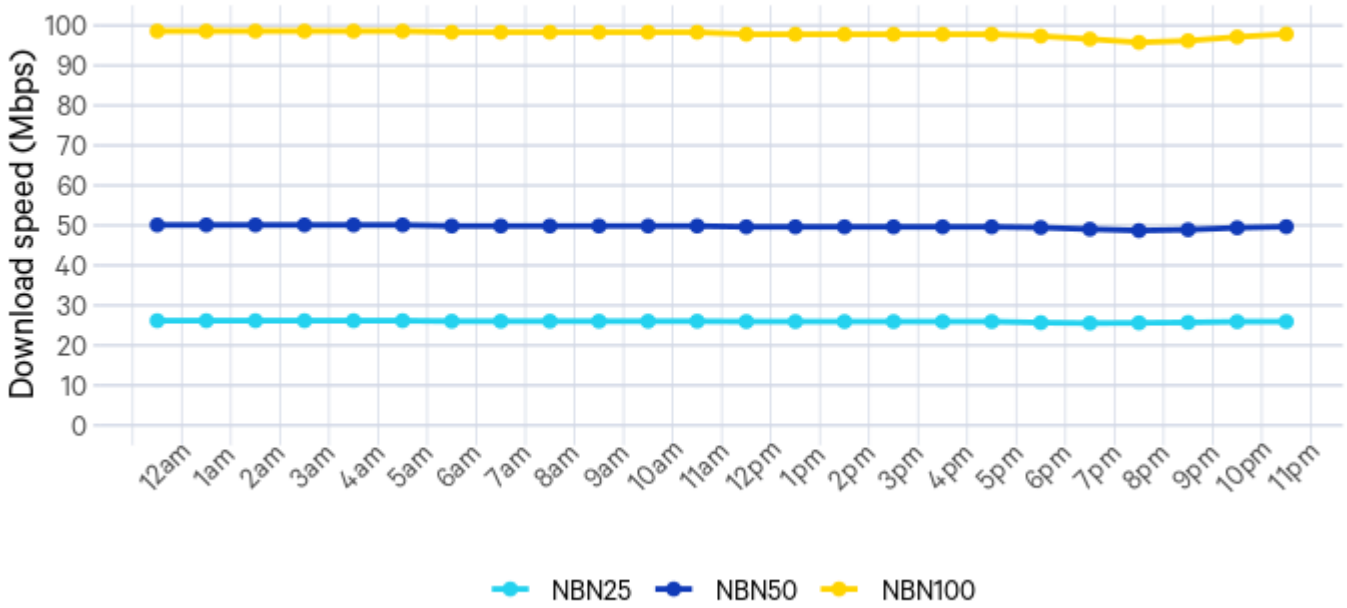


Figure 3 shows that average download speeds held steady throughout the day for users on most NBN plans. The 100 Mbps NBN plans remain the most affected by increased user activity in the evening hours. Speeds typically started to decrease during the evening, dipping to 2.8 Mbps below the day’s maximum by 8pm, and recovering to higher levels during the night. The average dip in NBN100 speeds is slightly lower than that observed in the previous report (3.4 Mbps).

Figure 4: Frequency of download speeds attained during tests

NBN fixed-line plans. All hours. Including underperforming services.

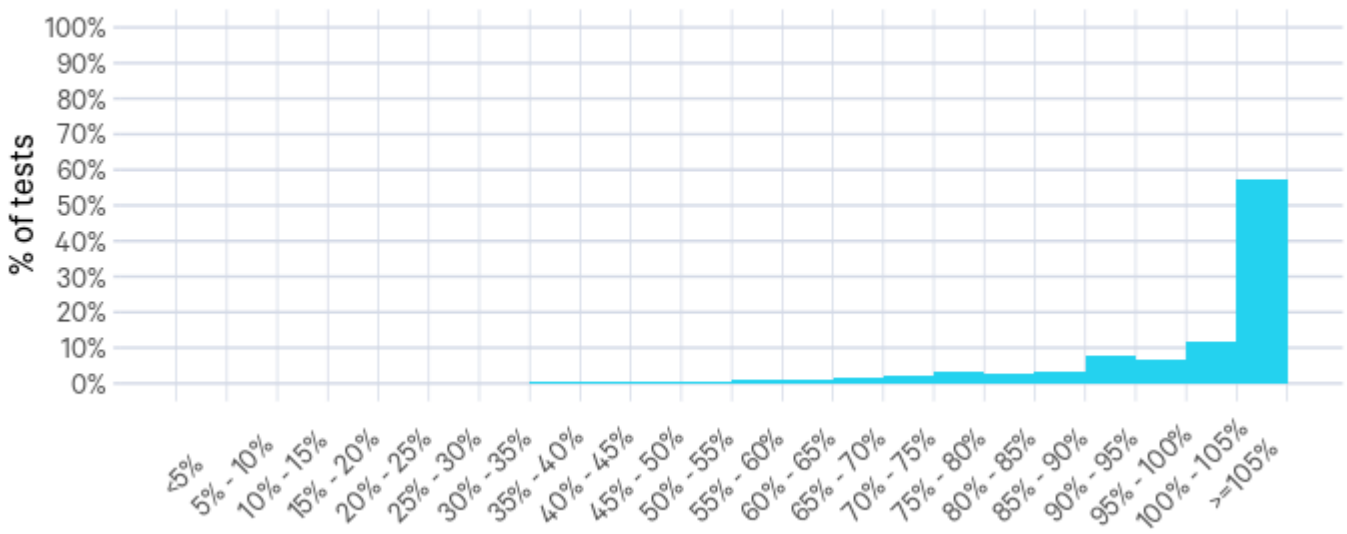
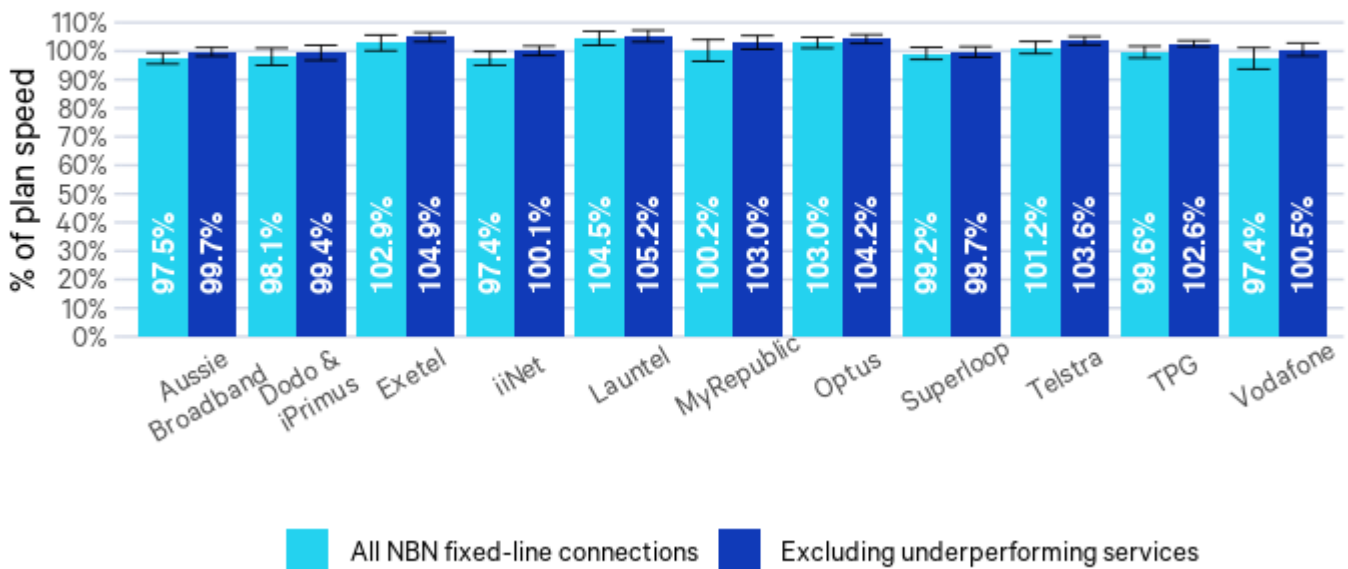


Figure 4 shows the distribution of 427,279 download speed tests performed across 1,197 Whiteboxes connected to fixed-line NBN infrastructure during this period.

Of these tests, 69.1% achieved at least 100% of plan speed, and only 1.6% of tests achieved less than 50% of plan speed. In the previous report, 68.6% of tests were at plan speed or higher, and 1.8% of tests failed to meet the 50% mark.

Figure 5: Average download speed by RSP - inclusive and exclusive of underperforming services

NBN fixed-line plans. All hours. Error bars indicate 95% confidence intervals of the mean.



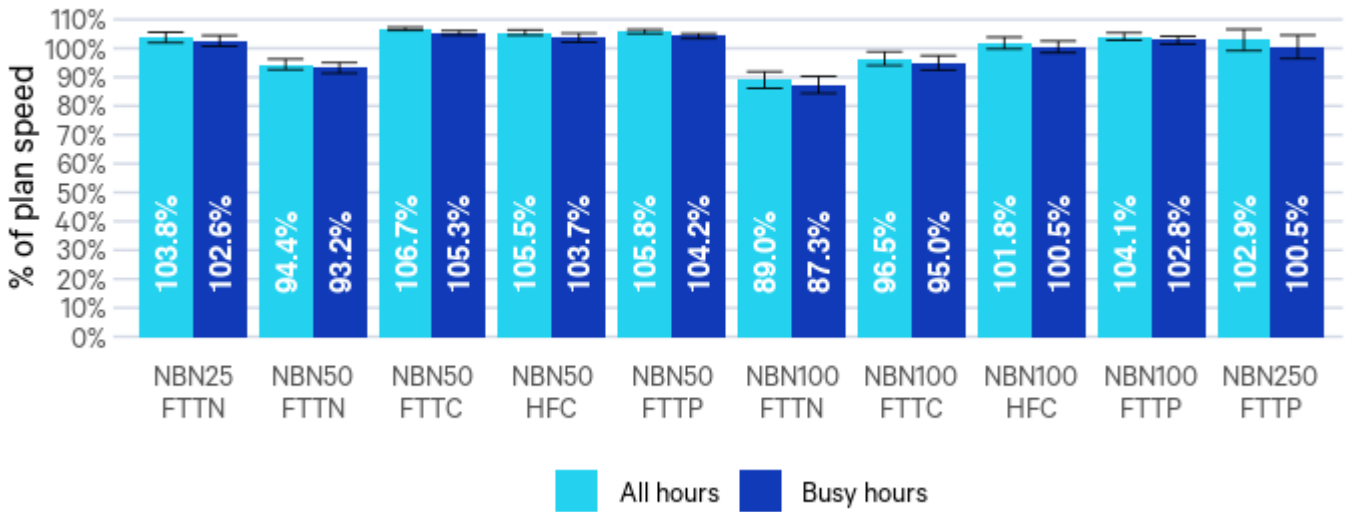
As in previous reports, we present separate measures of download performance exclusive of underperforming services. Underperforming services represented 4.8% of the 1,197 NBN services tested for this report. In our sample, FTTN services made up 91% of underperforming NBN services, and NBN50 and NBN100 plans accounted for 93% of the underperforming NBN services.

Once underperforming services are excluded, the average download performance during all hours is 101.8% compared with 99.7% for all services. Had underperforming services been remediated before the measurements were collected, the overall download performance would have been 2.1 percentage points higher during the period.

As in previous reports, underperforming services impacted the performance of all RSPs to some extent in August 2022.

Figure 6: Average download speed by plan and technology

NBN fixed-line plans. Including underperforming services. Error bars indicate 95% confidence intervals of the mean.



Within the NBN50 plan, FTTN services had an average download speed of around 6 Mbps lower than other technologies, a difference of 12%. Within the NBN100 plans, FTTN services had an average download speed around 13 Mbps lower than other technologies. The results are similar to previous reports, with FTTN performing significantly below other access technologies for the NBN50 and NBN100 plans.

Figure 7: Average download speed by plan and technology - inclusive and exclusive of underperforming services

NBN fixed-line plans. All hours. Error bars indicate 95% confidence intervals of the mean.

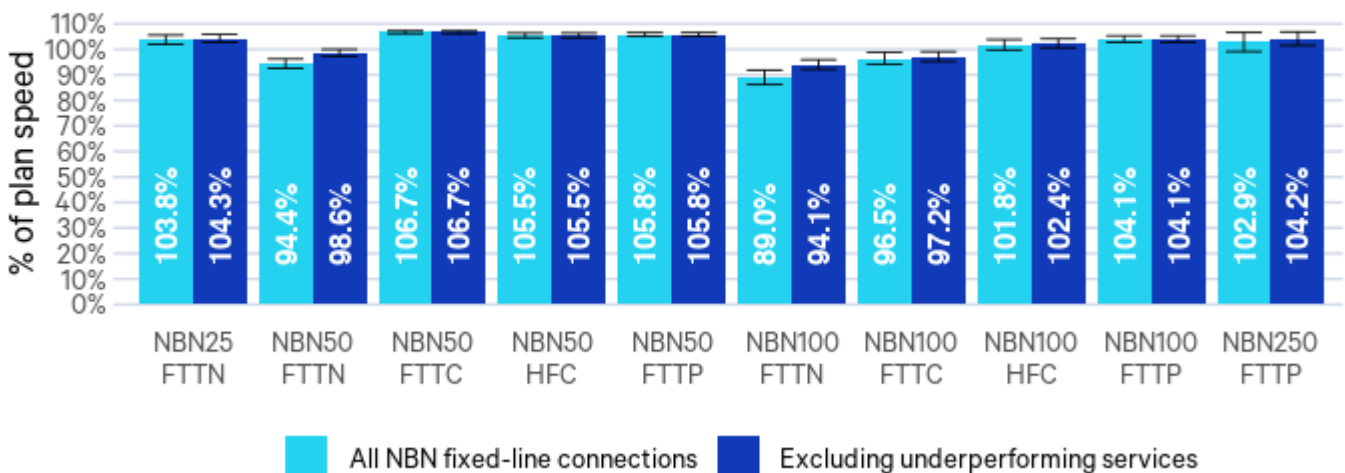
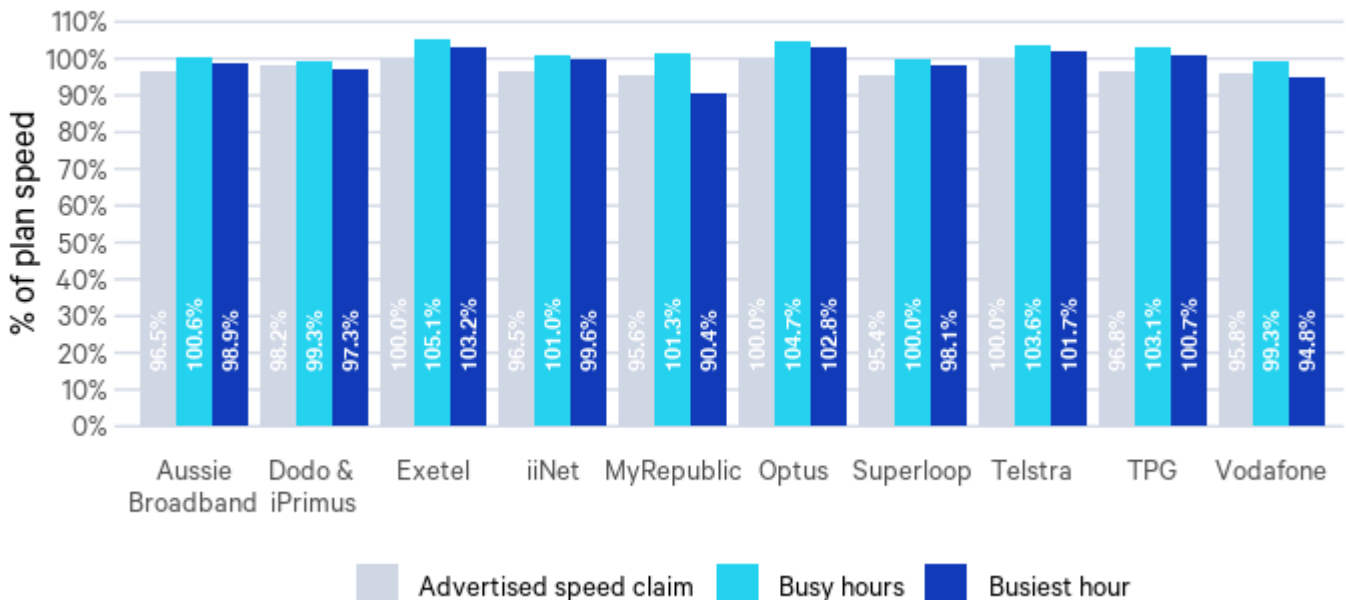


Figure 7 shows the impact of underperforming services on average download speed across different plans and technologies. FTTN services continue to account for the bulk of the impact from underperforming services across both the NBN50 and NBN100 plans.

Figure 8: Advertised speeds and average download speeds by RSP

50 Mbps and 100 Mbps NBN fixed-line plans. Excluding underperforming and impaired services.



During the measurement period, RSPs advertised download speeds between 90% and 100% of the maximum plan speed for NBN50 and NBN100 products.

Figure 8 shows the typical evening hour speeds that were the predominant speed advertised by RSPs during the measurement period, as well as the busy hour and busiest hour download performance by RSPs. The busy hour and busiest hour download performance is calculated against the nominal plan download speed (50 Mbps and 100 Mbps respectively), rather than the advertised speed claim.

These results show that had all underperforming services and impaired services been remediated, or moved to a more appropriate plan, the average download speeds of most RSPs would have met or exceeded their advertised speed claims during their busy hours.

Figure 9: Proportion of busy hours where advertised speed was achieved - by RSP

50 Mbps and 100 Mbps NBN fixed-line plans. Excluding underperforming and impaired services.

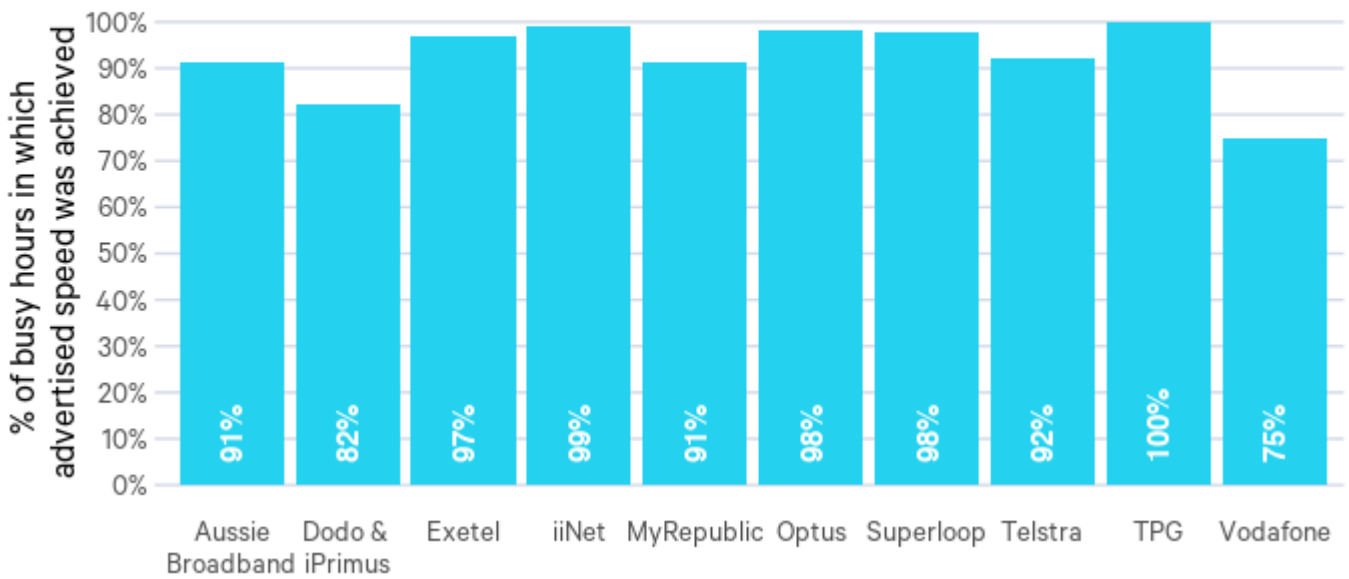


Figure 9 shows the percentage of busy hours during the period in which test speeds for NBN50 and NBN100 products met or exceeded the speeds advertised by RSPs. Had all underperforming services and impaired services been remediated, or moved to a more appropriate plan, the proportion of busy hours when RSPs met their advertised speed claims would have been no lower than 82% for most providers.

Figure 9 shows the proportion of busy hours where the advertised speed claim was achieved, rather than the proportion of busy hours where the nominal plan download speed was achieved. This means that an RSP advertising lower speed claims may achieve their advertised speed claim in a greater proportion of busy hours even when their busy hour download performance is lower. Conversely, another RSP advertising higher speed claims may only achieve their advertised speed claims in a lower proportion of busy hours even when their busy hour download performance is higher.

Upload speed test results

Figure 10: Average upload speed by RSP

NBN fixed-line plans. Including underperforming services. Error bars indicate 95% confidence intervals of the mean.

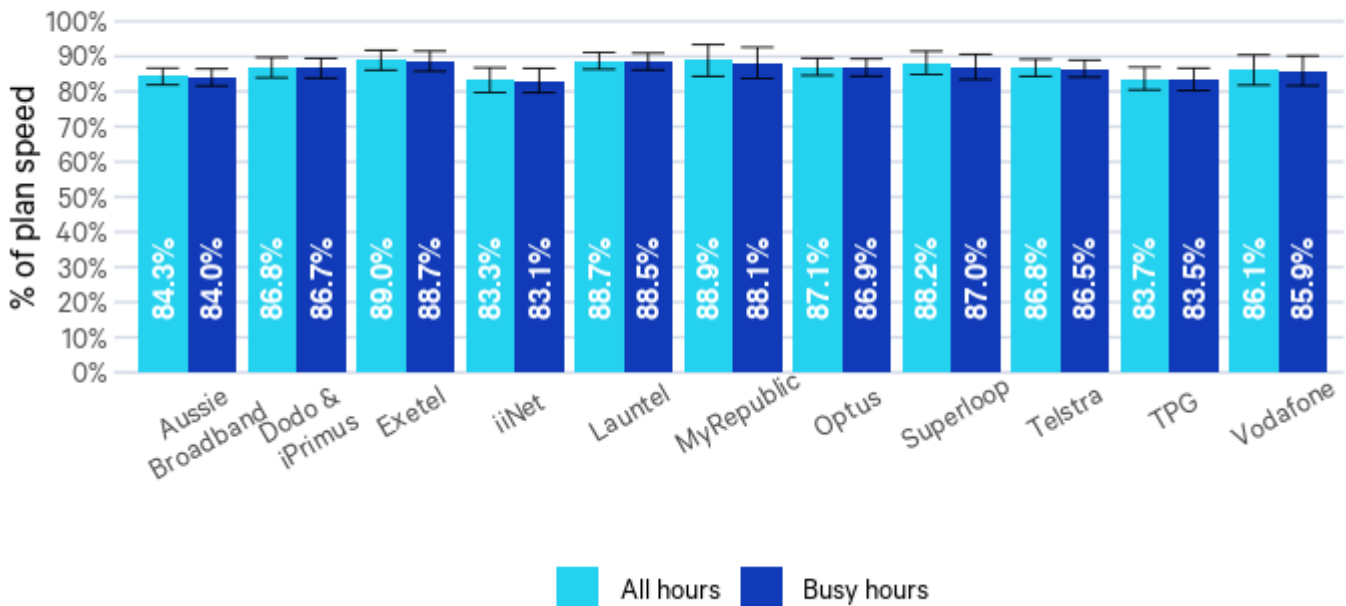


Figure 10 shows average upload speeds for the main NBN fixed-line RSPs and plans. Unlike download speeds, the upload component of NBN speed tiers is not overprovisioned.

Average upload performance ranged between 83.3% and 89.0% during all hours across RSPs. The results are in line with the previous report.

NBN fixed-line services achieved an overall average upload performance of 86.0% during all hours, compared to 85.6% in the previous report. During busy hours, NBN fixed-line services achieved an average upload performance of 85.7% compared to 85.3% in the previous report. As the uplink is not overprovisioned, upload results are lower than download results relative to plan speed.

Idle and working latency

Latency tests can be performed under different conditions. This report includes latency figures measured under both idle and heavy working conditions. For testing purposes, we simulate heavy working conditions by running a download or upload speed test at the same time as measuring latency.

Idle latency results for RSPs from this period remained in line with results from the previous report. The idle latency values were low enough that their effect is unlikely to be noticed by a typical end user, even when using more latency-sensitive applications (such as videoconferencing services or online gaming). These results are available on the ACCC's website: www.accc.gov.au/consumers/telcos-and-internet/broadband-performance-data.

Figure 11 compares idle latency with latency under load for all NBN services split by access technology.

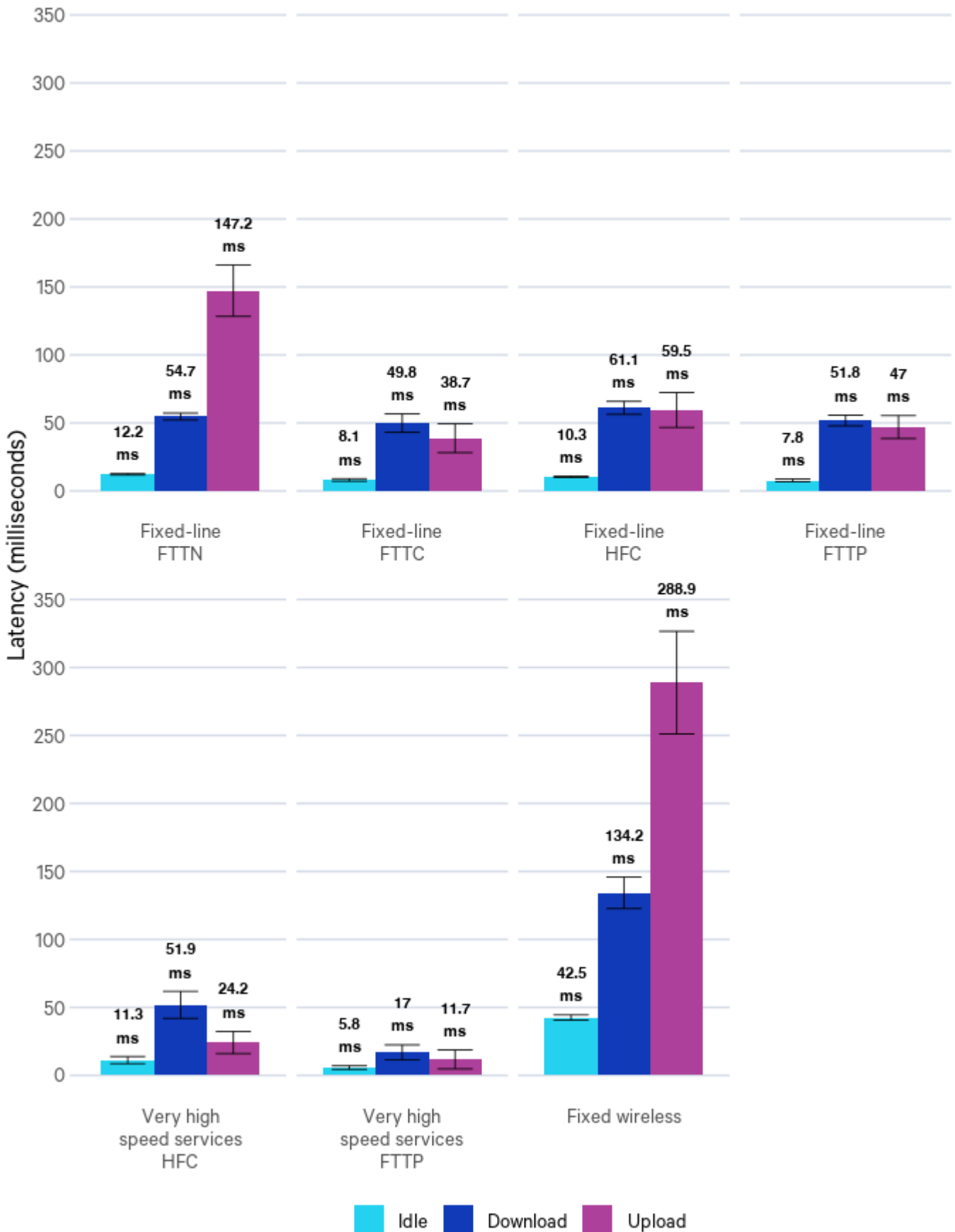
Irrespective of access technology, average latency increases under working conditions compared to when the line is idle. Figure 11 shows that the latency under load values (latency under upload in particular) were, on average, high enough in August 2022 to be noticeable to users on FTTN and fixed wireless services.

However, while access technology is a factor that affects the magnitude of the latency increase under load, the primary cause of the latency increase under load is understood to be at the router level, specifically due to the size of the buffers and how the queues are managed. Routers (or other network devices on the path) may be configured to buffer large amounts of data, which can in turn cause a sharp increase in latency under working conditions.

This means that the model and the configuration of the router can have a significant effect on the extent to which latency deteriorates under load. All else kept equal, higher bandwidth/speed does not guarantee lower latency under load. Therefore, a user experiencing high latency under load should not necessarily expect an improvement after switching to a higher speed tier.

Figure 11: Average idle latency and latency under load by access technology

NBN plans, all hours. Including underperforming services. Error bars indicate 95% confidence intervals of the mean.



Other metrics

Packet loss and webpage loading results were in line with results from previous reports.

These results are available on the ACCC's website: www.accc.gov.au/consumers/telcos-and-internet/broadband-performance-data

Figures 12 and 13 show, for each RSP, the average rate of outages per day and the distribution of outage duration. These metrics indicate respectively how often outages occurred and the severity of outages' impact on user experience.

Figure 12: Average daily outages lasting over 30 seconds by RSP

*NBN fixed-line plans. All hours. Including underperforming services.
Error bars indicate 95% confidence intervals of the mean.*

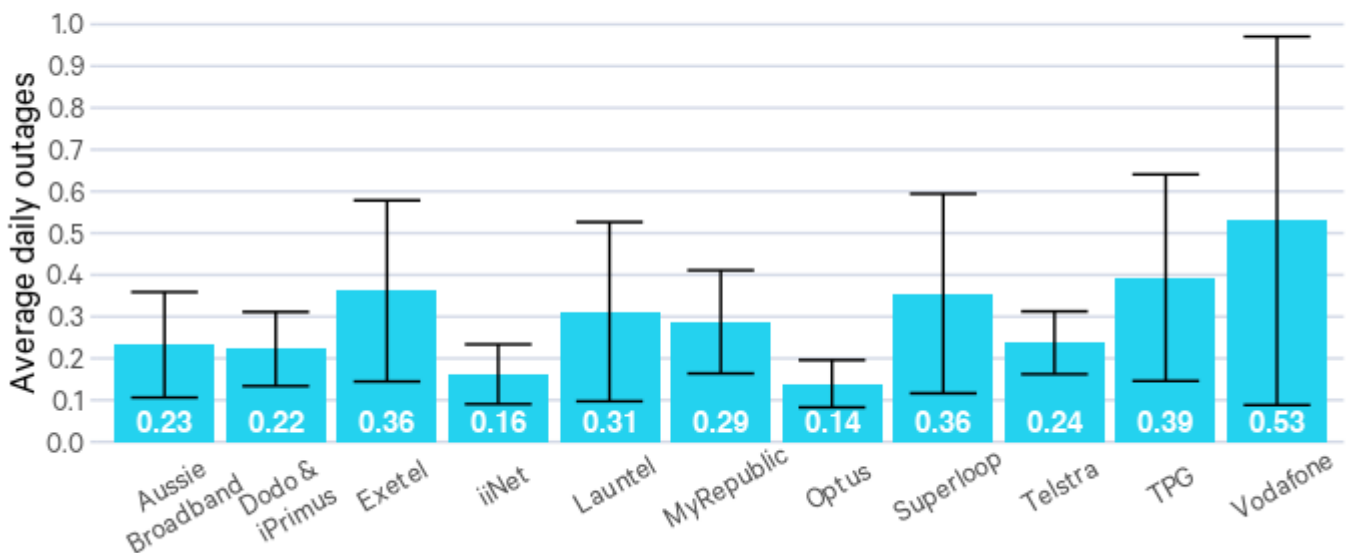
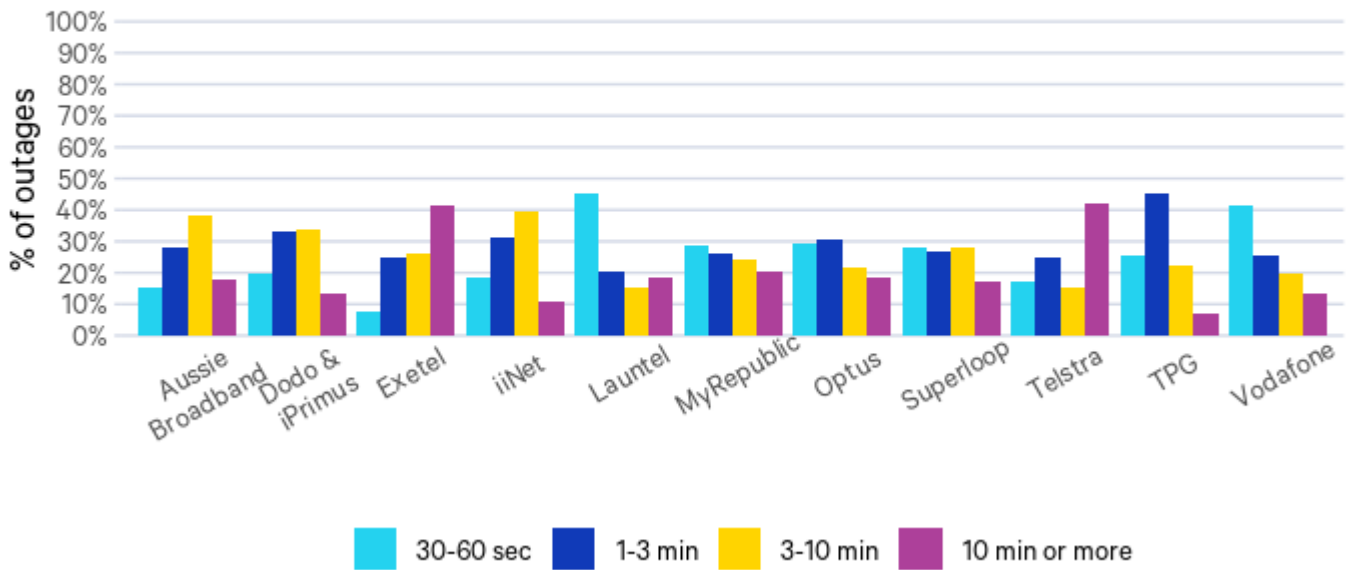


Figure 13: Distribution of outage duration by RSP - NBN plans including underperforming services - all hours

NBN fixed-line plans. All hours. Including underperforming services.



All RSPs had relatively low outage rates. Across all RSPs, the average rate of outages per day on NBN plans was 0.29 ± 0.06 outages per day. As 57% of outages did not last longer than 3 minutes, outages were likely to have had little material impact on end user experience.

NBN very high speed services

This section is based on a total of 136 monitored very high speed services, across both FTTP and HFC technologies. The results include data from services where we identified that the volunteer had a 100 Mbps link within the home and was unable to receive the full benefit of their high speed plan.

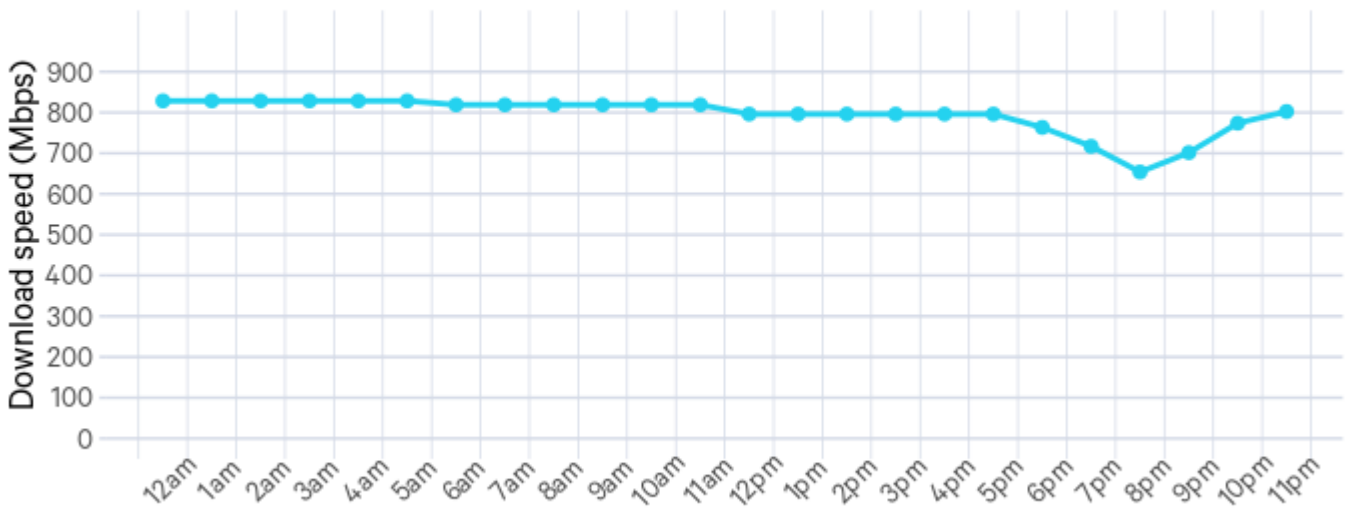
Unlike other NBN plans, NBN Co does not currently overprovision the download component of very high speed services. Coupled with the fact that the Whitebox connects via gigabit Ethernet to the home gateway, this means that the end-to-end link is limited to 1 Gbps. After network/transport protocol overheads are deducted, the fastest speed we expect to observe on these plans is around 940 Mbps.

The hourly average download speeds attained by NBN very high speed services ranged across the day from 654 Mbps to 828 Mbps. Performance varied more during the busy hours and wider evening peak period.

The measured download speeds are in line with results from previous reports.

Figure 14: Average hourly download speed for very high speed services

NBN very high speed services.



As shown in Figure 14, average download speeds for very high speed services varied considerably throughout the day. Speeds typically started to decrease during the evening, dipping to 175 Mbps below the day’s maximum speed by 8pm, and recovering later at night. This dip in speeds for very high speed services is greater than the dip observed on the other major NBN plans considered earlier in this report, including NBN100 plans. This shows that NBN very high speed plans are more affected by congestion during busy periods than lower speed plans.

Figure 15: Frequency of download speeds attained during tests of very high speed services

NBN very high speed services. All hours.

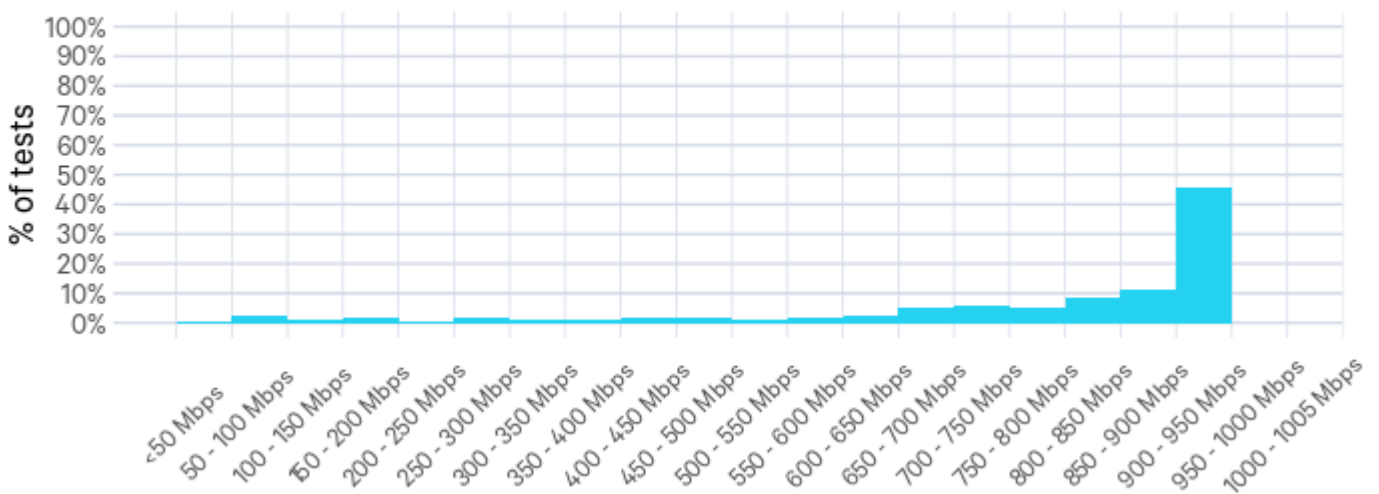


Figure 15 shows the distribution of 44,412 download speed tests performed across 136 Whiteboxes connected to very high speed services on fixed-line NBN infrastructure. Of these tests, 45.7% achieved a download speed of at least 900 Mbps.

Other metrics

Idle latency, packet loss and webpage loading results were in line with results from previous reports. These results are available on the ACCC's website:

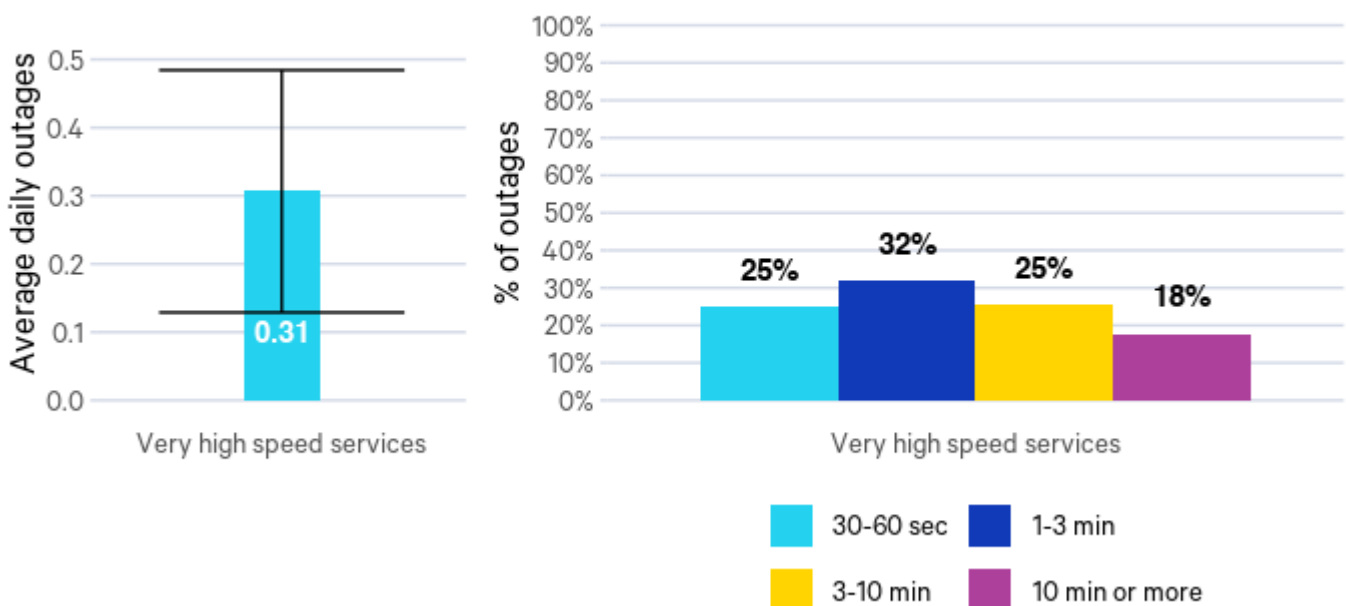
www.accc.gov.au/consumers/telcos-and-internet/broadband-performance-data

Figure 16 shows the average rate of daily outages and the distribution of outage duration for very high speed services during all hours.

The rate of outages was in line with previous results, and 57% of outages did not last longer than 3 minutes.

Figure 16: Outage characteristics

NBN very high speed services. All hours. Error bars indicate 95% confidence intervals of the mean.



NBN fixed wireless services

The goal of reporting on fixed wireless performance is to increase transparency and encourage greater performance-based competition and better internet performance throughout outer metropolitan, regional, rural and remote areas of Australia.

Fixed wireless performance is measured by Whiteboxes in much the same way as the fixed-line program.

The following sections summarise key metrics from our NBN fixed wireless sample, for both the 25/5 Mbps (14 units) and Fixed Wireless Plus plans (67 units).

As the sample number for the 25/5 Mbps plan is very low, all results for this plan should be considered indicative only.

Differences between NBN fixed-line and NBN fixed wireless services

NBN fixed-line services and NBN fixed wireless services utilise different technologies that are not directly comparable in terms of performance.

An NBN fixed-line connection utilises a physical line running to the household to connect it to the NBN. There are a number of fixed-line technologies: FTTP, FTTB, FTTC, FTTN and HFC.

An NBN fixed wireless connection transmits data over radio signals to connect a household to the NBN and uses similar technology to mobile networks. Data travels from a transmission tower to an outdoor antenna fitted at each household. Each fixed wireless tower has one or more 'cells' containing the equipment that transmits signals to a dish or the outdoor antenna at a customer's premises, allowing them to connect to the internet.

NBN typically uses this type of service in regional and remote areas, where the distance between households can be many kilometres, but outer metropolitan centres may also use NBN fixed wireless. NBN fixed wireless serves around 4% of NBN consumers.

The quality and maximum speed of a fixed wireless connection is often more variable than fixed-line technology. The following factors may affect fixed wireless performance:

- the distance of the consumer's premises to the fixed wireless tower
- whether there is a clear line of sight between the antenna on the roof of the premises and the fixed wireless tower, or if there is an obstruction (such as foliage)
- weather conditions such as extreme heat or heavy rain
- network congestion. Each fixed wireless cell has a finite amount of capacity (e.g. a certain number of megabits per second), that is shared between the households connected to that cell. Where more households in an area connect to a particular cell and/or those households increase their usage towards the limit of the cell, the cell can become congested. The impact of network congestion on the fixed wireless network is typically most noticeable during busy hours.

For further information on using NBN fixed wireless, see

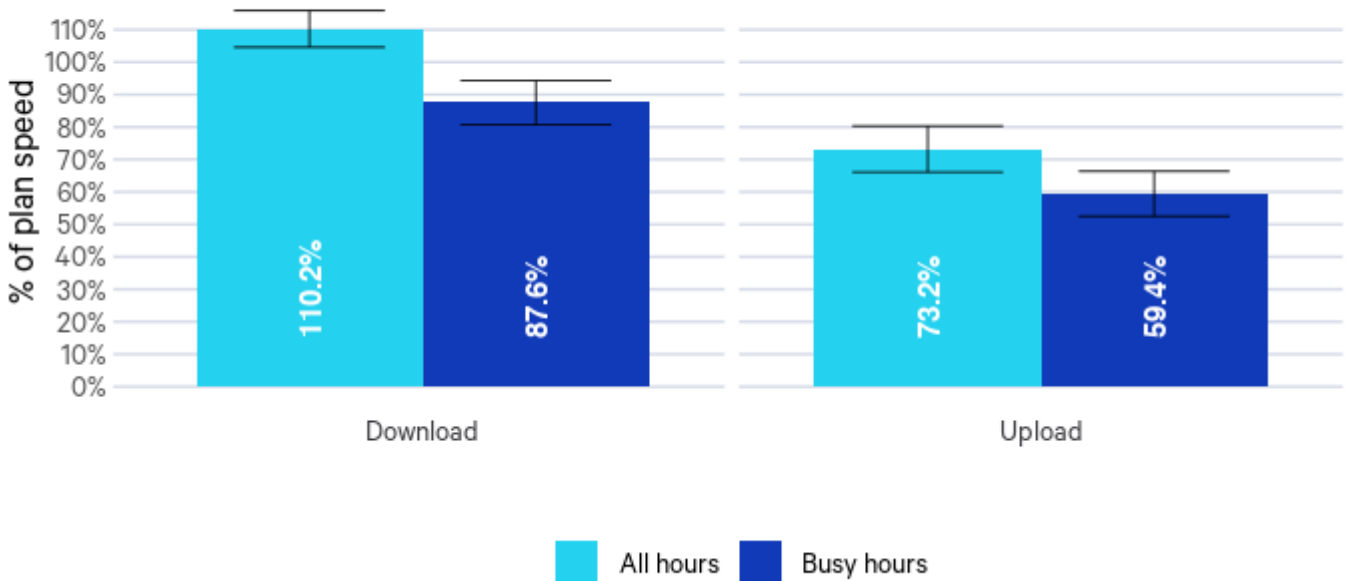
www.accc.gov.au/consumers/telcos-and-internet/broadband-speeds/using-nbn-fixed-wireless

Speed test results

In this section, we use download/upload speed benchmarks of 50/10 Mbps for the Fixed Wireless Plus plan. The results of the Fixed Wireless Plus plan and the 25/5 Mbps fixed wireless plan are expressed as a percentage of the service's plan speed.

Figure 17: Average download and upload performance for fixed wireless

NBN fixed wireless plans. Error bars indicate 95% confidence intervals of the mean.



The results in Figure 17 are based on a total of 81 NBN fixed wireless services across both the 25/5 Mbps and Fixed Wireless Plus plans.

During this period, users on NBN fixed wireless services attained an average download performance of 110.2% of plan speeds during all hours, decreasing to 87.6% during busy hours. This is slightly higher than the results in the previous report, where average download performance was 101.3% of plan speeds during all hours and 77.6% during busy hours.

As with the previous report, the increase in download performance was driven by services on the Fixed Wireless Plus plan attaining a higher average performance than before.

NBN fixed wireless services attained an average upload performance of 73.2% of plan speed during all hours, decreasing to 59.4% during the busy hours. In the previous report, average

upload performance during all hours was 65.9% of plan speed decreasing to 51.3% during busy hours.

Figure 18: Average hourly download speed for the Fixed Wireless Plus plan

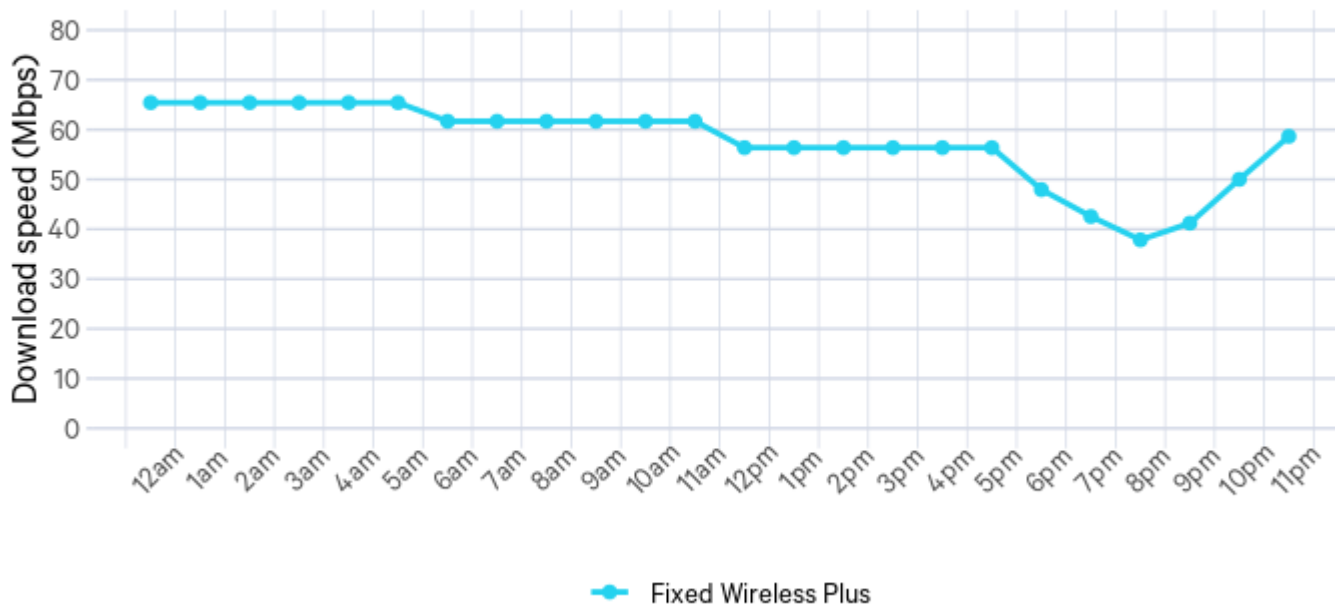


Figure 18 shows the variation in download speed during the day for Fixed Wireless Plus plans. These results are based on a total of 67 NBN fixed wireless services on the Fixed Wireless Plus plan.

Average download speeds for the Fixed Wireless Plus plan showed considerable variation throughout the day. Speeds typically started to decrease during the evening, dipping to 28 Mbps below the day's maximum speed by 8pm, and recovering to higher levels later at night. The average download speed for the Fixed Wireless Plus plan was 56.5 Mbps during all hours, decreasing to an average of 43.7 Mbps in the busy hours. In the previous report, the average download speed for the Fixed Wireless Plus plan was 52.2 Mbps during all hours and 38.8 Mbps during busy hours.

Figure 19: Average hourly upload speed for the Fixed Wireless Plus plan

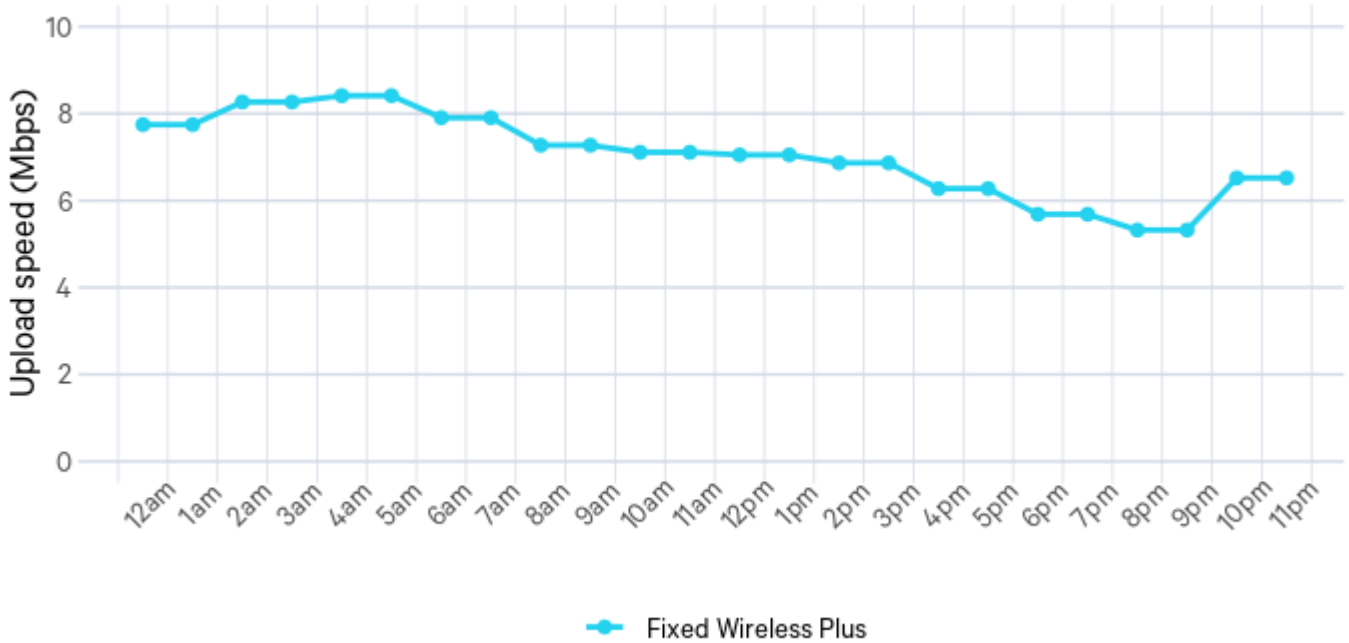


Figure 19 shows that upload speeds followed a similar pattern to download speeds, recording lower values both during the busy hours and during the afternoon. The average upload speed for the Fixed Wireless Plus plan was 7.1 Mbps during all hours, decreasing to an average of 5.6 Mbps in the busy hours. In the previous report, the average upload speed for the Fixed Wireless Plus plan was 6.4 Mbps during all hours, and 4.8 Mbps during busy hours.

Both download and upload speeds showed considerable daily variation for fixed wireless products. This is to be expected with this technology. Network congestion can affect the fixed wireless network, particularly during the busy hours.

Other metrics

Idle latency, packet loss and webpage loading results were in line with results from the previous report. These results are available on the ACCC's website:

www.accc.gov.au/consumers/telcos-and-internet/broadband-performance-data

Figure 20: Outage characteristics

NBN Fixed Wireless. All hours. Error bars indicate 95% confidence intervals of the mean.

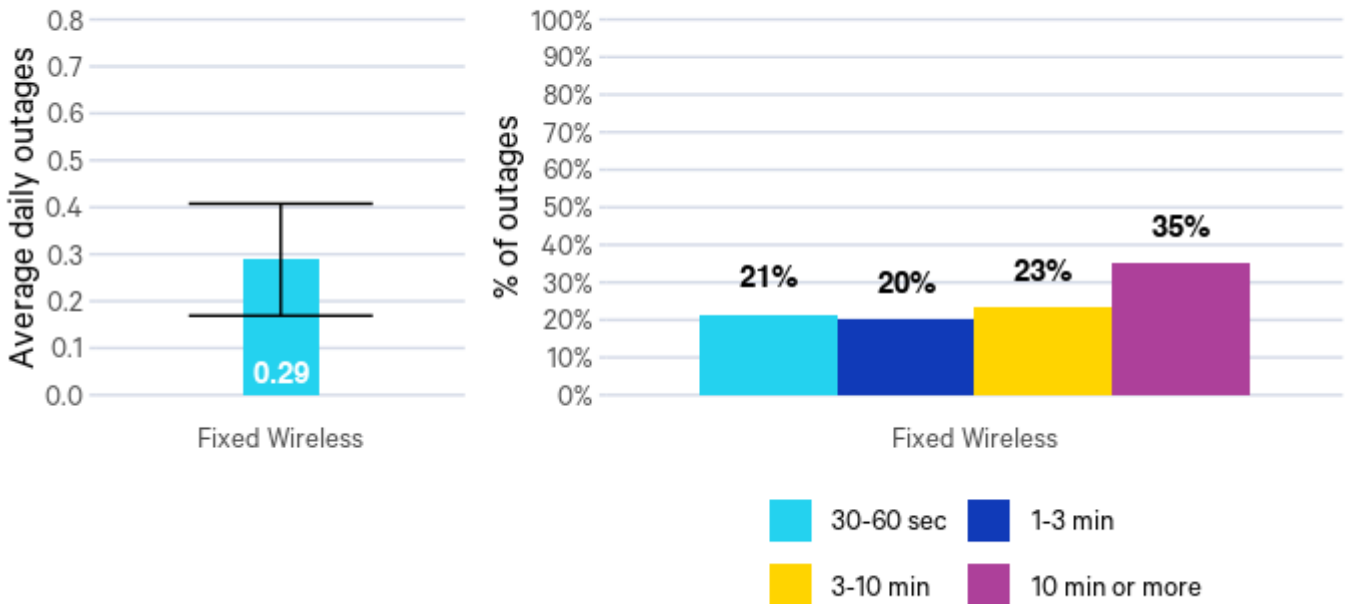


Figure 20 shows the average rate of daily outages and the distribution of outage duration for fixed wireless services during all hours. The rate of outages was in line with previous results.