Measuring Broadband Australia Program

ACCC | AUSTRALIAN COMPETITION & CONSUMER COMMISSION

Twenty-second Report, September 2023

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 on the ACCC's website. Report 22 is based on data measurements taken from 1 to 31 May 2023.

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 on the ACCC's website. Underlying data for this report can be found at www.data.gov.au
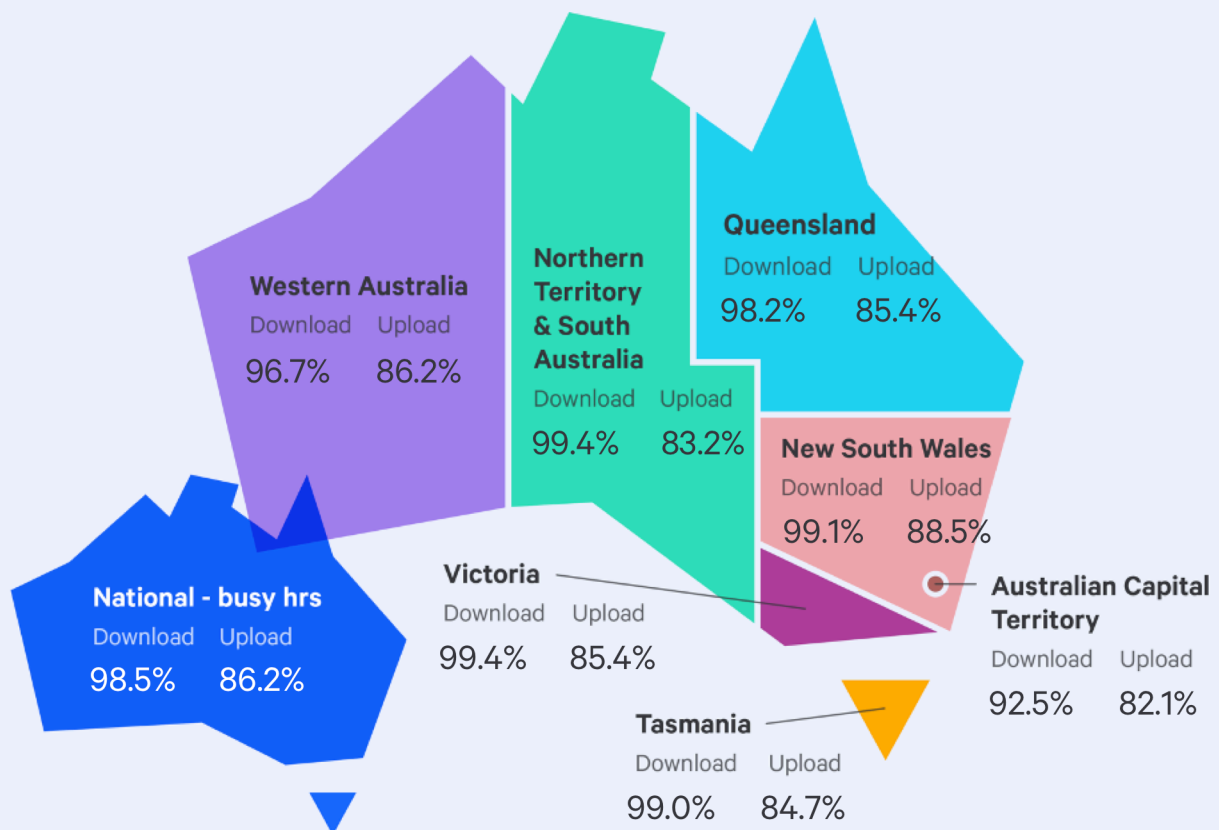
Contents

Key results - May 2023

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, excluding very high speed services.

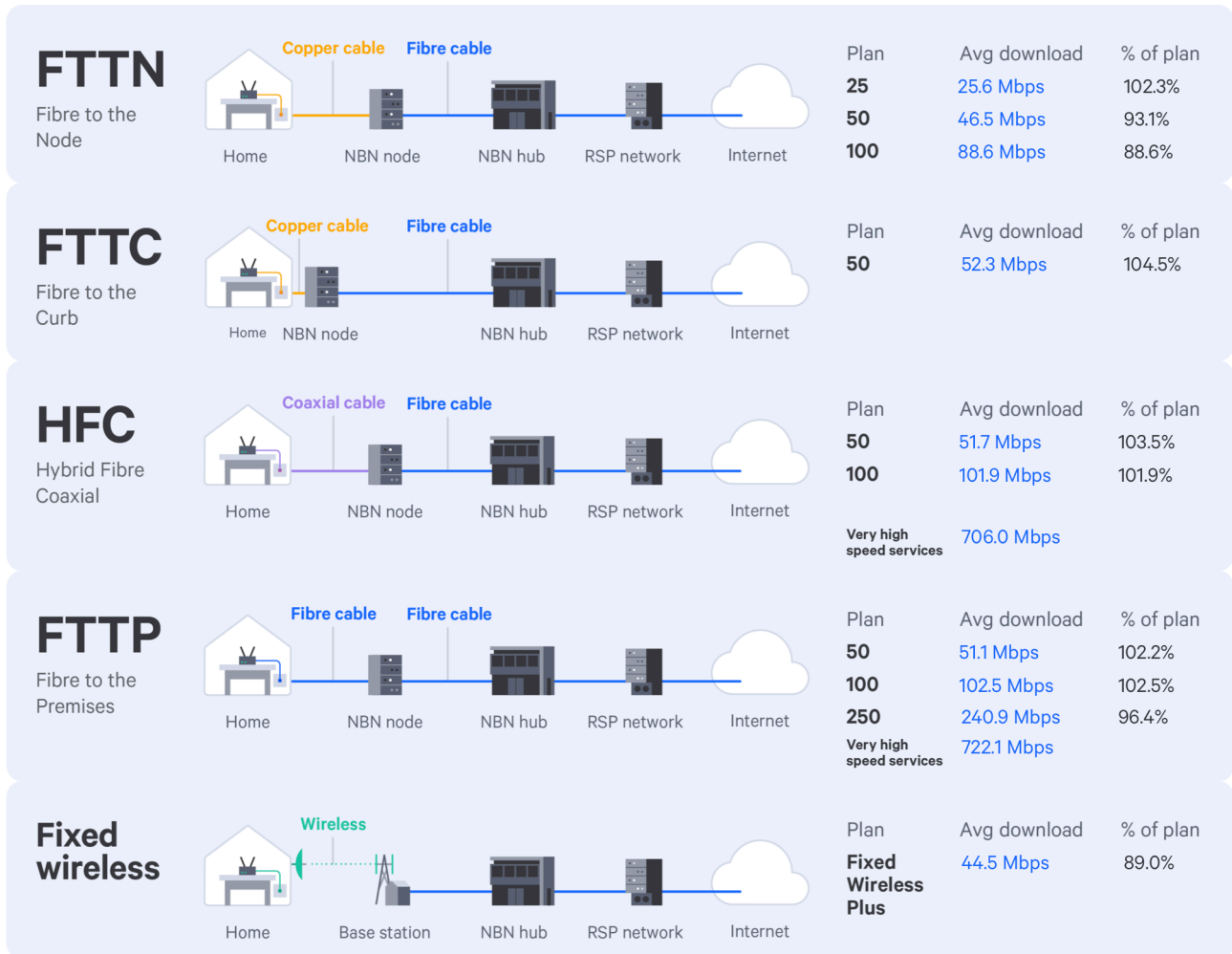The speeds ranged from 92.5%-99.4% of plan speed for download and 82.1%-88.5% for upload.

Download and upload speeds as a % of plan speed

Western Australia
Download	Upload
96.7%	86.2%

Northern Territory & South Australia
Download	Upload
99.4%	83.2%

Queensland
Download	Upload
98.2%	85.4%

New South Wales
Download	Upload
99.1%	88.5%

National - busy hrs
Download	Upload
98.5%	86.2%

Victoria
Download	Upload
99.4%	85.4%

Australian Capital Territory
Download	Upload
92.5%	82.1%

Tasmania
Download	Upload
99.0%	84.7%

NBN access technology

Download speeds during busy hours (7-11 pm, Monday to Friday), May 2023, including underperforming and impaired services.

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

FTTN
Fibre to the Node

Plan	Avg download	% of plan
25	25.6 Mbps	102.3%
50	46.5 Mbps	93.1%
100	88.6 Mbps	88.6%

FTTC
Fibre to the Curb

Plan	Avg download	% of plan
50	52.3 Mbps	104.5%

HFC
Hybrid Fibre Coaxial

Plan	Avg download	% of plan
50	51.7 Mbps	103.5%
100	101.9 Mbps	101.9%
Very high speed services	706.0 Mbps	

FTTP
Fibre to the Premises

Plan	Avg download	% of plan
50	51.1 Mbps	102.2%
100	102.5 Mbps	102.5%
250	240.9 Mbps	96.4%
Very high speed services	722.1 Mbps	

Fixed wireless

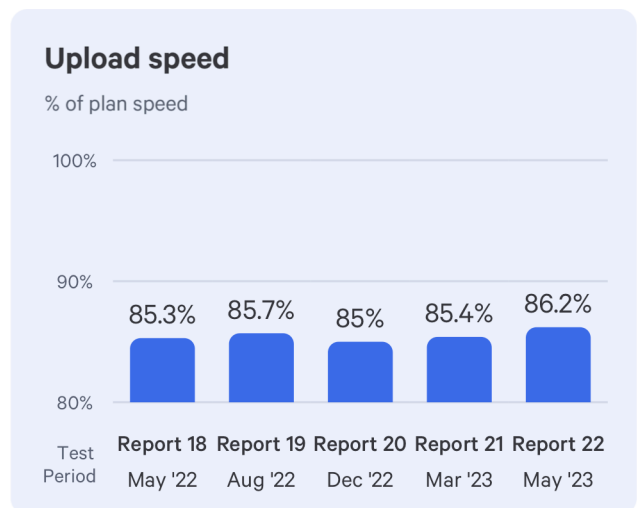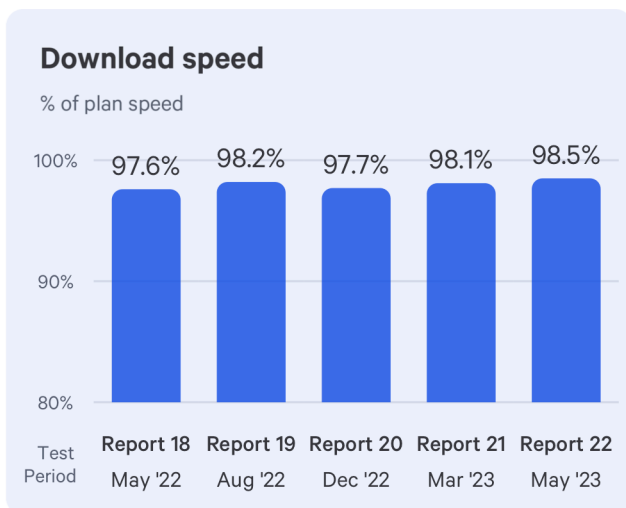| Plan	Avg download	% of plan
Fixed Wireless Plus	44.5 Mbps	89.0%

Quality of experience

Streaming high definition (HD) and ultra-high definition (UHD) video during busy hours (7-11 pm, Monday to Friday), May 2023, including underperforming and impaired services.

NBN plan speed	% that can reliably stream HD & UHD videos from Netflix								
25	HD 100.0%	HD 100.0%	HD 100.0%	HD 99.0%	HD 99.0%	HD 97.9%	HD 97.9%	HD 95.8%	**7+** Concurrent HD video streams
	UHD 97.9%	UHD 83.3%	▶ 0.0%	▶ 0.0%	▶ 0.0%	▶ 0.0%	▶ 0.0%	▶ 0.0%	**1-2** Concurrent UHD video streams
50	HD 100.0%	HD 100.0%	HD 100.0%	HD 99.8%	HD 99.8%	HD 99.6%	HD 99.1%	HD 99.1%	**7+** Concurrent HD video streams
	UHD 99.8%	UHD 97.9%	UHD 88.1%	UHD 68.4%	▶ 0.0%	▶ 0.0%	▶ 0.0%	▶ 0.0%	**3-4** Concurrent UHD video streams
100	UHD 100.0%	UHD 100.0%	UHD 99.5%	UHD 97.6%	UHD 95.9%	UHD 90.8%	UHD 82.0%	UHD 54.1%	**7+** Concurrent UHD video streams
250	UHD 100.0%	UHD 100.0%	UHD 98.9%	UHD 98.9%	UHD 95.6%	UHD 95.6%	UHD 95.6%	UHD 92.2%	**7+** Concurrent UHD video streams
Fixed Wireless Plus	UHD 96.1%	UHD 69.7%	▶ 40.8%	▶ 17.1%	▶ 5.3%	▶ 0.0%	▶ 0.0%	▶ 0.0%	**1-2** Concurrent UHD video streams

Long-term trends

NBN fixed-line services, during busy hours, including underperforming and impaired services.

Download speed
% of plan speed

Test Period	Report 18 May '22	Report 19 Aug '22	Report 20 Dec '22	Report 21 Mar '23	Report 22 May '23
	97.6%	98.2%	97.7%	98.1%	98.5%

Upload speed
% of plan speed

Test Period	Report 18 May '22	Report 19 Aug '22	Report 20 Dec '22	Report 21 Mar '23	Report 22 May '23
	85.3%	85.7%	85%	85.4%	86.2%

Overview

Testing period

This report is based on measurements collected from 1 to 31 May 2023.

Business services

This report includes results of various metrics showing the performance of standard broadband services in supporting key applications relied on by businesses, such as videoconferencing applications, accounting services, e-mail platforms, e-commerce platforms, customer relationship management (CRM) platforms and content delivery networks (CDNs).

Access networks

This report includes results for NBN fixed-line services (fixed-line plans up to 500 Mbps download), other superfast access networks (fixed-line plans up to 500 Mbps download), NBN very high speed services (fixed-line plans over 500 Mbps download) and NBN fixed wireless services as regular items.

Volunteers using speed constrained in-home equipment

As with previous reports, this report includes all services and plans that may be affected by a 100 Mbps link within the volunteers' homes. Common causes of this are customer premises equipment[1] (CPE) or other network devices that have Ethernet ports with a physical limit of 100 Mbps, damaged Ethernet cables, intermediate devices that only support 100 Mbps (such as old switches and hubs) and the configuration of network equipment within the home. Affected consumers are unable to receive download speeds above 100 Mbps. The ACCC encourages RSPs to contact their customers who may be using a constrained network device.

For further information on broadband speed issues, see the ACCC's website.

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

Further metrics available on ACCC website

Further metrics beyond those included in this report are available on the ACCC's broadband performance data dashboard.

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. For calculating the busiest hour and for determining the % of busy hours where the speed claim was attained, "busy hours" include 19:00:00 and 22:59:59, Monday to Sunday	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 for a metric 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 ±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 impaired and 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.
NBN fixed-line	Monitored connections on NBN Co's fixed-line footprint that utilise a physical line to connect the household to the NBN. There are a number of fixed-line technologies: 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.	

Term	Definition	Significance
NBN fixed wireless	Monitored connections on NBN Co's fixed wireless footprint. These services transmit data over radio signals to connect a household to the NBN using technology similar to mobile networks. Data travels from a transmission tower to an outdoor antenna fitted at the household.	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 LBNCo 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 12 am and 5 am 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.
Plan and plan speed	Plan refers to the retail broadband product. Each plan has an associated download and upload speed. For example, a 100/20 Mbps plan includes a 100 Mbps download plan speed and a 20 Mbps upload plan speed. The term "NBN100" refers to a download plan speed of 100 Mbps, but the upload plan speed may vary.	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.

Term	Definition	Significance
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 download plan speeds up to 500 Mbps. It excludes results from very high speed services, as these are presented separately.

Figure 1A shows that users on NBN fixed-line services attained an average download performance of 100.1% of plan speed during all hours in May. This decreased to 98.5% during busy hours (Monday–Friday). These results are similar to the previous report, where the corresponding figures were 99.7% of plan speed during all hours and 98.1% during busy hours.

The May 2023 measurement period had a total of 31 days with 4 busy hours per day (Monday–Sunday), totalling 124 busy hours in the month. The busiest hour download speed results in Figure 1B are lower than the busy hour download speeds shown in Figure 1A. This indicates that periods of higher demand affected network performance.

The range of speeds for the busiest hour (Figure 1B) varied from 91.6% to 102.0% of plan speed. This is a wider range of results compared with the download metrics for all hours and busy hours (Monday–Friday) shown in Figure 1A. Some RSPs were more affected by high demand peaks than others. All RSPs achieved busiest hour speeds above 90% of plan speed, which is in line with the previous report.

Further detail on hourly average download and upload performance results for the main NBN fixed-line plans is available on the ACCC's dashboard.

Figure 1: Average download performance by RSP

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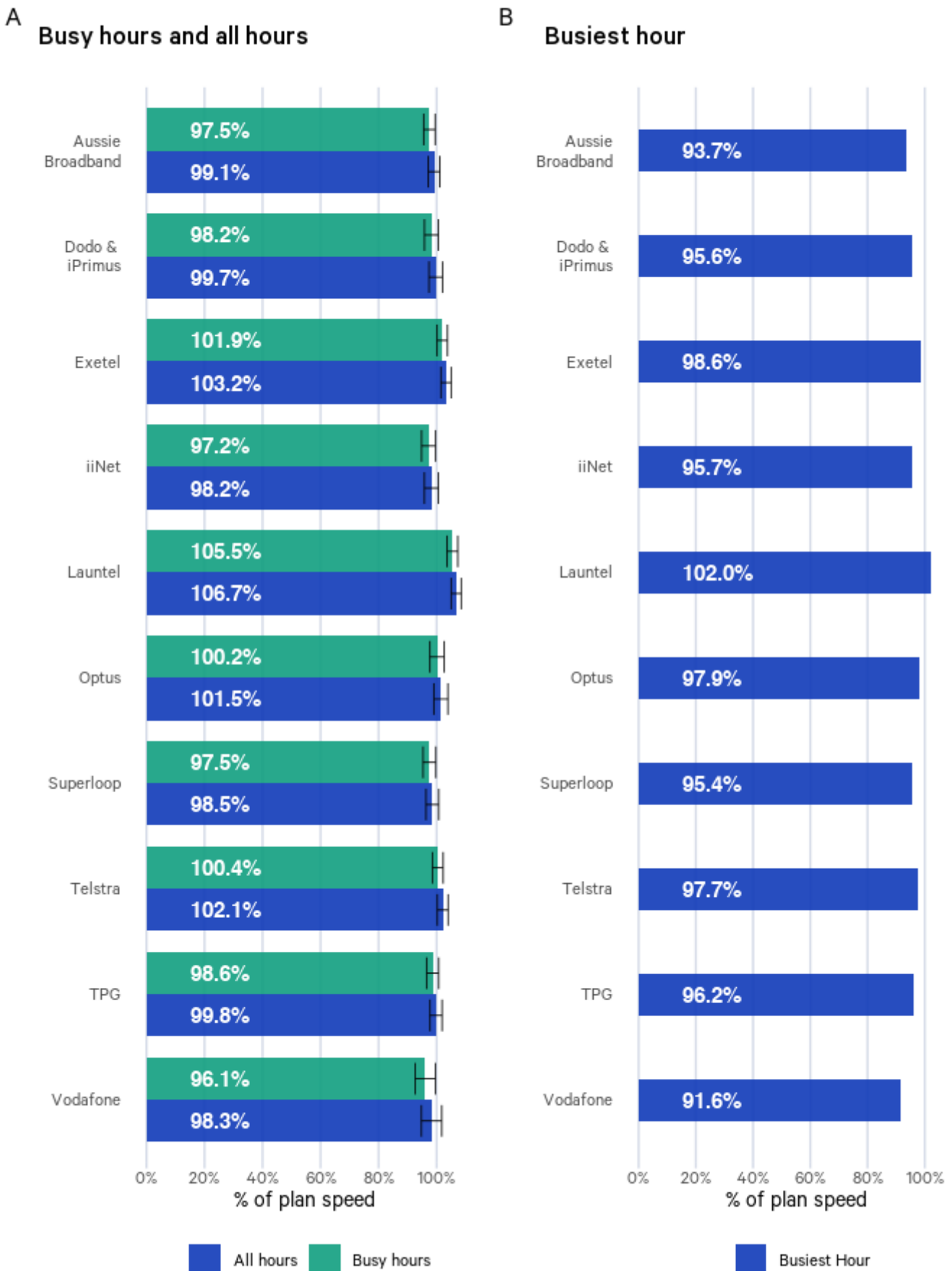

A Busy hours and all hours

RSP	Busy hours	All hours
Aussie Broadband	97.5%	99.1%
Dodo & iPrimus	98.2%	99.7%
Exetel	101.9%	103.2%
iiNet	97.2%	98.2%
Launtel	105.5%	106.7%
Optus	100.2%	101.5%
Superloop	97.5%	98.5%
Telstra	100.4%	102.1%
TPG	98.6%	99.8%
Vodafone	96.1%	98.3%

B Busiest hour

RSP	Busiest Hour
Aussie Broadband	93.7%
Dodo & iPrimus	95.6%
Exetel	98.6%
iiNet	95.7%
Launtel	102.0%
Optus	97.9%
Superloop	95.4%
Telstra	97.7%
TPG	96.2%
Vodafone	91.6%

% of plan speed

Legend: All hours, Busy hours, Busiest Hour

Figure 2 shows the distribution of 425,505 download speed tests performed across 1223 Whiteboxes connected to fixed-line NBN infrastructure during this period.

Of these tests, 70.0% achieved at least 100% of plan speed, and only 1.2% of tests achieved less than 50% of plan speed. In the previous report, 69.9% of tests were at plan speed or higher, and 1.5% of tests failed to meet the 50% mark.

Figure 2: Frequency of download speeds attained during tests

NBN fixed-line plans. All hours. Including underperforming services.
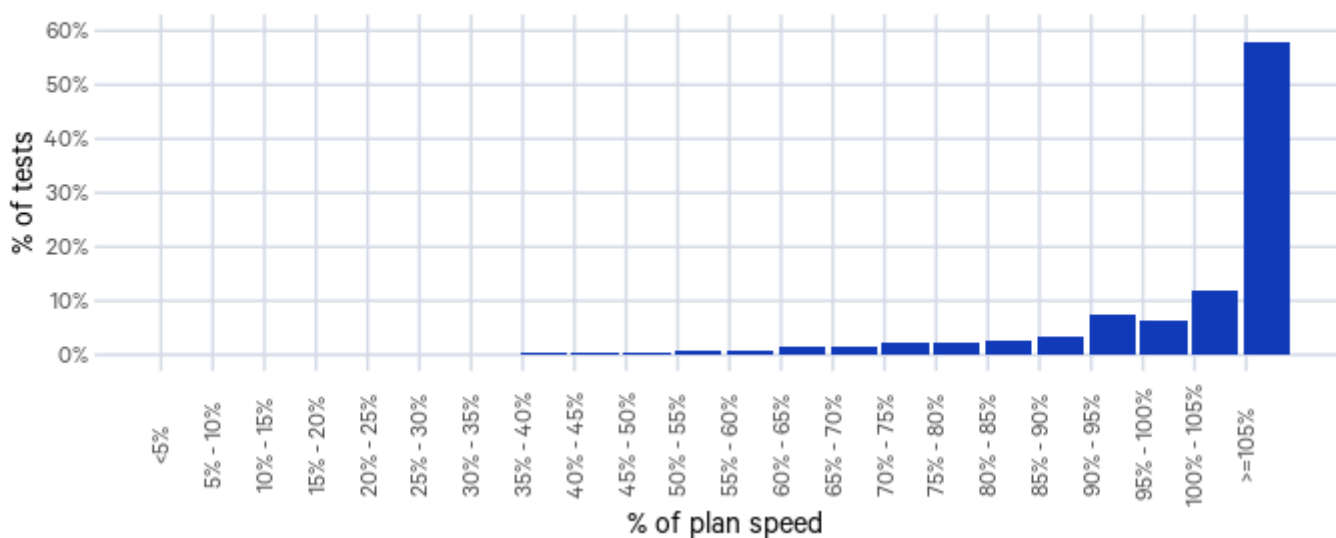
In Figure 3, we present separate download performance results including and excluding underperforming services. Underperforming services represented 4.7% of the 1223 NBN services tested for this report. In our sample, FTTN services made up 88% of underperforming NBN services, and NBN50 and NBN100 plans accounted for 91% of the underperforming NBN services.

Once underperforming services are excluded, the average download performance during all hours is 102.0% of plan speed compared with 100.1% for all services. Had underperforming services been remediated before the measurements were collected, the overall download performance would have been 1.9 percentage points higher during the period.

Figure 3: Average download speed by RSP - inclusive and exclusive of underperforming services

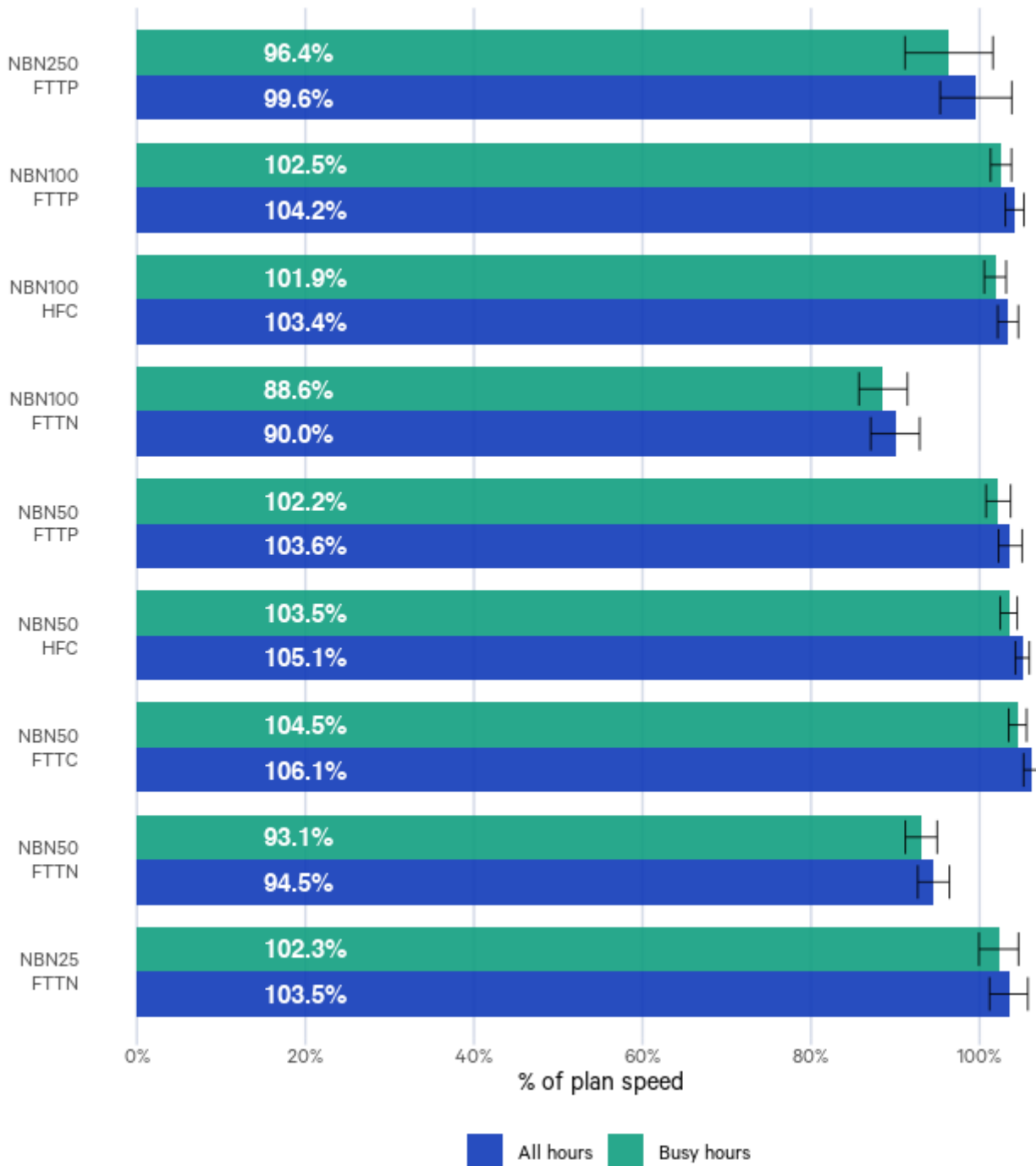NBN fixed-line plans. All hours. Error bars indicate 95% confidence intervals of the mean.

	All NBN fixed-line connections	Excluding underperforming services
Aussie Broadband	99.1%	101.8%
Dodo & iPrimus	99.7%	101.7%
Exetel	103.2%	104.2%
iiNet	98.2%	100.6%
Launtel	106.7%	106.7%
Optus	101.5%	103.3%
Superloop	98.5%	100.3%
Telstra	102.1%	103.8%
TPG	99.8%	101.6%
Vodafone	98.3%	100.7%
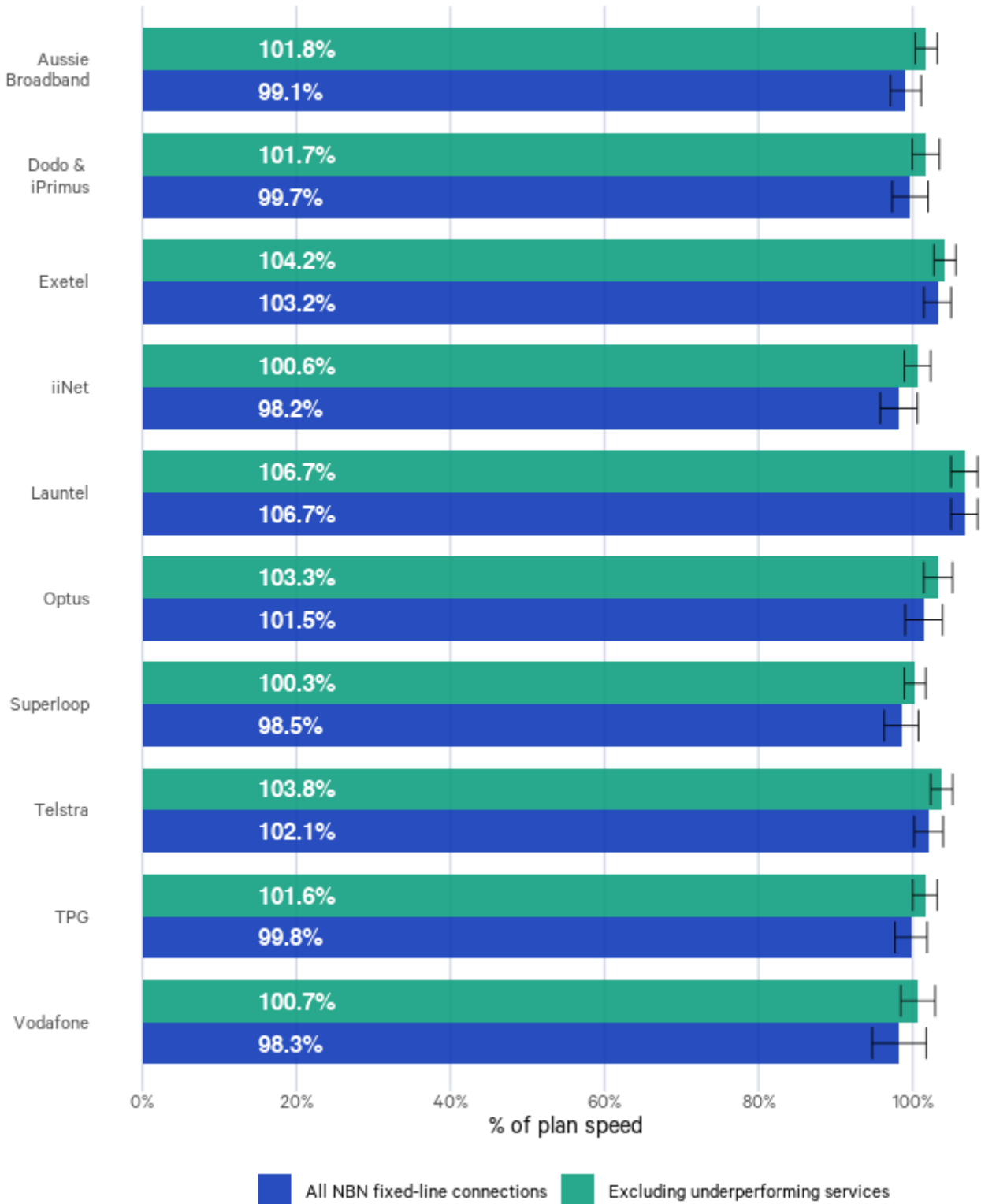
Within the NBN50 plan, FTTN services had an average download speed of around 5 Mbps lower than other technologies—a difference of 10%. Within the NBN100 plans, FTTN services had an average download speed around 13 Mbps lower than other technologies.

The results are similar to previous reports, with FTTN performing significantly below other access technologies for the NBN50 and NBN100 plans and accounting for the bulk of underperforming services across these plans. A comparison of NBN fixed-line download performance results including and excluding underperforming services by access technology is available on the ACCC's dashboard.

Figure 4: Average download speed by plan and technology

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

Plan / Technology	Busy hours	All hours
NBN250 FTTP	96.4%	99.6%
NBN100 FTTP	102.5%	104.2%
NBN100 HFC	101.9%	103.4%
NBN100 FTTN	88.6%	90.0%
NBN50 FTTP	102.2%	103.6%
NBN50 HFC	103.5%	105.1%
NBN50 FTTC	104.5%	106.1%
NBN50 FTTN	93.1%	94.5%
NBN25 FTTN	102.3%	103.5%

% of plan speed

■ All hours ■ Busy hours

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

Figure 5A shows the typical evening hour speeds that were the predominant speeds advertised by RSPs during the measurement period separately for the 50 Mbps and 100 Mbps download plans, as well as the busy hour and busiest hour download performance by RSPs (combined results for services with 50 Mbps and 100 Mbps plan download speeds). 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 5B shows the percentage of busy hours (Monday–Sunday) 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 71% for the providers presented.

Figure 5B 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.

Figure 5: Advertised speeds and average download speeds by RSP

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

A

% of plan speed

RSP	Advertised speed claim	Busy hours	Busiest hour
Aussie Broadband	100.0%	101.0%	97.5%
Dodo & iPrimus	100.0%	100.8%	98.5%
Exetel	100.0%	103.5%	101.5%
iiNet	96.4%	101.1%	99.2%
Optus	100.0%	104.2%	101.6%
Superloop	95.3%	99.9%	98.1%
Telstra	100.0%	103.2%	100.7%
TPG	97.4%	102.5%	100.2%
Vodafone	95.6%	98.9%	94.8%

B

% of busy hours in which advertised speed was achieved

RSP	Busy hours
Aussie Broadband	71%
Dodo & iPrimus	79%
Exetel	94%
iiNet	98%
Optus	94%
Superloop	98%
Telstra	95%
TPG	99%
Vodafone	84%

Legend:
- Busiest hour (green)
- Busy hours (blue)
- Advertised speed claim (grey)

Upload speed test results

Figure 6 shows average upload performance for the main NBN fixed-line RSPs and plans.

Average upload performance ranged between 83.7% and 89.6% of plan speed 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 86.5% of plan speed during all hours, compared to 85.8% in the previous report. During busy hours (Monday–Friday), NBN fixed-line services achieved an average upload performance of 86.2% of plan speed compared to 85.4% in the previous report. As the uplink is not overprovisioned, upload performance results are lower than download performance results.

Figure 6: Average upload speed by RSP

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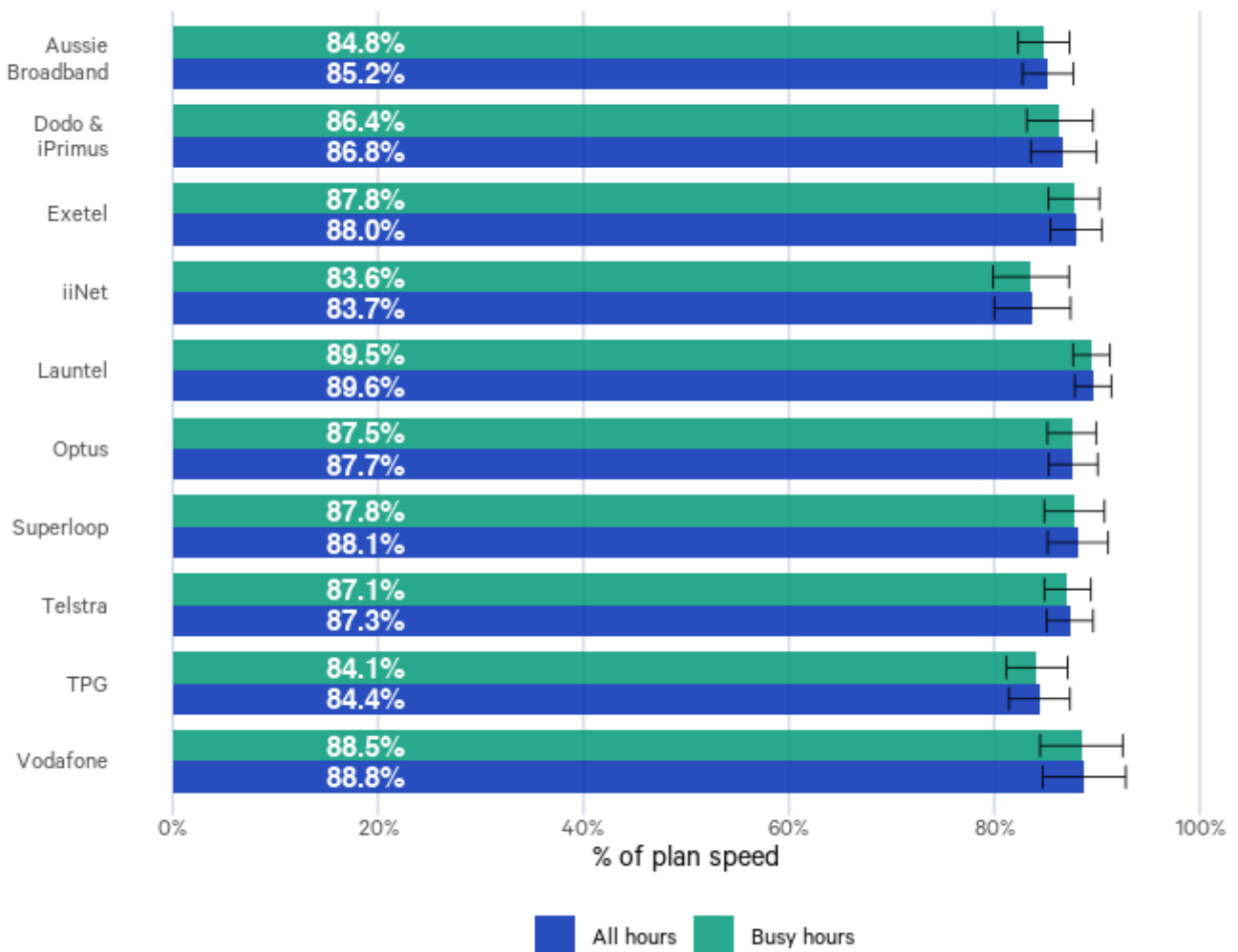
Other metrics

Average daily outages, latency and webpage loading results for each RSP were in line with results from previous reports, as were packet loss results across all NBN services. These results are available on the ACCC's dashboard.

Figure 7 shows the distribution of outage rates and the distribution of outage durations for each RSP. These metrics indicate respectively how often outages occurred and the severity of outages' impact on user experience.

The average daily rate of outages on NBN plans was 0.26 outages per day. As 95% of households experienced fewer than 1 outage per day, and 57% of outages did not last longer than 3 minutes, outages were likely to have had little material impact on end user experience.

Figure 7: Outage characteristics by RSP
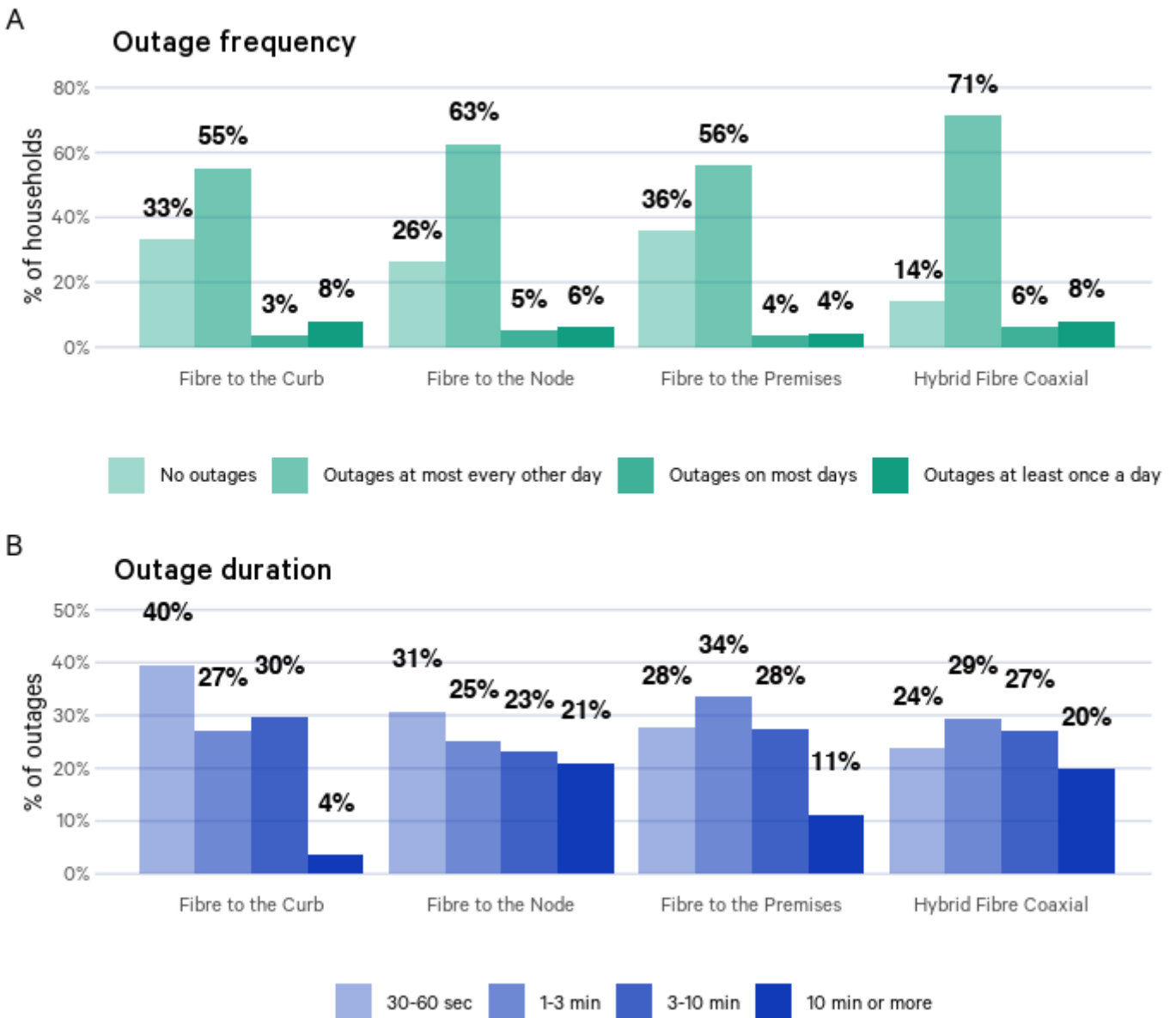
NBN fixed-line services. All hours.

A Outage frequency

RSP	No outages	Outages at most every other day	Outages on most days	Outages at least once a day
Aussie Broadband	36%	54%	4%	6%
Dodo & iPrimus	16%	64%	11%	10%
Exetel	28%	68%	2%	2%
iiNet	35%	61%	1%	4%
Launtel	17%	65%	2%	15%
Optus	39%	60%	1%	0%
Superloop	42%	52%	6%	0%
Telstra	21%	69%	5%	5%
TPG	18%	72%	3%	7%
Vodafone	21%	67%	10%	2%

% of households

B Outage duration

RSP	30-60 sec	1-3 min	3-10 min	10 min or more
Aussie Broadband	28%	28%	36%	8%
Dodo & iPrimus	29%	30%	17%	23%
Exetel	25%	29%	35%	11%
iiNet	23%	30%	25%	22%
Launtel	21%	22%	44%	13%
Optus	27%	32%	21%	20%
Superloop	25%	28%	23%	24%
Telstra	19%	20%	24%	37%
TPG	28%	32%	32%	8%
Vodafone	16%	40%	25%	20%

% of outages

Legend A:
- No outages
- Outages at most every other day
- Outages on most days
- Outages at least once a day

Legend B:
- 30-60 sec
- 1-3 min
- 3-10 min
- 10 min or more

The volunteer panels of different RSPs have different access technology compositions, which may contribute to the differences between RSPs' results.

Figure 8 shows the distribution of outage rates and the distribution of outage durations for different access technologies.

Figure 8: Outage characteristics by access technology

NBN fixed-line services. All hours.

A

Outage frequency

Legend: No outages | Outages at most every other day | Outages on most days | Outages at least once a day

B

Outage duration

Legend: 30-60 sec | 1-3 min | 3-10 min | 10 min or more

Other superfast access networks

This section presents data on 46 services on other superfast access networks on a variety of plans: 12/1 Mbps (1 unit), 25/5 Mbps (5 units), 50/20 Mbps (11 units), 100/20 Mbps (5 units), 100/40 Mbps (12 units), 250/25 Mbps (9 units) and 250/100 Mbps (3 units). The results presented are aggregated across the Uniti Group's LBNCo and OptiComm fixed-line networks. Download and upload speeds are expressed as a percentage of plan speed.

These results are indicative only and should not be used to draw inferences about the performance of other superfast access networks.

Speed test results

In May the sampled households on other superfast access networks attained an average download performance of 105% of plan speeds during all hours and 105% during the busy hours (Monday–Friday).

The sampled services on other superfast access networks attained an average upload performance of 89% of plan speeds during all hours and 89% during the busy hours (Monday–Friday).

Figure 9: Average download and upload speeds

Other superfast access networks. Error bars indicate 95% confidence intervals of the mean.
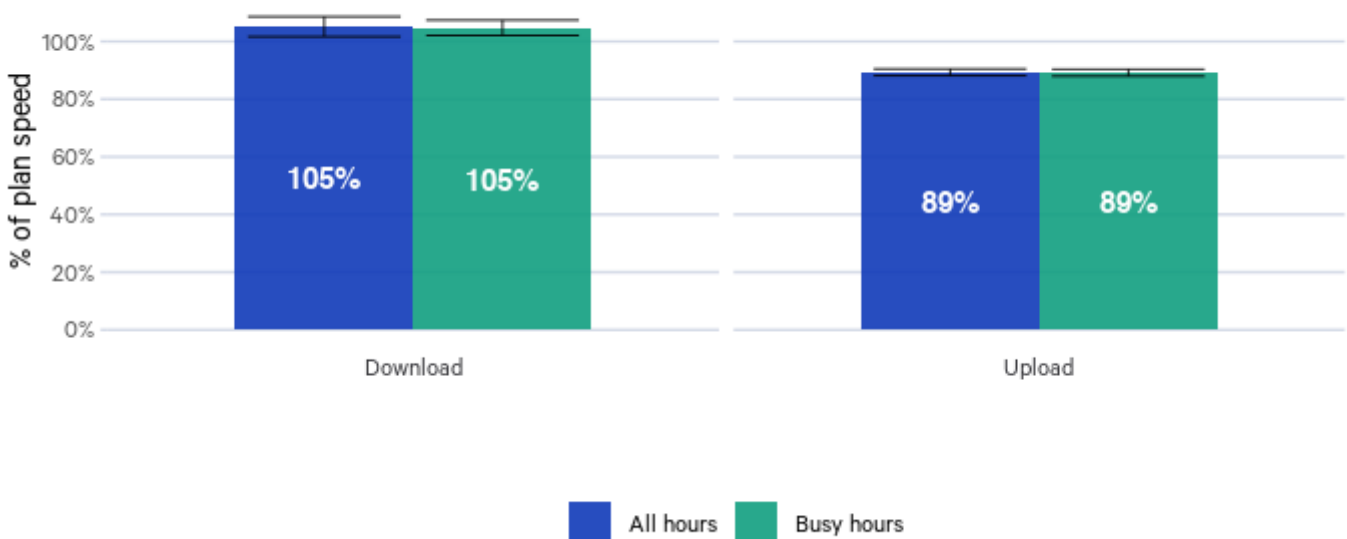
Other metrics

Latency, packet loss and webpage loading results were in line with results from previous reports. These results are available on the ACCC's dashboard.

Figure 10 shows the distribution of outage rates and the distribution of outage durations for other superfast access networks during all hours.

The average daily rate of outages in May on other superfast networks was 0.30 outages per day. 91% of households experienced fewer than 1 outage per day, and 73% of outages did not last longer than 3 minutes.

Figure 10: Outage characteristics
Other superfast access networks. All hours.

A **Outage frequency**

- No outages
- Outages at most every other day
- Outages on most days
- Outages at least once a day

B **Outage duration**

- 30-60 sec
- 1-3 min
- 3-10 min
- 10 min or more
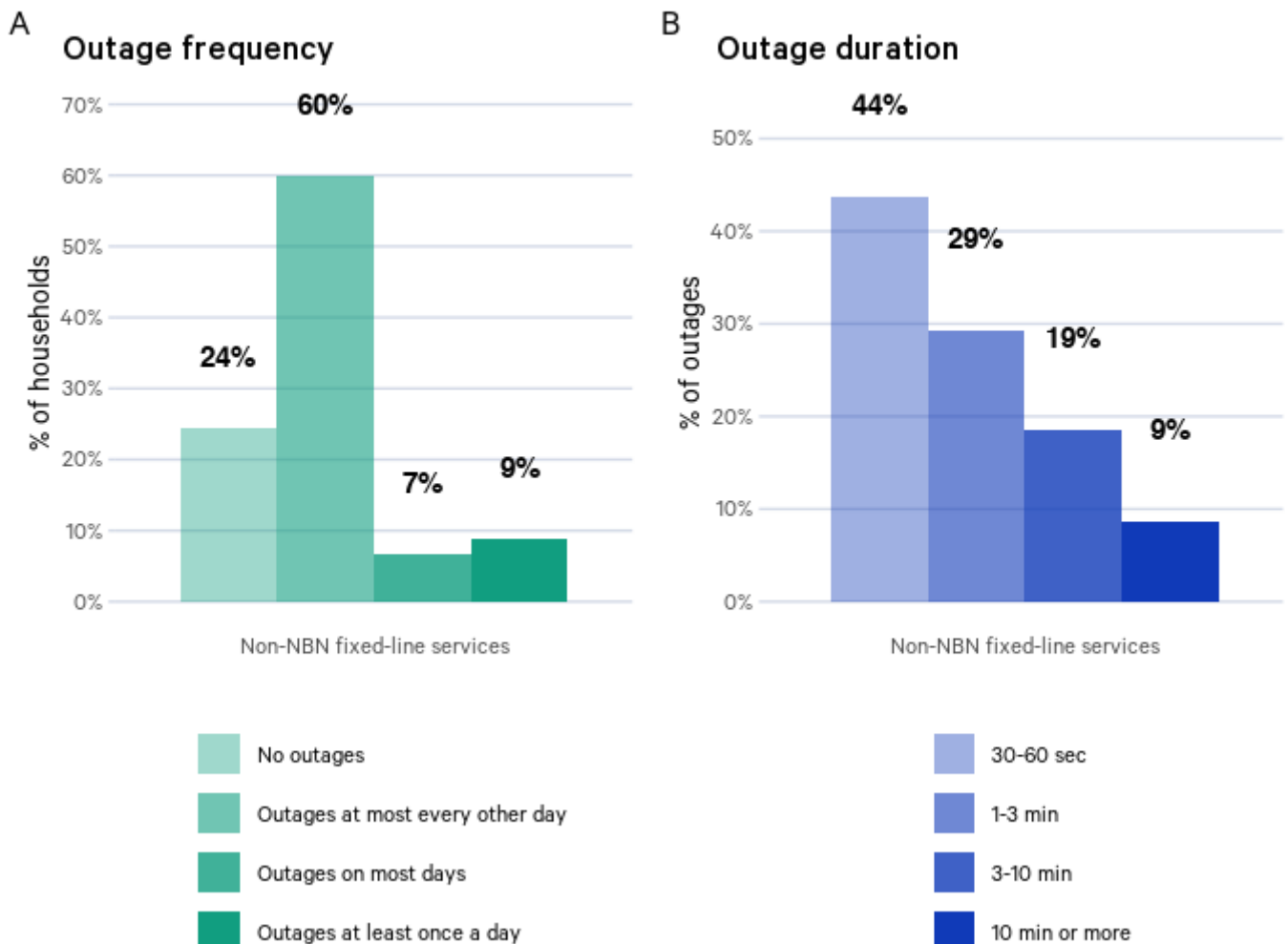
NBN very high speed services

This section is based on a total of 153 monitored very high speed services, across both FTTP and HFC technologies. The results include data from services where we identified that the volunteer most likely 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 deducting network/transport protocol overheads, 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 642 Mbps to 832 Mbps. Figure 11A shows that performance varied more during the busy hours (Monday–Friday) and wider evening peak period. Speeds typically started to decrease during the evening, dipping to 190 Mbps below the day's maximum speed by 8 pm, 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 in previous reports, including NBN100 plans. This indicates that NBN very high speed plans are more affected by congestion during busy periods than lower speed plans.

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

Figure 11B shows the distribution of 47,033 download speed tests performed across 153 Whiteboxes connected to very high speed services on fixed-line NBN infrastructure. Of these tests, 52.6% achieved a download speed of at least 900 Mbps.

Figure 11: Download speed test results for very high speed services

NBN very high speed services.
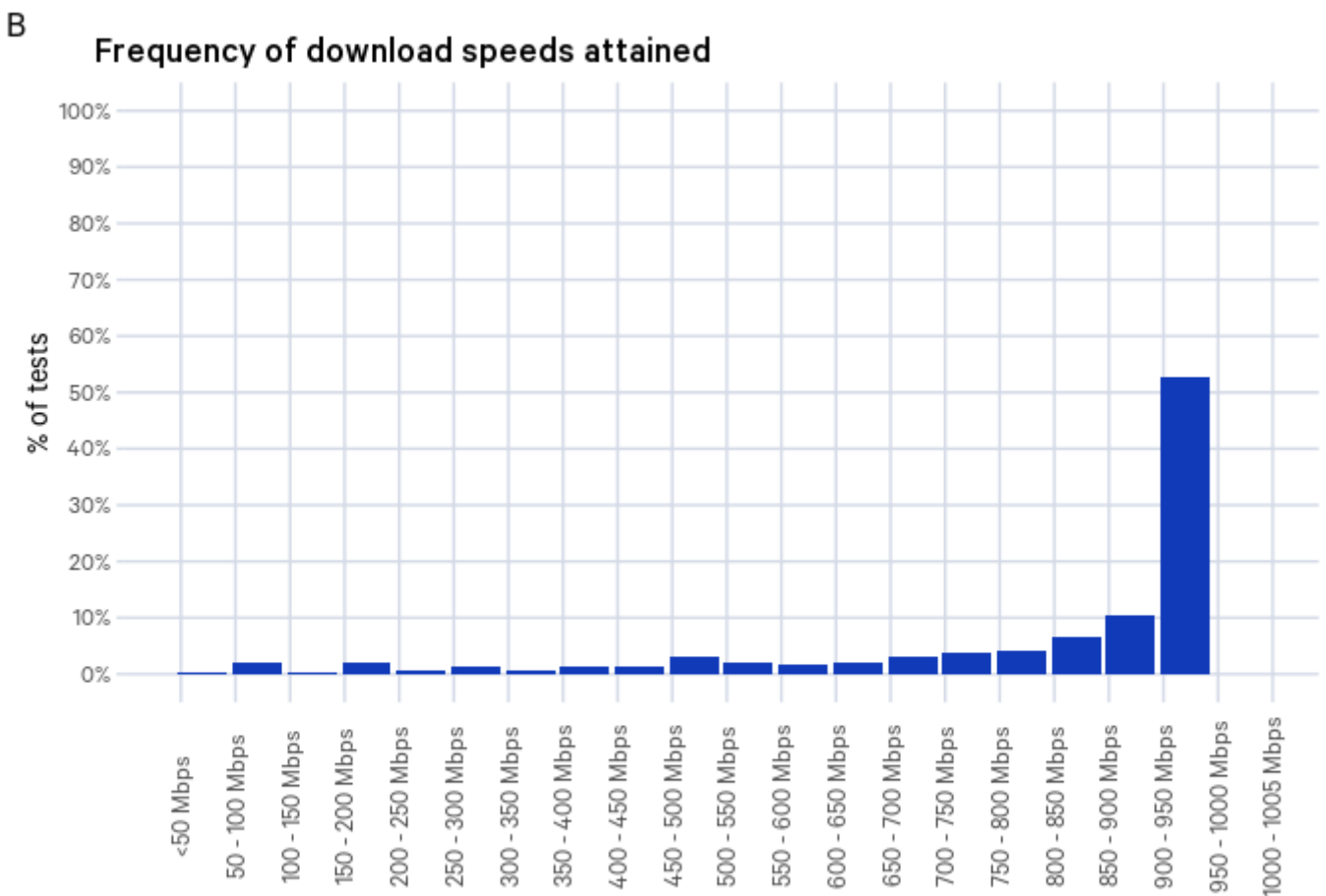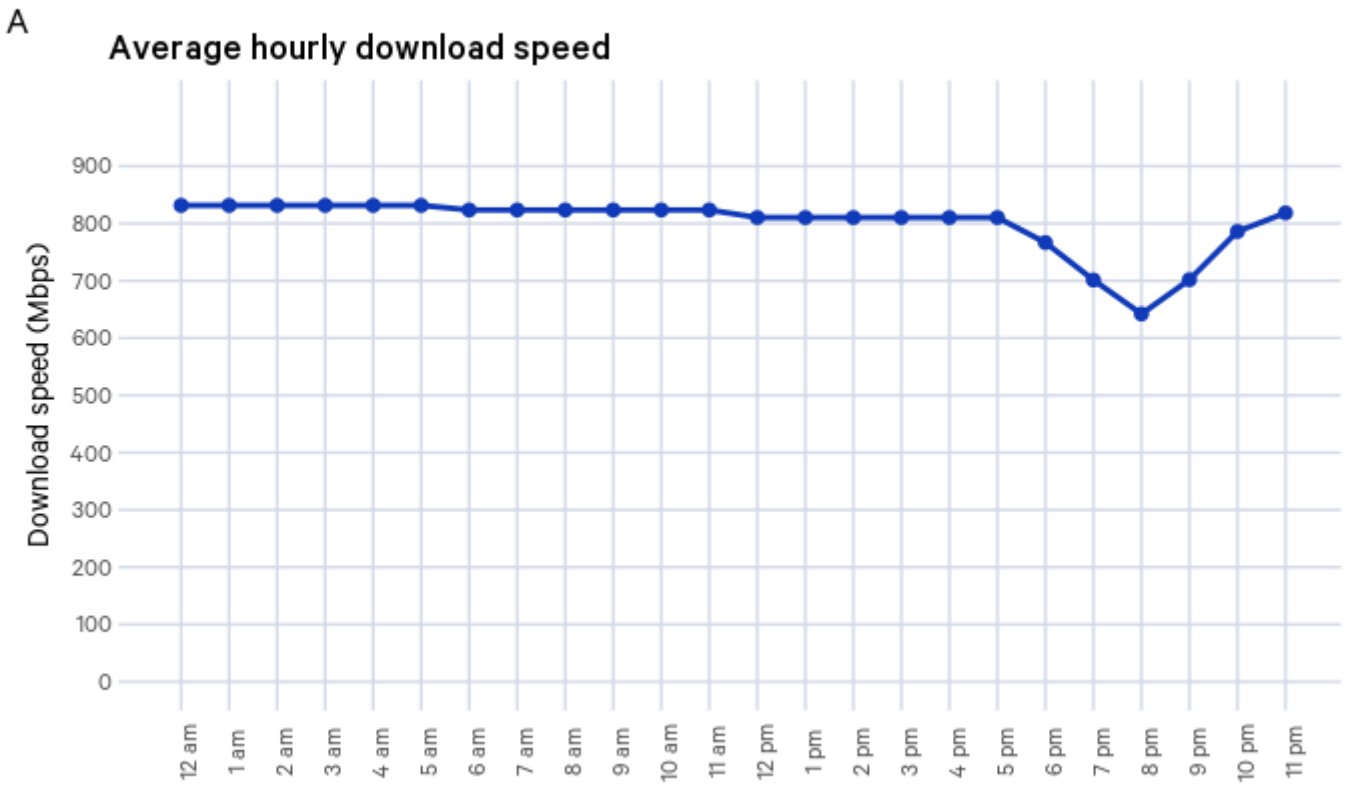
A

Average hourly download speed

B

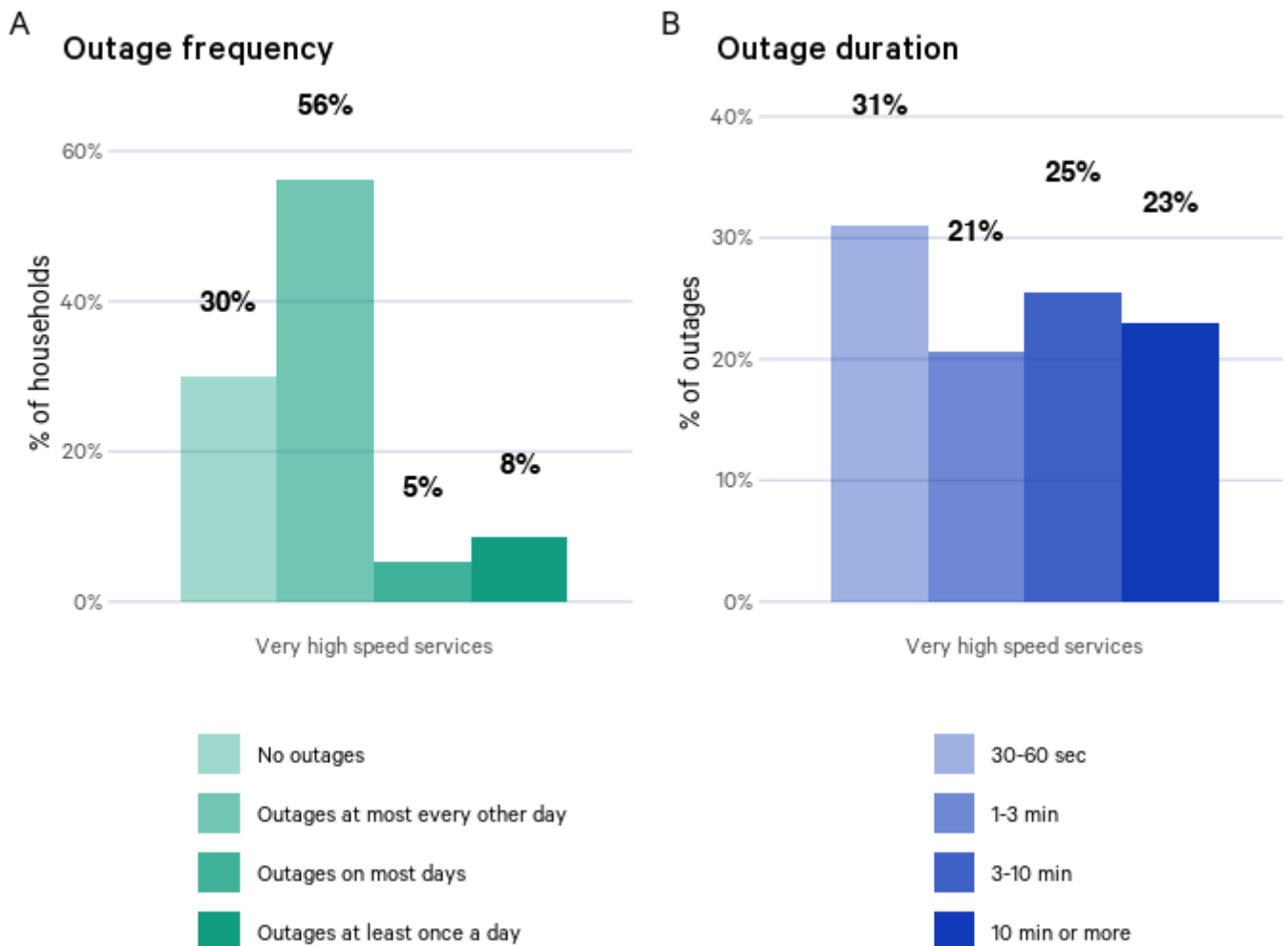### Frequency of download speeds attained

Other metrics

Latency, packet loss and webpage loading results were in line with results from previous reports. These results are available on the ACCC's dashboard.

Figure 12 shows the distribution of outage rates and the distribution of outage durations for very high speed services during all hours.

The average daily rate of outages in May for NBN very high speed services was 0.38 outages per day. 92% of households experienced fewer than 1 outage per day and 52% of outages did not last longer than 3 minutes.

Figure 12: Outage characteristics

NBN very high speed services. All hours.

A — Outage frequency
- No outages
- Outages at most every other day
- Outages on most days
- Outages at least once a day

B — Outage duration
- 30-60 sec
- 1-3 min
- 3-10 min
- 10 min or more

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.

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.

Speed test results

This section uses 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 plan speed.

The results in Figure 13A are based on a total of 93 NBN fixed wireless services across both the 25/5 Mbps (16 units) and Fixed Wireless Plus plans (77 units).

During this period, users on NBN fixed wireless services attained an average download performance of 109.7% of plan speeds during all hours, decreasing to 87.5% during busy hours (Monday–Friday). This is in line with the results in the previous report, where average download performance was 109.9% of plan speeds during all hours and 86.2% during busy hours.

NBN fixed wireless services attained an average upload performance of 77.1% of plan speed during all hours, decreasing to 63.4% during the busy hours. In the previous report, average upload performance during all hours was 75.5% of plan speed decreasing to 60.5% during busy hours.
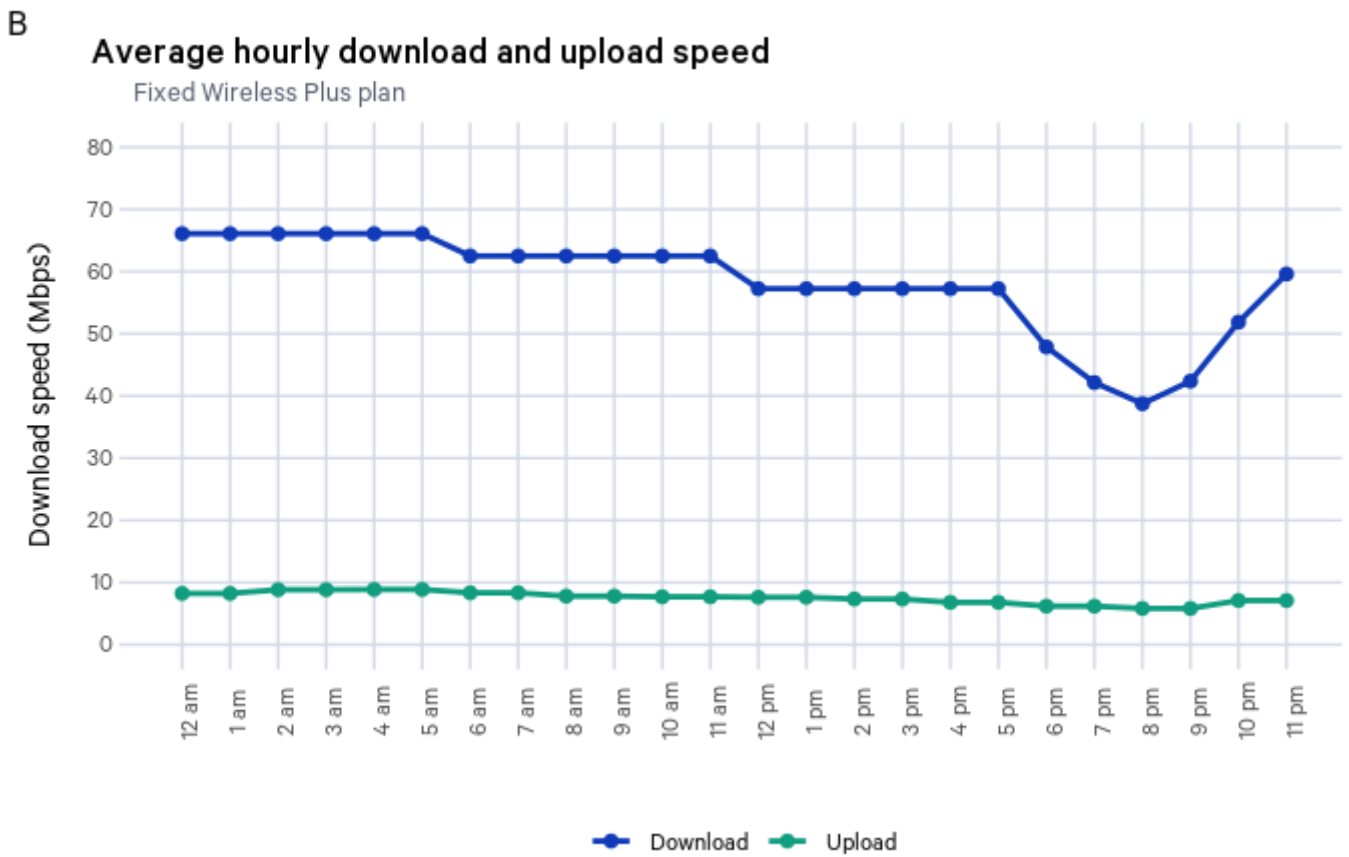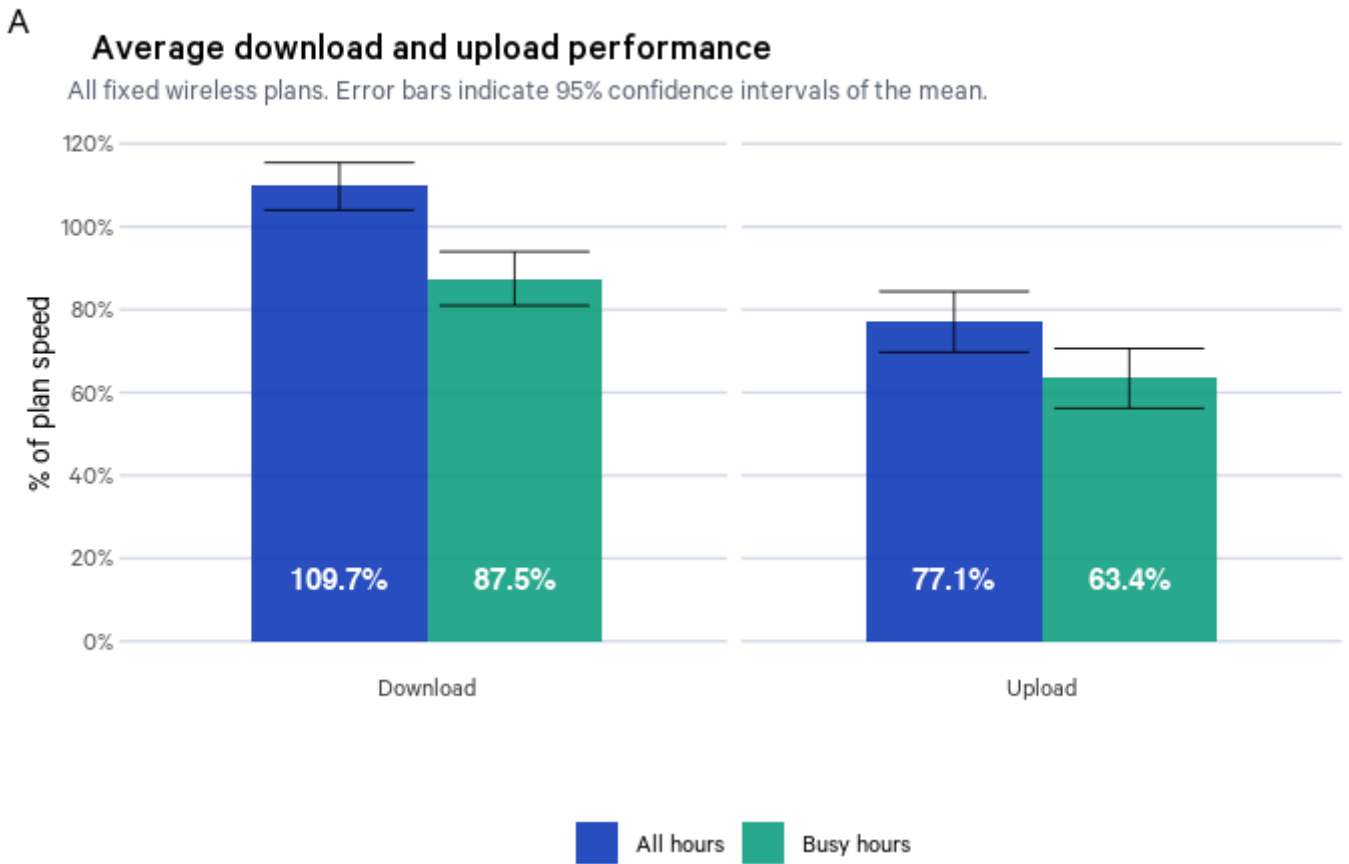
Figure 13B shows the variation in download and upload speeds during the day for Fixed Wireless Plus plans. These results only include services on the Fixed Wireless Plus plan.

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 27 Mbps below the day's maximum speed by 8 pm, and recovering to higher levels later at night. The average download speed for the Fixed Wireless Plus plan was 57 Mbps during all hours, decreasing to an average of 44.5 Mbps during busy hours. In the previous report, the average download speeds were 57.2 Mbps and 43.6 Mbps respectively.

Upload speeds followed a similar pattern, recording lower values both during busy hours and during the afternoon. The average upload speed for the Fixed Wireless Plus plan was 7.6 Mbps during all hours, decreasing to an average of 6.2 Mbps during busy hours. In the previous report, the average upload speed was 7.4 Mbps during all hours, and 5.8 Mbps during busy hours.

Both download and upload speeds showed considerable daily variation for fixed wireless products, which is to be expected with fixed wireless products. Network congestion can affect the fixed wireless network, particularly during busy hours.
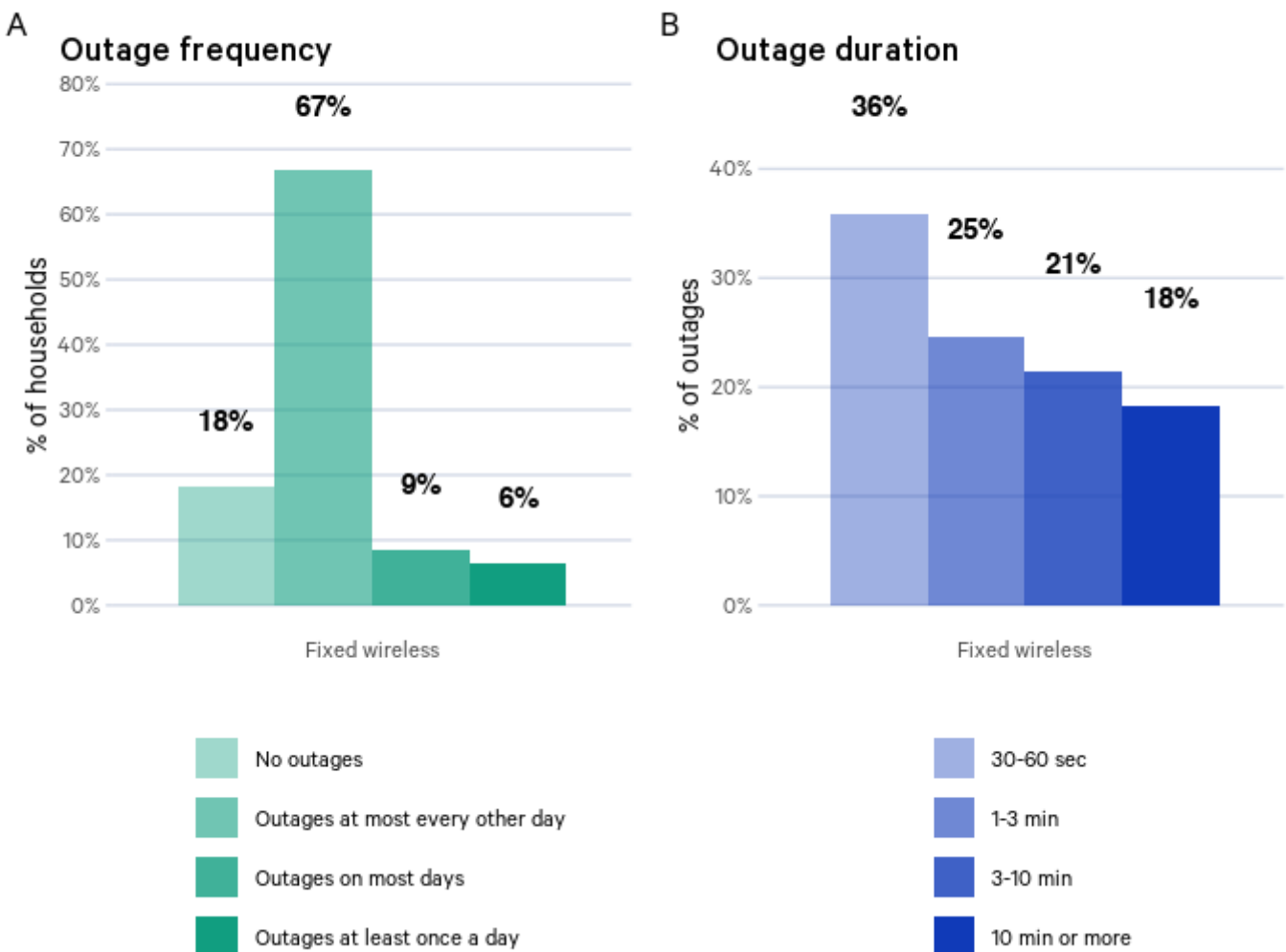
Figure 13: Speed test results for NBN fixed wireless

A

Average download and upload performance

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

Download: 109.7% (All hours), 87.5% (Busy hours)
Upload: 77.1% (All hours), 63.4% (Busy hours)

Legend: All hours, Busy hours

B

Average hourly download and upload speed

Fixed Wireless Plus plan

Legend: Download, Upload

Other metrics

Latency, packet loss and webpage loading results were in line with results from the previous report. These results are available on the ACCC's dashboard.

Figure 14 shows the distribution of outage rates and the distribution of outage durations for fixed wireless services during all hours.

The average daily rate of outages in May for NBN fixed wireless services was 0.28 outages per day. 94% of households experienced fewer than 1 outage per day and 60% of outages did not last longer than 3 minutes.

Figure 14: Outage characteristics
NBN fixed wireless. All hours.

A Outage frequency

Legend:
- No outages
- Outages at most every other day
- Outages on most days
- Outages at least once a day

B Outage duration

Legend:
- 30-60 sec
- 1-3 min
- 3-10 min
- 10 min or more

Connectivity to business applications

This section of the report studies the ability of broadband services to support the needs of small and medium businesses (including those running businesses from home). The following pages include data on the performance of videoconferencing services, and the loading time of various webpages commonly used by small and medium businesses. Data is presented by access network and connection type for each service. Service providers are anonymised throughout this section.

Videoconferencing

One of the factors that can affect the user experience of a video call is latency, which is influenced by the location of the servers for the user's videoconferencing service. Three out of the four services included here (VC 1, 3 and 4) offer paid subscriptions as well as a free service. For VC 1, calls made via a paid account will direct traffic to a different server than the free version of the service. The other providers (VC 2, VC 3 and VC 4) tested use domestic servers for free accounts as well as paid accounts where applicable. Besides using servers that are closer to the user, paid accounts can offer various features that enhance the user experience in ways that our tests do not measure.

Figures 15 and 16 present latency results to the servers of the four videoconferencing services.

Figure 15 shows the breakdown of the latency results by access network and access technology during all hours. Besides server location, access technology can also affect the latency, but this variation is unlikely to be noticeable by the end user. For example, the mean latency of each videoconferencing service is higher over fixed wireless connections than over fixed-line.

Figure 15: Latency to video conferencing services by access network and technology
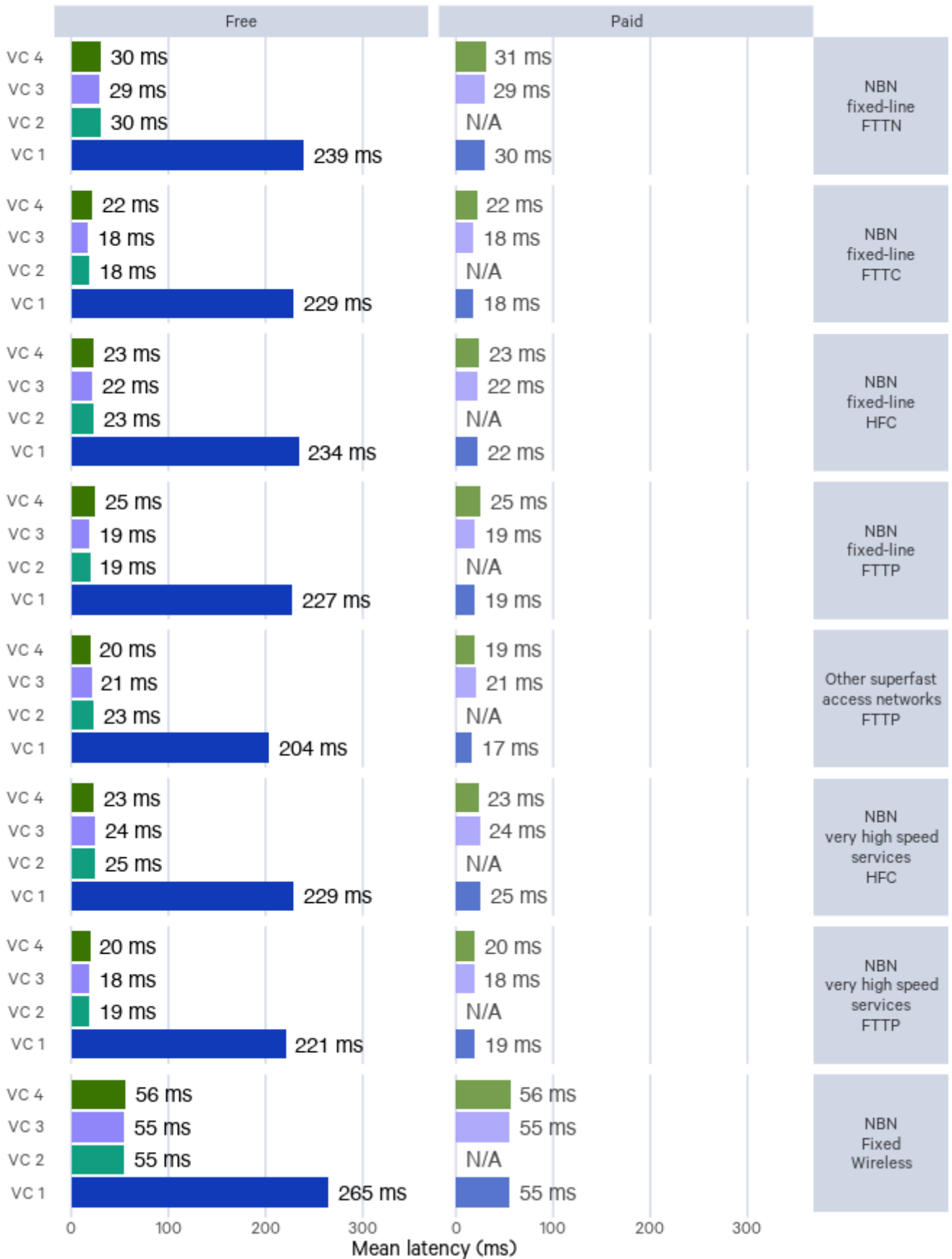
All hours.

	Free	Paid	
VC 4	30 ms	31 ms	NBN fixed-line FTTN
VC 3	29 ms	29 ms	
VC 2	30 ms	N/A	
VC 1	239 ms	30 ms	
VC 4	22 ms	22 ms	NBN fixed-line FTTC
VC 3	18 ms	18 ms	
VC 2	18 ms	N/A	
VC 1	229 ms	18 ms	
VC 4	23 ms	23 ms	NBN fixed-line HFC
VC 3	22 ms	22 ms	
VC 2	23 ms	N/A	
VC 1	234 ms	22 ms	
VC 4	25 ms	25 ms	NBN fixed-line FTTP
VC 3	19 ms	19 ms	
VC 2	19 ms	N/A	
VC 1	227 ms	19 ms	
VC 4	20 ms	19 ms	Other superfast access networks FTTP
VC 3	21 ms	21 ms	
VC 2	23 ms	N/A	
VC 1	204 ms	17 ms	
VC 4	23 ms	23 ms	NBN very high speed services HFC
VC 3	24 ms	24 ms	
VC 2	25 ms	N/A	
VC 1	229 ms	25 ms	
VC 4	20 ms	20 ms	NBN very high speed services FTTP
VC 3	18 ms	18 ms	
VC 2	19 ms	N/A	
VC 1	221 ms	19 ms	
VC 4	56 ms	56 ms	NBN Fixed Wireless
VC 3	55 ms	55 ms	
VC 2	55 ms	N/A	
VC 1	265 ms	55 ms	

Mean latency (ms)

Figure 16 shows the mean latency to the servers of the four tested videoconferencing services for different NBN fixed-line plans: NBN 25, NBN 50, NBN 100 and NBN 250. Although the sample set for different plans comprises different access technologies in different proportions, the results are relatively consistent between plans. This means that while the latency of a particular videoconferencing service is strongly affected by server location, and to a lesser extent, access technology, plan download speed does not have a strong influence on the latency. However, businesses may benefit from higher speed connections if multiple staff are using various online business applications and transferring large files at the same time.

Figure 16: Latency to video conferencing services by plan download speed

NBN fixed-line plans. All hours.
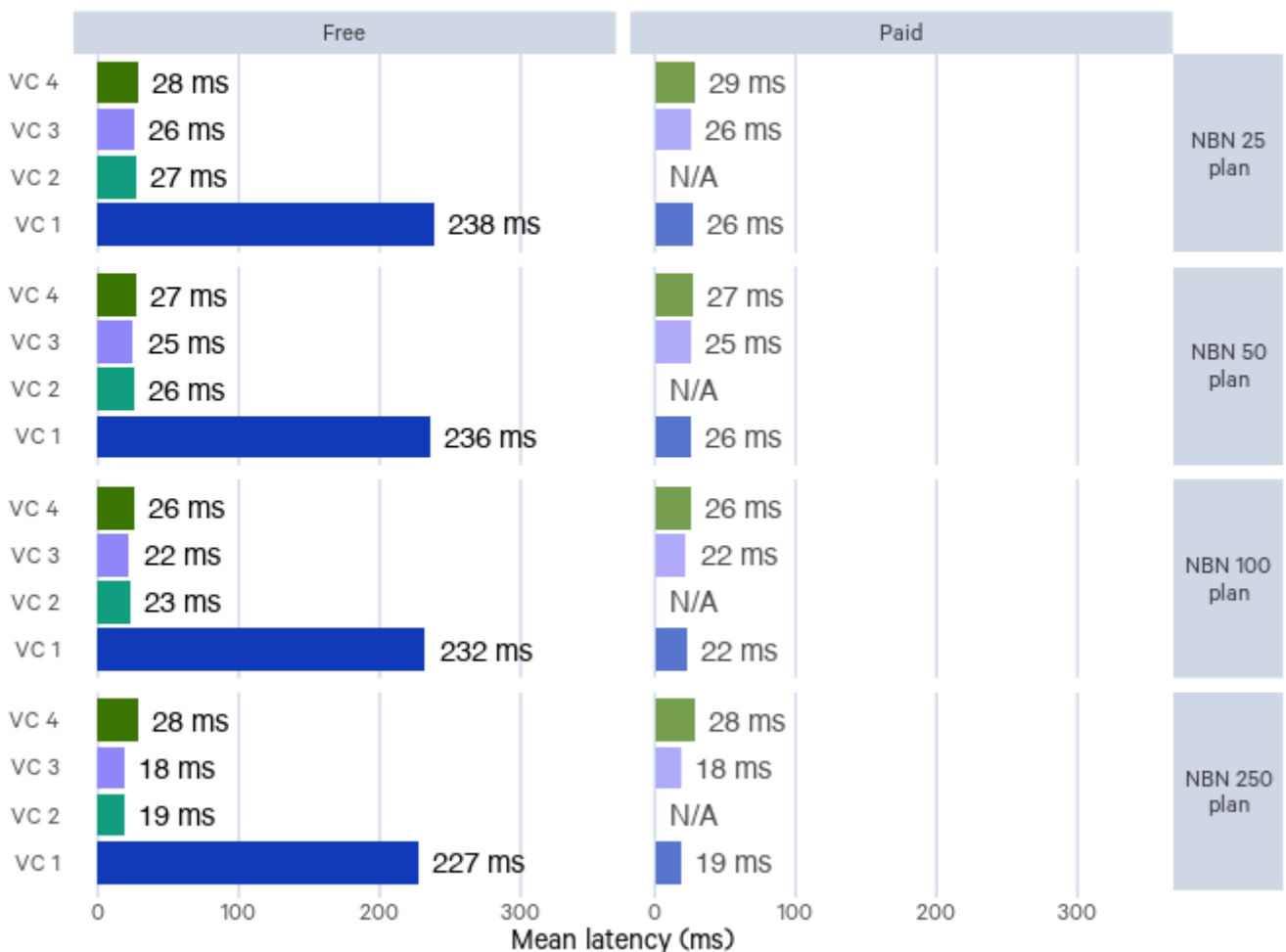
Packet loss

Latency is not the only factor impacting on the quality of a video call. Packet loss can result in stuttering and dropouts, and these are not captured in the round trip times measured in the previous section. Video conferencing services can use different technologies and processes to encode audio and video that can also lead to differences in the quality of the experience for users.

Figure 17 shows the mean packet loss throughout the day for the free versions of the four videoconferencing services. While the overall packet loss remains close to zero for most services, VC 2 has a consistent packet loss around 3% throughout the day. VC 1's packet loss increases slightly around the evening busy hours. During normal business hours (9 am – 5 pm), VC 1, VC 3 and VC 4's packet loss remained close to zero, while VC 2's packet loss remained around 3%. We did not observe a significant difference in the mean packet loss results on different access technologies.

Figure 17: Packet loss of video conferencing services

All hours. Free services.
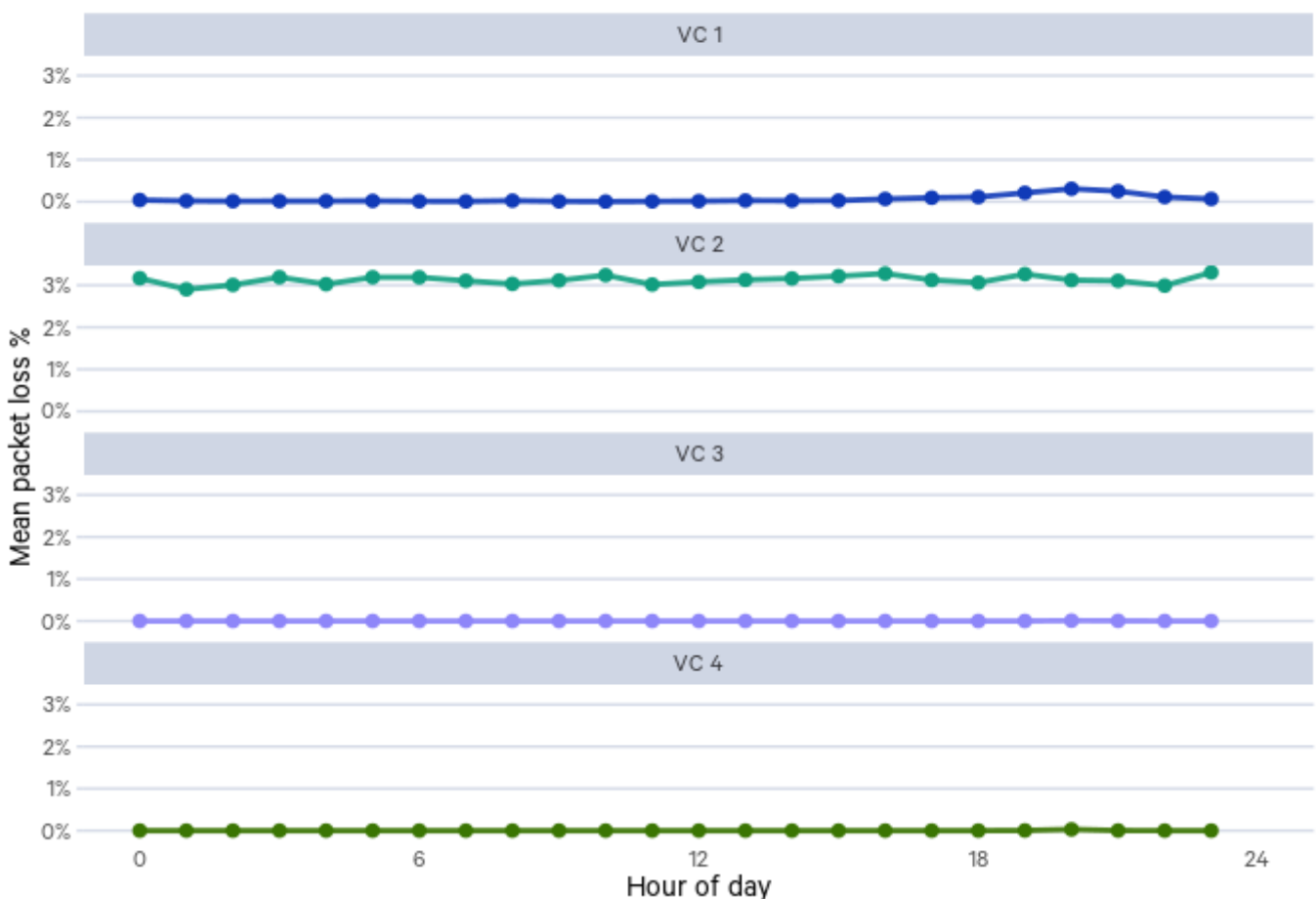
Webpage loading times

This section presents webpage loading times for eight different websites that small or medium businesses might use frequently. The eight websites include the websites of two accounting services, two customer relationship management (CRM) platforms, two e-commerce platforms and two e-mail platforms.

Webpage loading times can depend on many factors, including where the page and its content is hosted in relation to the user and the complexity and design of the webpage. Lower latency between the user and the server hosting the webpage and its content means that it takes a shorter time to fetch each object on the webpage. Websites that include more content (for example, more objects, or larger objects) are likely to be slower to load. This is due to the increased time needed to download all separate objects and the possibility that these objects could be stored on many different servers with many dependencies. Tracking software, which is often used to provide targeted advertising can make the website more complex (by requiring more objects to be downloaded, potentially from different locations) and impact web performance. Besides these factors, choices made by the webpage designers can further improve or worsen a website's loading time.

Figures 18-21 each show the average webpage loading times for a particular kind of business application, by access network and technology.

Figure 18: Webpage loading times for accounting services

All hours.
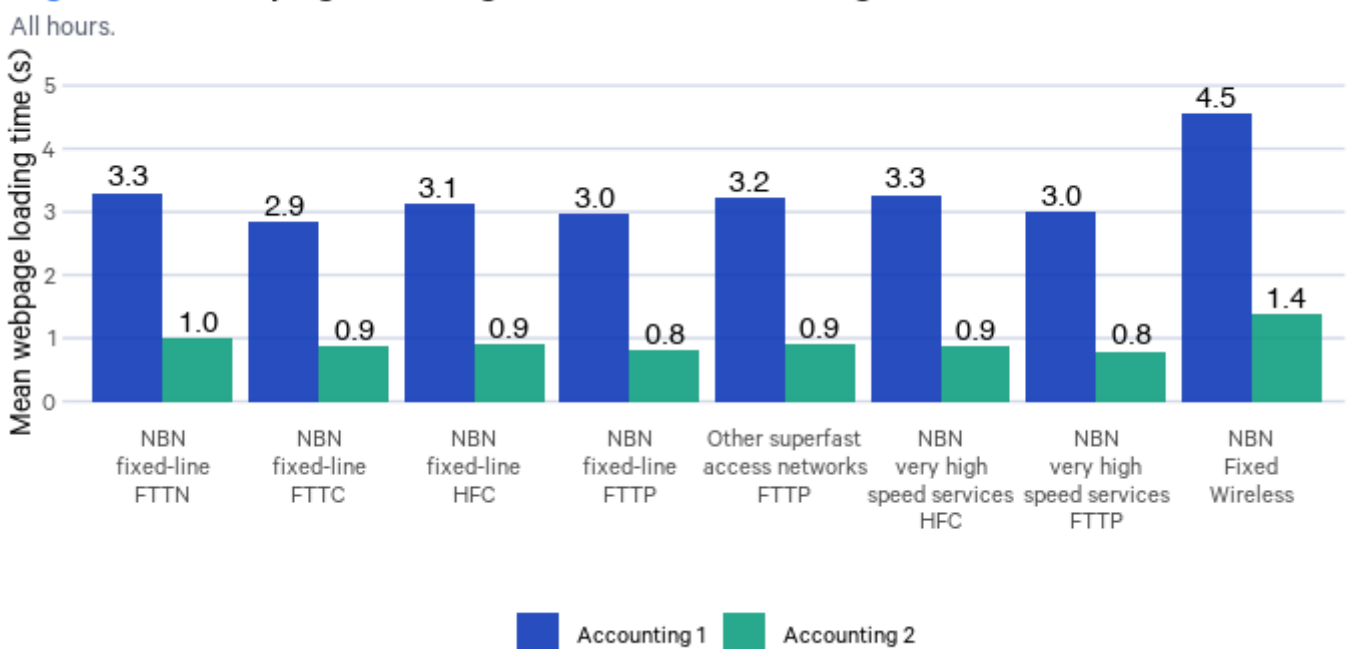
Accounting

The two accounting services shown in the first panel are commonly used in Australia and around the world. In both cases, the local (Australian) website was used for testing. The first service (Accounting 1) took significantly longer to load over all access technologies than the second service (Accounting 2). Loading the website of Accounting 1 required fetching about twice as many objects and downloading significantly more data in total than loading the website of Accounting 2.

Figure 19: Webpage loading times for CRM platforms

All hours.
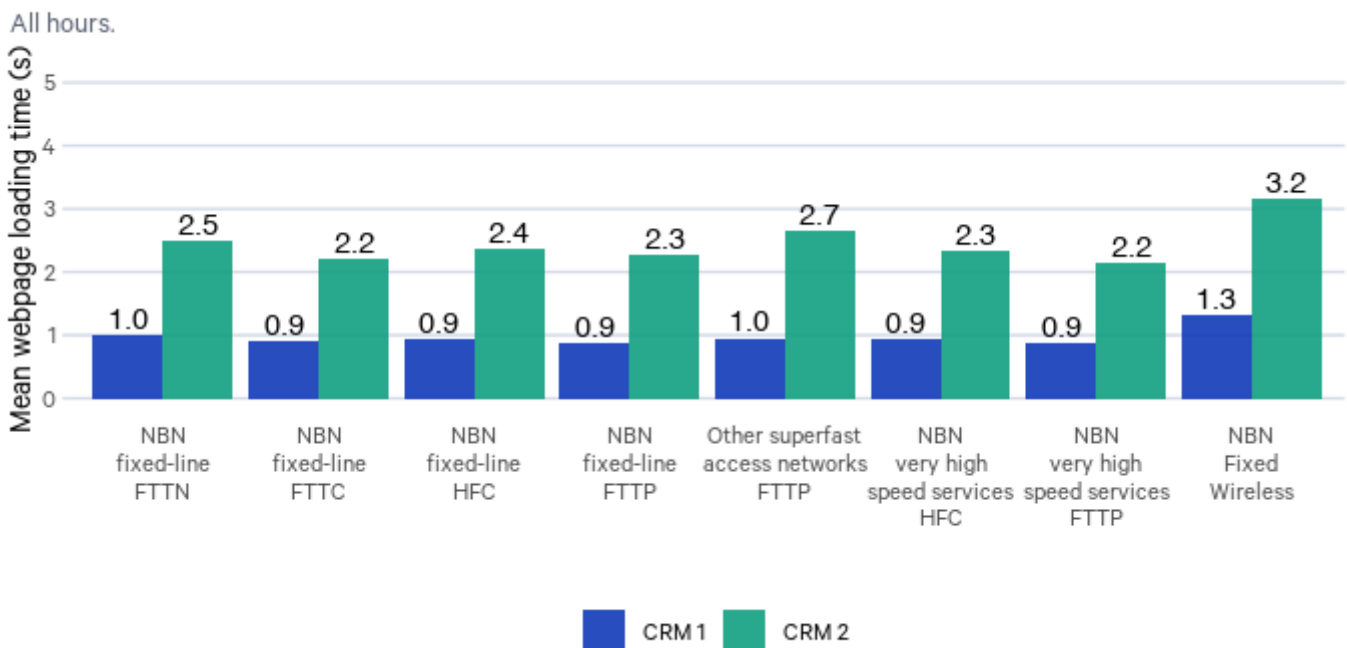
CRM platforms

The second panel shows the average webpage loading time for two CRM platforms that are available in Australia. CRM platforms help businesses to collate and organise customer data and streamline various processes (such as marketing campaigns). In both cases, a global (non-Australia-specific) website was used for testing, because users from Australia would be directed to these global sites. Although the second service (CRM 2) is more popular in Australia, the first one (CRM 1) loads somewhat faster over all access technologies. Loading the website of CRM 1 required fetching only a few objects, while loading CRM 2's website required fetching many more. However, the average size of the objects fetched were comparable between the two services and relatively low.

Figure 20: Webpage loading times for e-commerce platforms

All hours.
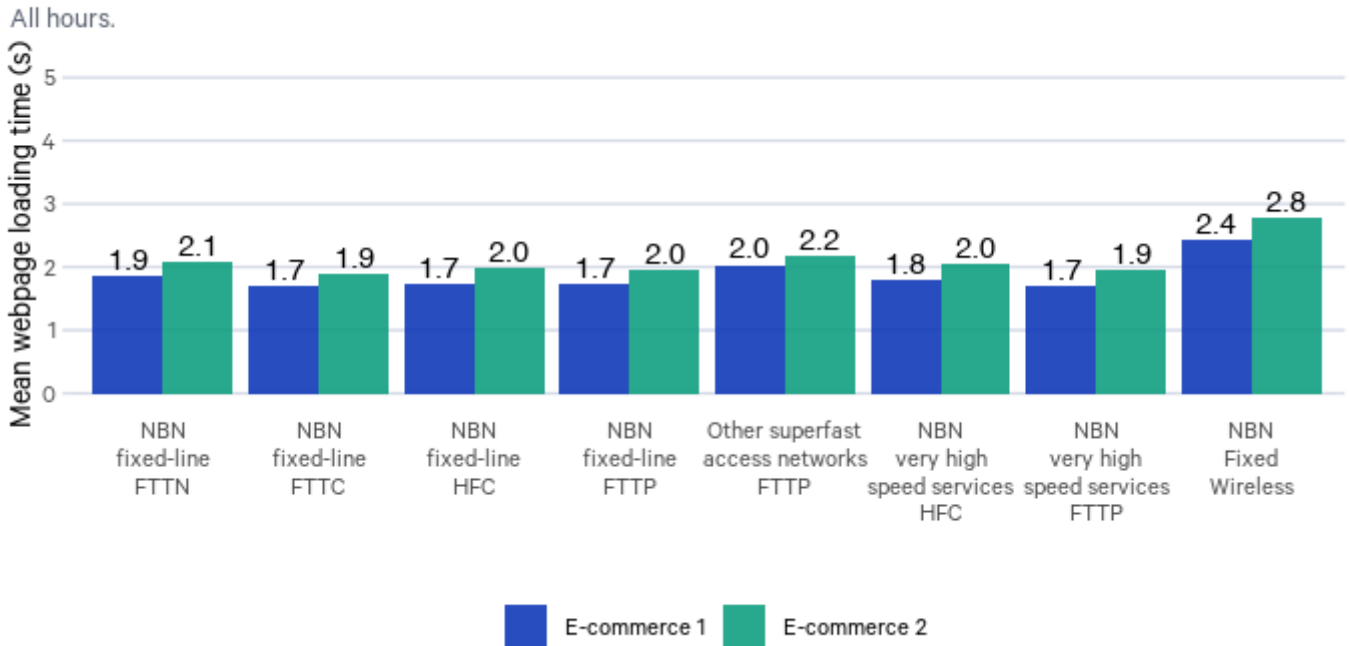
E-commerce platforms

The third panel shows the average webpage loading time for two e-commerce platforms that are extremely popular in Australia and around the world. In both cases, the local (Australian) website was used for testing. Both platforms take comparable time to load over all access technologies. Loading the website of E-commerce 1 required downloading a larger amount of data, but loading the website of E-commerce 2 required fetching about three times as many objects.

Figure 21: Webpage loading times for e-mail platforms

All hours.
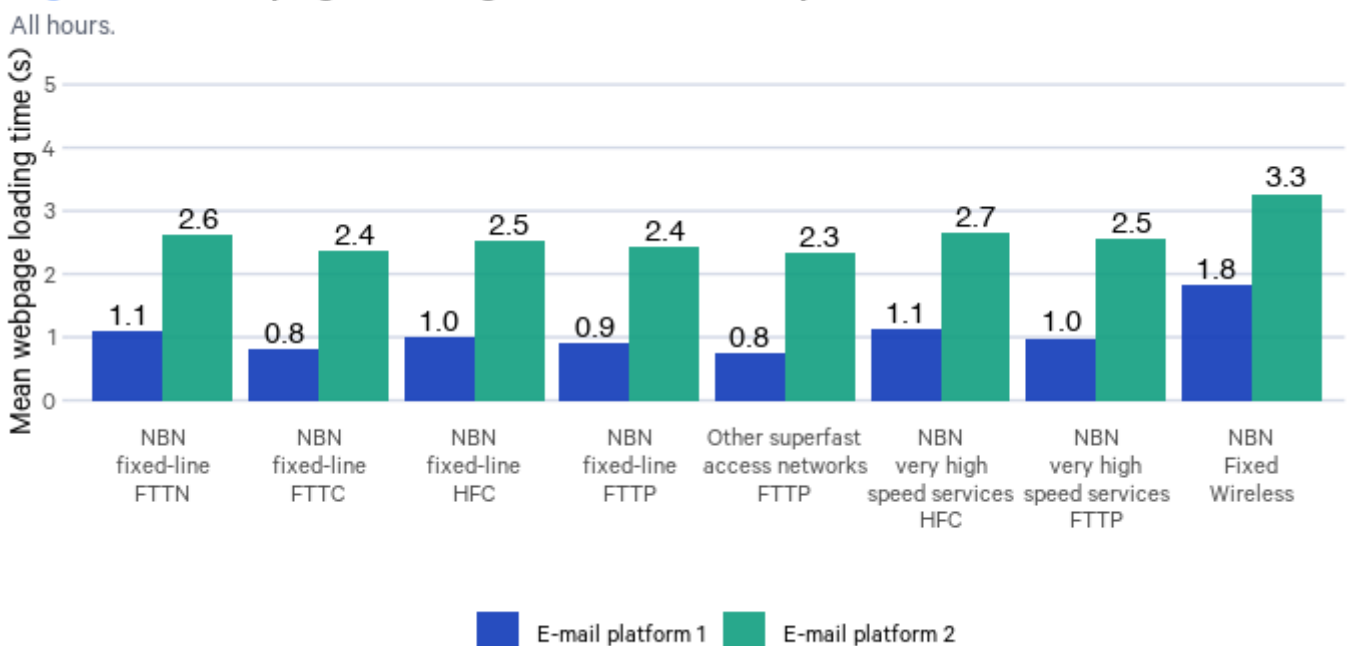
E-mail platforms

The two e-mail platforms shown in the fourth panel are commonly used in Australia and around the world. In both cases, a global (non-Australia-specific) website was used for testing, because users from Australia would be directed to these global sites. The second service (E-mail platform 2) takes somewhat longer to load over all access technologies than the first service (E-mail platform 1). For both platforms, loading the website required fetching the same, very small, number of objects. The total amount of data downloaded was also relatively small, though on average higher for E-mail platform 2.

The most important factors affecting webpage loading times (the location where the webpage is hosted, and the design and complexity of the webpage) depend on choices made by the business service providers. Webpage loading times are unlikely to be noticeably affected by the choice of RSP or plan download speed. While the above charts show that webpage loading times are marginally higher over fixed wireless than over fixed-line networks, the webpage loading times for all tested services and all types of connections were low enough that it would not adversely affect user experience.

Content delivery networks

A content delivery network (CDN) is a group of geographically distributed servers that speed up the delivery of web content by bringing it closer to where users are. Data centres across the globe use caching, a process that temporarily stores copies of files, so that users can access internet content from a web-enabled device or browser more quickly through a server near the user. For example, caching allows users to do things like watch a movie or download software, without having to wait for content to load from a remote server.

The largest CDN operators will place caches inside RSPs' networks so that traffic does not even need to leave the RSP's network. This is beneficial for both the RSPs (it reduces the load on their transit and peering links) and the CDN operators too (it spreads the content serving burden to a wider array of servers).

CDN tests were run to nine different CDNs during the measurement period. Figure 24 shows the median latency to various CDNs for NBN fixed-line services, split by RSPs. The latency here is defined as the time taken to establish a TCP connection with a cache.

Figure 22 shows that CDN 2 and CDN 9 had considerably worse results across all RSPs than the other seven CDNs. During the May 2023 measurement period, measurements targeting CDN 9 were directed to their servers in Singapore. While the majority of measurements targeting CDN 2 were directed to domestic servers, a non-negligible fraction of the tests were directed to CDN 2's servers in Japan. This is in line with the observation that, on average, connecting to CDN 9 took the longest, and CDN 2's average results are also higher than other CDNs.

Figure 22: Latency to CDNs

NBN fixed-line plans. All hours.