



# The Impacts of COVID-19 Response Measures on Australian Broadband Traffic on the **nbn**<sup>TM</sup> Network

---

January 2021

**nbn** Chief Technology Office





# Contents

---

|          |  |           |
|----------|--|-----------|
| <b>1</b> | <b>Synopsis</b>  | <b>4</b>  |
| <b>2</b> | <b>Introduction to NBN Co</b>  | <b>5</b>  |
| <b>3</b> | <b>Introduction to COVID-19 impacts on broadband network traffic</b> | <b>6</b>  |
| <b>4</b> | <b>Changes to nbn™ network traffic</b>                               | <b>8</b>  |
|          | 4.1 Network Utilisation  | 9         |
|          | 4.2 24-Hour Profile  | 10        |
|          | 4.3 Data Volume  | 13        |
|          | 4.4 Usage of Application Types                                       | 14        |
|          | 4.4.1 Volume Breakdowns  | 14        |
|          | 4.4.2 Daily Profiles   | 15        |
|          | 4.4.3 Application Session Numbers                                    | 16        |
| <b>5</b> | <b>Actions taken</b>   | <b>17</b> |
|          | 5.1 Analysis and Modelling   | 17        |
|          | 5.2 Industry Engagement  | 18        |
|          | 5.3 Capacity Management  | 19        |
|          | 5.4 Commercial response  | 19        |
| <b>6</b> | <b>Key insights</b>  | <b>20</b> |
| <b>7</b> | <b>Conclusion</b>  | <b>21</b> |

---



# Figures

|  |    |
|--|----|
| Figure 1. Downstream Network Utilisation                   | 9  |
| Figure 2. Upstream Network Utilisation                     | 10 |
| Figure 3. Downstream 24-Hour Profile                       | 11 |
| Figure 4. Upstream 24-Hour Profile                         | 12 |
| Figure 5. Average Weekly Data Download per Customer        | 13 |
| Figure 6. Average Usage Per Day by Application Type        | 14 |
| Figure 7. 24-Hour Profile for Real Time Communication      | 15 |
| Figure 8. 24-Hour Profile for Tunnelling and Remote Access | 15 |
| Figure 9. 24-Hour Profile for Media Streaming              | 16 |
| Figure 10. Application Sessions Growth                     | 16 |

## Disclaimer

This document is provided for information purposes only. This document is subject to the information classification set out on this page. If no information classification has been included, this document must be treated as 'nbn-Confidential: Commercial' and must not be disclosed other than with the consent of NBN Co. The recipient (including third parties) must make and rely on their own inquiries as to the currency, accuracy and completeness of the information contained herein and must not use this document other than with the consent of NBN Co.

Copyright © 2021 nbn co limited. All rights reserved.



## Synopsis

This paper analyses changes in broadband network traffic on the **nbn**<sup>™</sup> network during the initial stages of the COVID-19 pandemic response in Australia through March, April and May 2020. Drawing on NBN Co's unique role as a wholesale-only, open access network operator, it highlights strategies employed to manage demand and insights to help inform future industry responses.

Following its identification in December 2019, COVID-19 was declared a Public Health Emergency of International Concern in January 2020, and a pandemic in March 2020. Various governments around the world began implementing mandated or recommended social distancing or lockdown measures during this period.

As the operator of Australia's national wholesale broadband access network, NBN Co paid close attention to the developing situation, understanding the role it would need to play to support increased demand from homes and businesses for fast and reliable broadband.

The paper provides insight into changes in consumer behaviour and related changes in **nbn**<sup>™</sup> network traffic volume and distribution that resulted from, among other things, the implementation and changes in stringency of social distancing and lockdown measures. To this end, NBN Co utilised the **COVID-19: Government Response Stringency Index**<sup>1</sup>, which records and scales the number and strictness of government policies including school closures, workplace closures, and travel bans.

The paper also outlines some of the actions taken by NBN Co and industry to help manage a surge in broadband network traffic volume and changes to traffic profile over the three-month analysis period. NBN Co hopes these insights can be of benefit to industry in learning from the COVID-19 experience and to prepare for potential future events both in Australia and globally.



<sup>1</sup> COVID-19: Government Response Stringency Index, **Our World in Data**, <https://ourworldindata.org/grapher/covid-stringency-index>, April 2020



## Introduction to NBN Co

NBN Co was established in 2009 to design, build and operate Australia's wholesale broadband access network. Underpinned by a purpose to lift the digital capability of Australia, the company's key objective is to ensure all Australians have access to fast broadband at affordable prices, and at least cost.

To achieve this objective, NBN Co has been structured as a wholesale-only, open-access broadband network. The Company provides broadband services on its local access network on equivalent terms to retail phone and internet providers. This is intended to level the retailer playing field in Australian telecommunications, helping to create real and vibrant competition within the industry and providing choice for consumers.

Since establishment, the Government has presented NBN Co's mandate through a Statement of Expectations (SoE) which is supplemented from time to time by policy directives and correspondence. NBN Co's current objectives are set out in the 24 August 2016 SoE.

NBN Co is wholly owned by the Commonwealth of Australia as a Government Business Enterprise (GBE), incorporated under the Corporations Act 2001 and operated in accordance with the Public Governance, Performance and Accountability Act 2013 (PGPA Act).

**For more information about NBN Co please visit:**  
[nbn.com.au](http://nbn.com.au)



## Introduction to COVID-19 impacts on broadband network traffic

Following its first identification in December 2019, COVID-19 was declared a Public Health Emergency of International Concern in January 2020, and a pandemic in March 2020. Various governments around the world began implementing mandated or recommended social distancing or lockdown measures during this period.

Australia's first case of COVID-19 was confirmed on 25 January 2020. In-bound travel restrictions were subsequently introduced for a number of international locations and several large public events cancelled. In late February and early March, many Australian businesses began encouraging their employees to work from home and some schools closed to focus on learning from home. NBN Co itself conducted a remote working test of its national workforce to help plan business continuity in the case of a subsequent decision to close offices.

During March, Commonwealth, State and Territory Governments implemented a range of social distancing measures, including the closure of public spaces, limitation of public gatherings and isolation requirements for international arrivals.

Throughout this early period of 2020, NBN Co technical and engineering teams began exploring the potential impacts of social distancing measures on Australian broadband network traffic. This included engagement with various international peers as well as analysis and modelling of potential scenarios to help design and implement a management plan.

Early engagement with international peers highlighted an increase in network utilisation when social distancing measures or lockdowns were implemented. The increases in evening busy hours traffic varied significantly, ranging from 14 per cent to 45 per cent against applicable baselines, noting that different dates/durations were used between different peer operators. These peak growth rates were also observed through Nokia Deepfield analysis, which reported peak ranges of 20 per cent to 40 per cent<sup>2</sup> and Cloudflare with peak ranges of 30 per cent to 50 per cent<sup>3</sup>.

Peer discussions revealed a high correlation of increased network utilisation with more stringent isolation measures. Countries such as New Zealand, USA and Spain, which moved into more stringent lockdown measures, experienced higher network utilisation levels, each having measured growth in their busy hour traffic of more than 30 per cent.

Analysis of international experience revealed three different phases of traffic volume change with the level of impact and duration of each phase dependant on the length and stringency of the social distancing or lockdown measures in place.

<sup>2</sup> Craig Labovitz, 'Early effects of COVID-19 lockdowns on service provider networks: the networks soldier on!', Nokia Blog, <https://www.nokia.com/blog/early-effects-covid-19-lockdowns-service-provider-networks-networks-soldier/>, March 2020

<sup>3</sup> John Graham-Cumming, 'Internet performance during the COVID-19 emergency', Cloudflare Blog, <https://blog.cloudflare.com/recent-trends-in-internet-traffic/>, April 2020



## Phase 1: Sudden Increase

- Once a city or region implemented social distancing or lockdown measures, there was a sudden increase in network utilisation from that point in time.
- The size of this impact was correlated to the stringency of measures implemented. This can be seen through the strict lockdown measures of Milan Internet Exchange reaching 40 per cent Busy Hour peak traffic increase<sup>4</sup>, when compared to Bulgaria Internet Exchange, where less stringent measures resulted in a 4 per cent to 14 per cent Busy Hour peak traffic increase<sup>5</sup>.
- Other international operators reported slight increases in utilisation ahead of the sudden increase, which was reflective of businesses implementing work from home arrangements ahead of official city and region lockdown measures, although this initial increase was minimal.

## Phase 2: Plateau / Stabilisation

- When social distancing or lockdown measures remained constant, some operators reported a slight decline in downstream network traffic following the initial sudden increase. The fall tended to occur a few days after the implementation of official social distancing or lockdown measures.
- If the official lockdown measures remained constant for a few weeks, network utilisation began to plateau and stabilise at a new high network utilisation level<sup>6,7,8</sup>.

<sup>4</sup> 'Statistics', Mix-it, <https://www.mix-it.net/en/statistiche/>, March 2020

<sup>5</sup> 'Bulgarian Statistics', B-IX, <https://b-ix.net/statistics/>, March 2020

<sup>6</sup> 'COVID-19 Network Update', COMCAST, <https://corporate.comcast.com/covid-19/network>, March 2020

<sup>7</sup> 'BEREC Summary Report on the status of internet capacity in light of the Covid-19 crisis', BEREC,

[https://berec.europa.eu/eng/document\\_register/subject\\_matter/berec-reports/9253-berec-summary-report-on-the-status-of-internet-capacity-in-light-of-the-covid-19-crisis](https://berec.europa.eu/eng/document_register/subject_matter/berec-reports/9253-berec-summary-report-on-the-status-of-internet-capacity-in-light-of-the-covid-19-crisis), April 2020

<sup>8</sup> 'COVID-19 broadband usage starts to plateau—OpenVault', Fierce Telecom, [https://www.fiercetelecom.com/telecom/covid-19-broadband-usage-starts-to-plateau-openvault?utm\\_source=internal&utm\\_medium=rss](https://www.fiercetelecom.com/telecom/covid-19-broadband-usage-starts-to-plateau-openvault?utm_source=internal&utm_medium=rss), April 2020

<sup>9</sup> 'BEREC Summary Report on the status of internet capacity in light of the Covid-19 crisis', BEREC,

[https://berec.europa.eu/eng/document\\_register/subject\\_matter/berec-reports/9253-berec-summary-report-on-the-status-of-internet-capacity-in-light-of-the-covid-19-crisis](https://berec.europa.eu/eng/document_register/subject_matter/berec-reports/9253-berec-summary-report-on-the-status-of-internet-capacity-in-light-of-the-covid-19-crisis), April 2020

<sup>10</sup> ibid

<sup>11</sup> 'Statistics', Mix-it, <https://www.mix-it.net/en/statistiche/>, March 2020

<sup>12</sup> 'De-CIX Frankfurt Statistics', De-CIX, <https://www.de-cix.net/en/locations/germany/frankfurt/statistics>, March 2020

## Phase 3: Varying Rate of Decline

- As social distancing or lockdown measures were eased or removed, operators began to see a decrease in network utilisation<sup>9</sup>.
- The rate of the decline was aligned with the extent that measures were eased as well as the level of compliance within a population<sup>10</sup>.
- Milan Internet Exchange reported a considerable and rapid decrease when initial tough and extended lockdown laws were lifted. A decrease of 22 per cent in peak network utilisation was observed just days after measures were relaxed on the 4 May.<sup>11</sup>
- Frankfurt Internet Exchange demonstrated a slow decline in traffic as measures were eased, albeit at a slower rate than Milan and from a less strict starting point. Over a two-month period, Frankfurt experienced a slow decrease of around 13 per cent over the two months of April to May, with intermittent spikes of high usage<sup>12</sup>.





## Changes to nbn™ network traffic

This paper analyses changes in nbn™ network traffic resulting from the initial stages of the COVID-19 pandemic response in Australia through March, April and May 2020. As such, the analysis measures against a baseline dataset taken across the last week of February 2020 (24 February - 1 March).

The following section explores the impact of social distancing measures and changing customer behaviour as more Australians relied on their broadband connection to maintain work and school, to connect with family and friends, and to access online entertainment from home. As such it relies on the **COVID-19: Government Response Stringency Index**<sup>13</sup>, which records and scales the number and strictness of government policies including school closures, workplace closures, and travel bans.

These changes had demonstrable impacts on nbn™ network utilisation, including substantial peaks in downstream and upstream utilisation, as well as changes to the 24-hour usage profile with substantial growth during the day, growth in data volume, and changes to application usage.

It should be noted that changes in network traffic, while certainly influenced by changed behaviour resulting from social distancing restrictions, were also influenced by organic increased use by existing NBN Co customers, as well as seasonal factors and the addition of 430,000 new customers to the network during the analysis period. Additionally, data volume was moderated by the voluntary bitrate measures implemented by video streaming providers (See section 5.2).

Despite additional customer demand, the nbn™ network performed well throughout the period. In August 2020, broadband monitoring company cable.co.uk released analysis<sup>14</sup> based on over 364 million broadband speed tests that showed an average drop in speed of 6.38 per cent across 114 countries with social distancing and lockdown measures in place. Australia was shown as one of only a small number of countries that improved its internet speed, with a gain of 5.3 per cent.

<sup>13</sup> COVID-19: Government Response Stringency Index, Our World in Data, [www.ourworldindata.org/grapher/covid-stringency-index](https://www.ourworldindata.org/grapher/covid-stringency-index), April 2020

<sup>14</sup> How global broadband speeds changed during COVID-19 lockdown periods, cable.co.uk, [www.cable.co.uk/broadband/speed/broadband-speeds-covid-19-lockdown](https://www.cable.co.uk/broadband/speed/broadband-speeds-covid-19-lockdown), 4 August 2020





## 4.1 Network Utilisation

Substantial changes in **nbn**™ network utilisation (throughput) were observed for the three-month analysis period compared to the late February baseline. Changes become more pronounced in the second half of March, following the implementation of formal social distancing measures.

Figure 1 and Figure 2 show a 90-day view of peak and average network utilisation for downstream and upstream. For comparison, each graph includes a forecast natural average growth indicator. It should be noted that network utilisation growth is also impacted by the addition of around 430,000 new customers to the network throughout the analysis period as well as organic data growth across the customer base.

For both downstream and upstream, we observed a number of all-time peaks throughout the analysis period, impacted by changed customer behaviour related to social distancing, as well as the scheduled release of major online game updates.

For downstream, we observed increases of 5 per cent to 20 per cent in peak utilisation when compared to the late February baseline peak utilisation of 11.05 terabits per second (Tbps). The network recorded a high utilisation of 14.56 Tbps on the 19 May driven by a game update with file size between around -40GB to 60GB (depending on gaming platform). This represented a 32 per cent increase from the February baseline or -14 per cent increase above previous the week.

### Downstream Throughput 90-day View

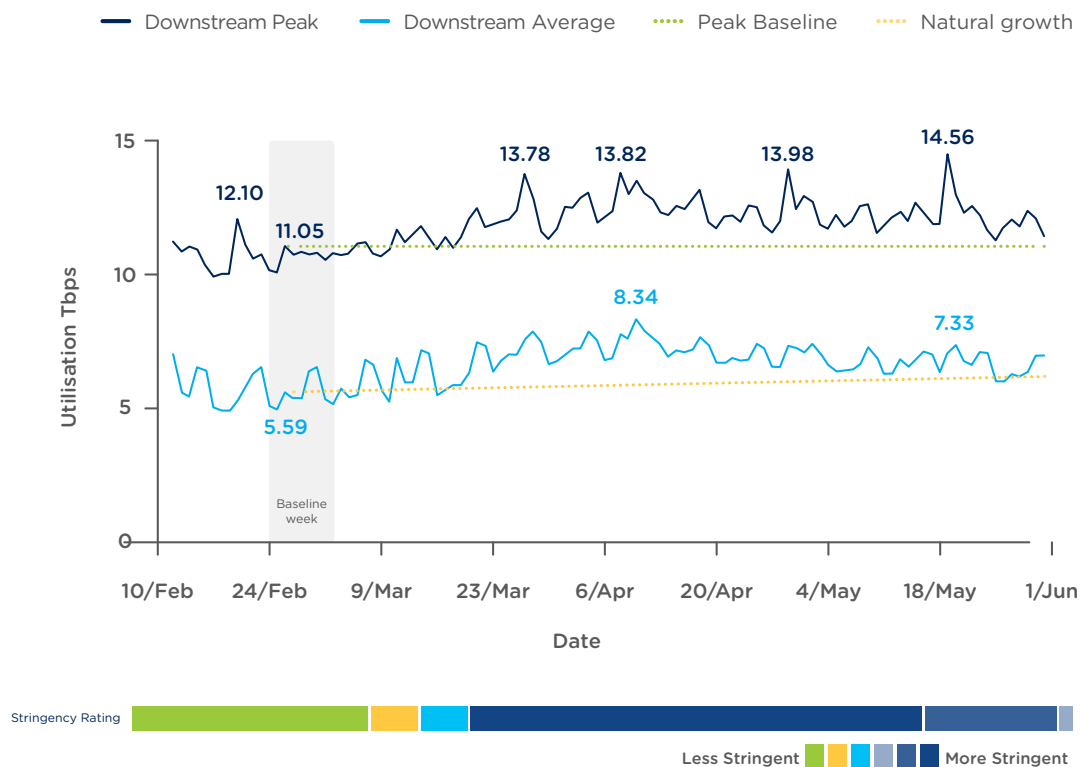


Figure 1. Downstream Network Utilisation



For upstream, we observed a surge beginning from the week of the 16 March, aligned with the implementation of formal social distancing measures, including requests that people work from home if they were performing non-essential services and subsequent school closures. The upstream demonstrated increases of 20 per cent to 70 per cent in peak utilisation when comparing to the late February baseline peak utilisation of 0.77Tbps. The network recorded a high upstream utilisation of 1.07Tbps on multiple dates in late March and early April.

### Upstream Throughput 90-day View

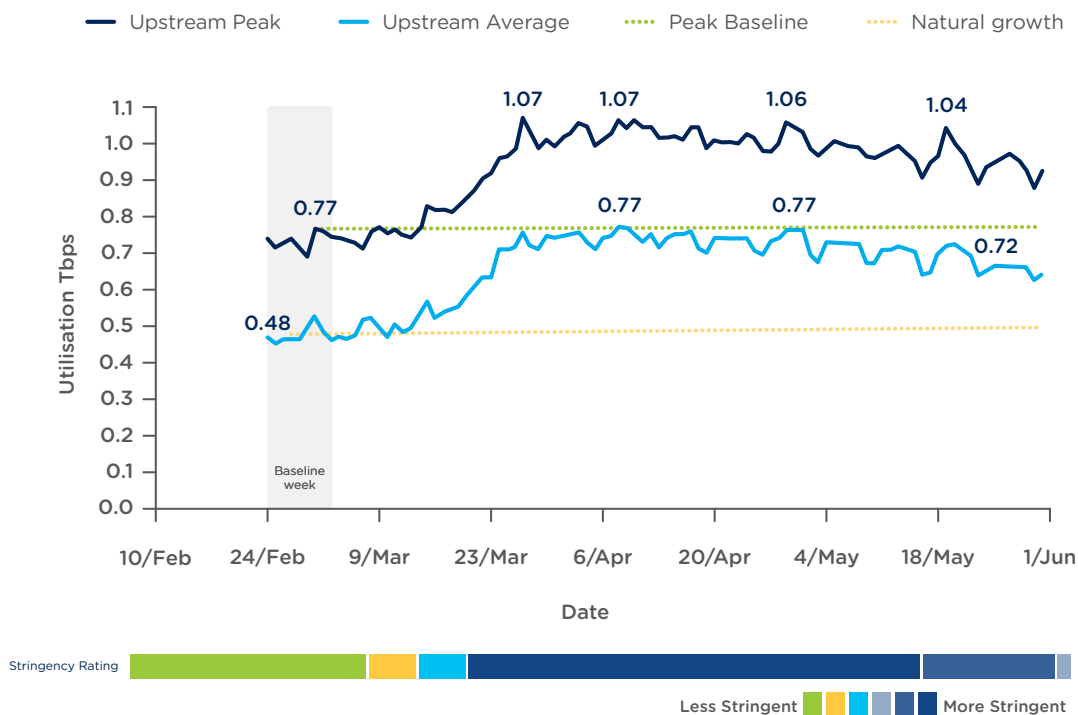


Figure 2. Upstream Network Utilisation

Since the last all-time downstream peak (20 February 2020: 12.10Tbps) the network surpassed this figure ~41 times (45 per cent of days) over the months of March, April and May. For the upstream, using February’s baseline max (23 February 2020: 0.77 Tbps), this number was exceeded ~79 times (87 per cent of days) over the same period.

Consistent with experience reported by international peers, as the period of lockdown continued nbn™ network usage began to plateau into a new normalised range which can be seen on both 90-day view (Figure 1 and Figure 2).

### 4.2 24-Hour Profile

Our analysis has shown substantial change to the 24-hour traffic profile of the nbn™ network, reflecting changes to consumer behaviour and demand, as observed by international peers. Compared to the late February baseline, the 24-hour profile for downstream showed a most marked change during Business Hours (8am to 4:59pm), while upstream showed a pronounced increase in utilisation throughout the Business Hours (8am to 4:59pm), Early Evening Hours (5pm to 7:59pm) and Busy Evening Hours (8pm to 11:59pm) periods of the day.

As a whole, the observations indicated a trend towards a 24-hour profile more resembling a typical ‘weekend profile’, with higher utilisation rates throughout the day when compared to a pre-baseline weekday, as described on page 11 in Figure 3.



## Downstream Throughput

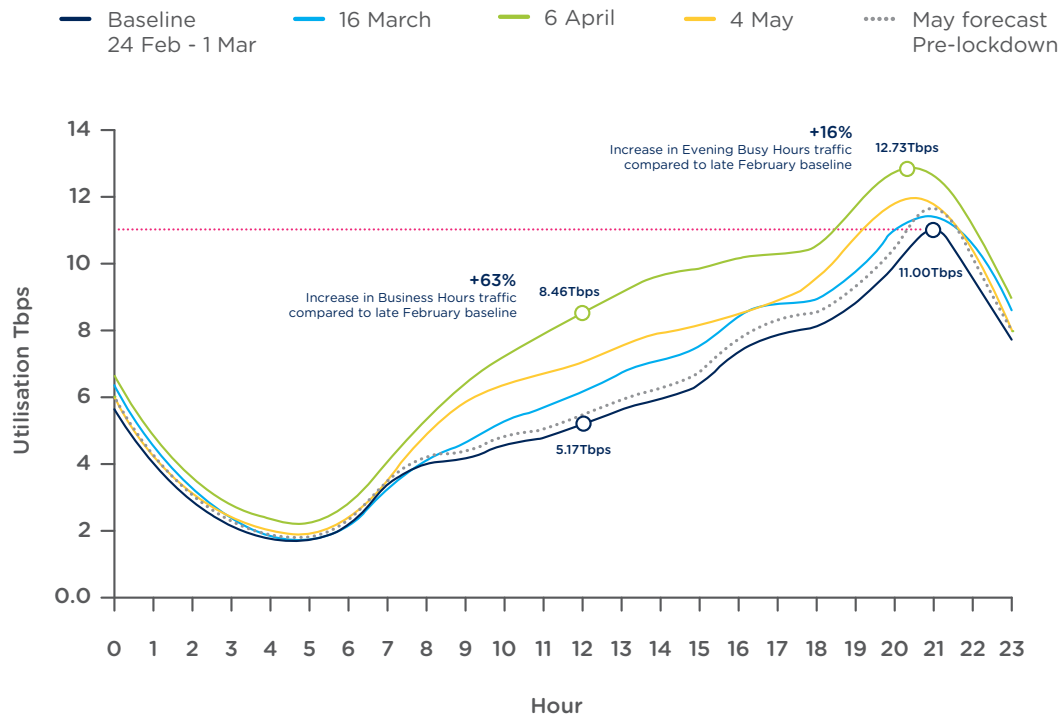


Figure 3. Downstream 24-hour Profile

Figure 3 provides several key observations about changes to the 24-hour profile for downstream utilisation:

- Business Hours downstream utilisation increased to a peak of 64 per cent above the baseline for the week of 6 April. Growth increases over baseline for Business Hours ranged from 20 per cent to 70 per cent during the months of March and April, and began to decline in May.
- Utilisation in the Evening Busy Hours was 16 per cent above baseline for the week of 6 April, with typical increases of 5 per cent to 20 per cent during the analysis period.
- Evening Busy Hours utilisation tended to peak earlier in the evening during the analysis period. The **nbn™** network Evening Busy Hours is defined from 8pm to 11:59pm, with the usual peak utilisation occurring between 9-10pm, however during the analysis period we observed traffic increases usually associated with this period begin to appear up to 60 minutes earlier.
- We also observed a ‘fattening’ of the profile at the beginning and end of the day, with recognisable lifts in downstream utilisation starting earlier in the morning and remaining later into the night during the analysis period compared to the baseline.
- The graph also compares NBN Co’s pre-COVID-19 May forecast to the actual for the first week of May 2020. The forecast represented by the ‘dotted line’ shows a 5.3 per cent forecasted growth. Utilisation was higher than projected rate by a magnitude of ~3x (for week of 4 May), noting that growth can also be attributed to organic increased use by existing customers, as well as seasonal factors and the addition of 430,000 new customers to the network during the analysis period.



## UpstreamThroughput

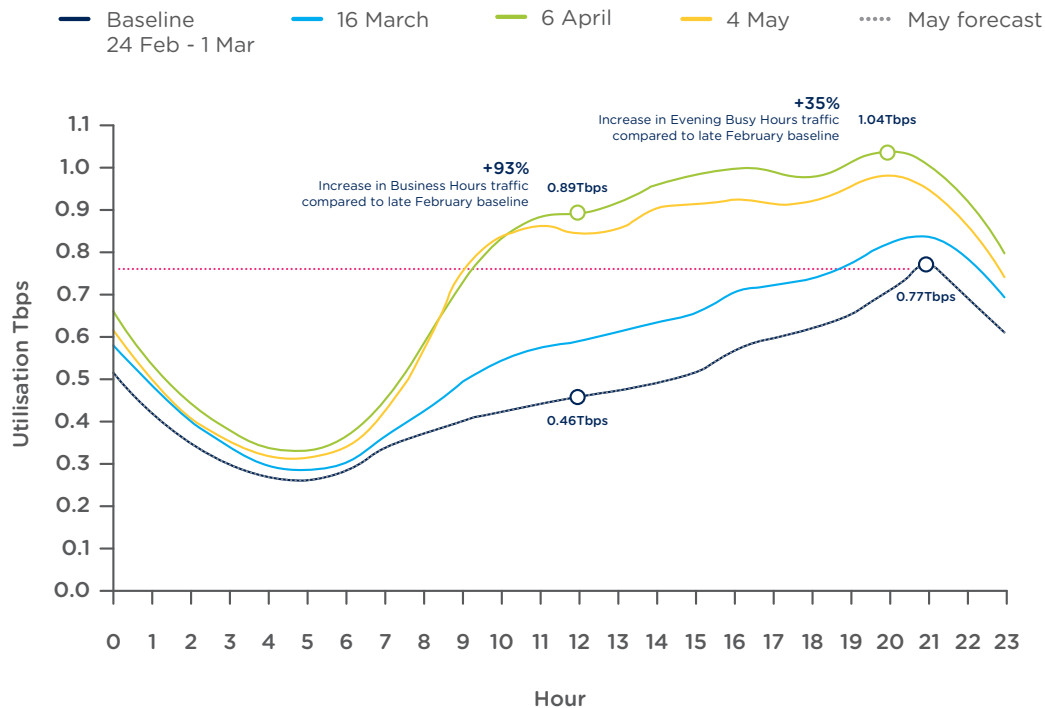


Figure 4. Upstream 24-hour Profile

Figure 4 provides several key observations about changes to the 24-hour profile for upstream utilisation:

- Higher upstream utilisation was observed earlier in the day and sustained consistently throughout the day. Upstream utilisation increased to a peak of 93 per cent above the baseline for the Business Hours during the week of 6 April. Business Hours upstream utilisation increases were typically in a range of 40 per cent to 110 per cent over baseline during the analysis period.
- Growth was also observed during the Evening Busy Hours, with a 35 per cent increase during the week of 6 April, with typical increases of 10 per cent to 35 per cent during the analysis period.
- During this period the upstream experienced a shift in peak utilisation within the Evening Busy Hours period, with the traditional peak between 9pm and 10pm occurring earlier between 8pm and 9pm during the analysis period.
- Some days saw a dramatic shift in the timing of peak utilisation, in some cases the peak occurring in the Business Hours between 2pm to 4pm instead of its traditional Evening Busy Hours period. This change was attributed to the large increase in the utilisation of video-conferencing applications.



### 4.3 Data Volume

The nbn™ network recorded a general increase in data downloaded over the analysis period, however average weekly volumes fluctuated week to week and peaked with a total of ~83GB in the week of 6 April. Our analysis shows increased network data volumes as social distancing measures were implemented in March, noting that there were school and public holiday periods throughout April when demand typically trends higher. Overall for the three month analysis period, data volume increased around 8 per cent over the February baseline.

Between the baseline week and the week of 6 April, average weekly data volumes increased 32 per cent, however this declined by 18 per cent through to the week of 25 May. This reduction can be attributed in part to seasonality and the end of school and public holiday periods, as well the voluntary bitrate measures implemented by video streaming providers (See section 5.2).

Figure 5 shows the correlation between increased usage and increasing social distancing and lockdown measures as drawn from the Stringency Index<sup>15</sup>, which records and scales the number and strictness of government policies including school closures, workplace closures, and travel bans. There was a step change data volume in the week of 16 March when Australian Commonwealth, State and Territory Governments began implementing a range of social distancing measures, including the closure of public spaces, limitation of public gatherings and isolation requirements for international arrivals.

### Average Downloaded Per Customer Per Week

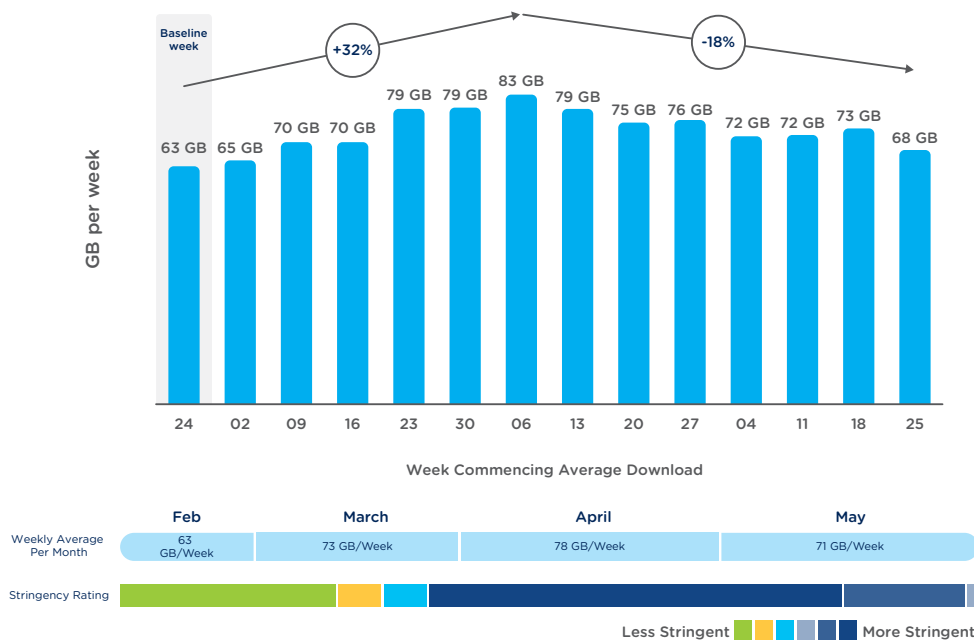


Figure 5. Average Weekly Data Download Per Customer

<sup>15</sup> COVID-19: Government Response Stringency Index, Our World in Data, <https://ourworldindata.org/grapher/covid-stringency-index> April 2020



## 4.4 Usage of Application Types

This section provides analysis of how different application types drove changes in network traffic.

Our analysis separates average per customer daily data download volume into ten top application groups, providing insight for each of March, April and May against a February baseline. Average daily data volumes grew for each month compared to the February baseline of 9.8GB. There was an 8 per cent increase to 10.6GB in March, 14 per cent growth to 10.6GB in April and 1 per cent increase to 9.9GB in May.

For the period, we observed that a few key application types contributed the majority of growth. Our analysis also identified changes in consumer behaviour with application in use either for longer durations, more often or at different periods throughout the day. The following analysis was conducted on a sample of approximately 2,000 connections across different nbn™ access technologies and geographic locations across the period February to May 2020.

### 4.4.1 Volume Breakdowns

Our analysis separates average per customer daily data download volume into ten top application groups, providing insight for each of March, April and May against a February baseline. Average daily data volumes grew for each month compared to the February baseline of 9.8GB. There was an 8 per cent increase to 10.6GB in March, 14 per cent growth to 10.6GB in April and 1 per cent increase to 9.9GB in May.

Most significant changes during the analysis period were observed in Realtime Communication (up 154 per cent in April), Tunnelling and Remote Access (up 74 per cent in April), Business Applications (up 50 per cent in April and May) and Gaming (up 51 per cent in April).

From a total volume perspective, the top three application types - Multimedia Streaming, Web and Tunnelling and Remote Access - were consistent across the three months. It is important to note that declined volumes attributable to Multimedia Streaming are attributable in part to seasonality and the end of school and public holiday periods, as well the voluntary bitrate measures implemented by video streaming providers. (See section 5.2).

In line with historical trends, volume attributable to the Social Networking application type declined over the analysis period, while Gaming was the only application type that registered a rise in volume rankings, moving from 5<sup>th</sup> to 4<sup>th</sup> position.

### Average Usage Per End-user Per Day

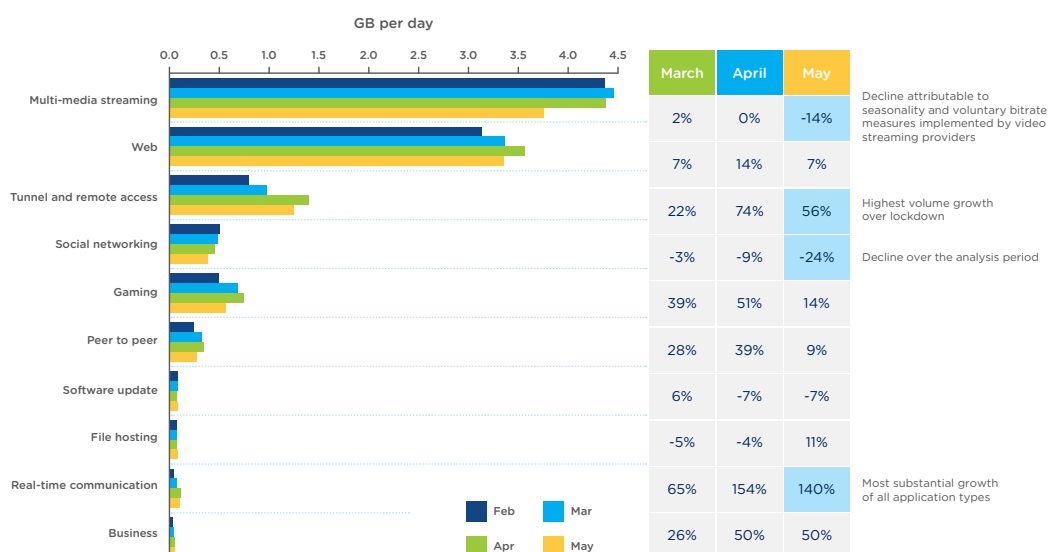


Figure 6. Average Usage Per Day By Application Type<sup>16</sup>

16 Analysis based on a sample size of ~2,600 customers on the nbn™ network



### 4.4.2 Daily Profiles

The following section analyses changes in the use of different application types across a 24-hour period and as such demonstrates substantial changes in the daily usage profiles. Figure 10 and 11 present the normalised aggregated network utilisation by month for the application groups of Realtime Communications, Tunnelling and Remote Access and Media Streaming.

The analysis for Realtime Communication and Tunnelling and Remote Access highlight significant increased use during the Business Hours and into the Early Evening Hours and Evening Busy Hours periods. The daily profile for Media Streaming remained generally in line with the February baseline with some increase during the Business Hours, particularly in April, and the Evening Busy Hours tending to earlier in the evening.

### Real Time Communication

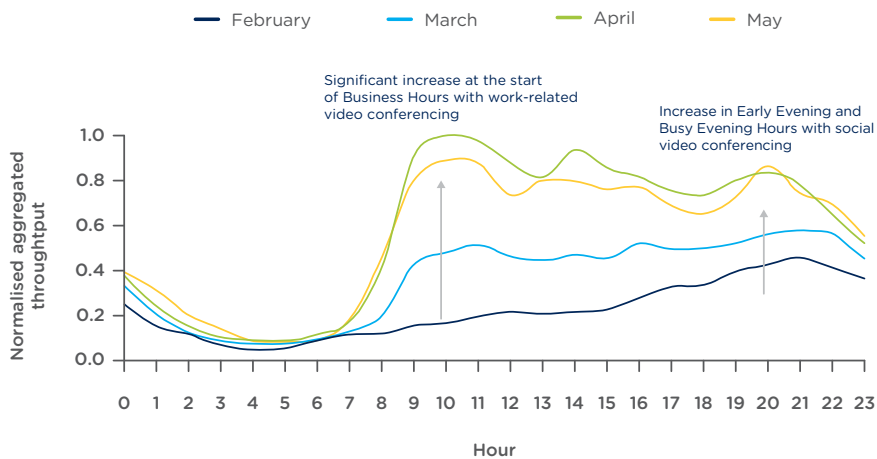


Figure 7. 24-hour Profile For Real Time Communication

### Tunnel And Remote Access

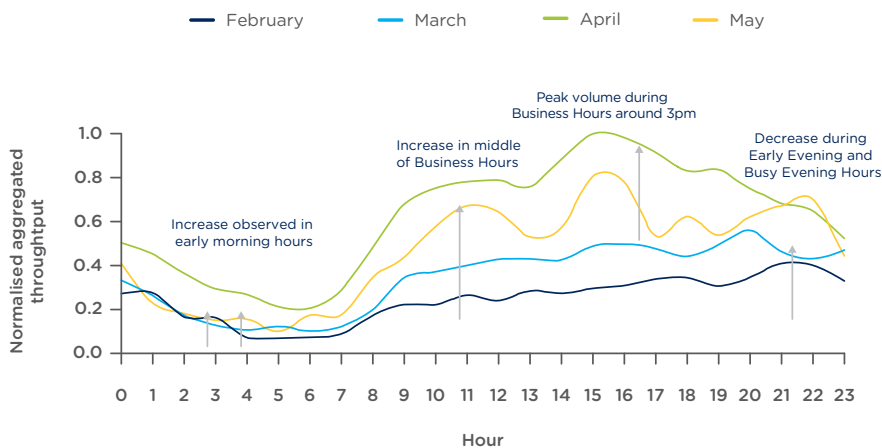


Figure 8. 24-hour Profile For Tunneling And Remote Access

## Media Streaming

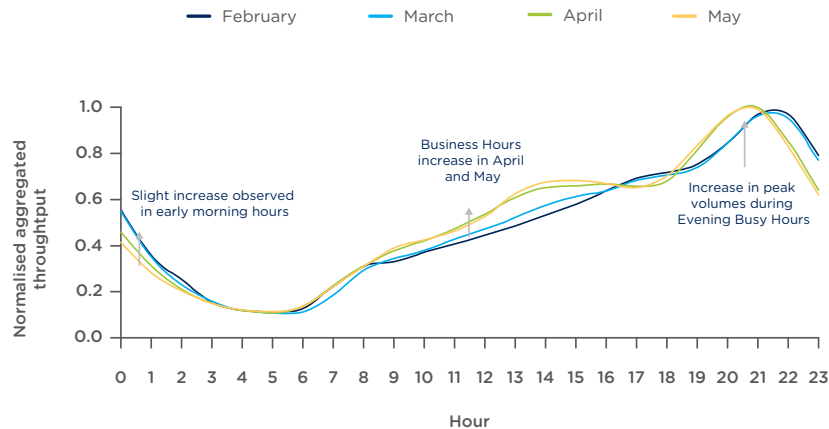


Figure 9. 24-hour Profile For Media Streaming

### 4.4.3 Application Type Session Numbers

The following analysis provides additional insight into the influence of social distancing measures on consumer behaviour by examining the number of sessions for different application groups. Figure demonstrates changes in the daily sessions total for Realtime Communications, Tunnelling and Remote Access, Media Streaming and Web compared to the February baseline.

The analysis shows changes in the number of sessions generally consistent with the implementation and easing of social distancing measures. For example, sessions for Realtime Communications generally increased through March and April before declining in line with the easing of official social distancing requirements in Queensland and New South Wales on 11 May<sup>17</sup>. Most application types analysed demonstrated an increase in sessions of between 25 per cent - 65 per cent over the baseline over the analysis period.

Our analysis suggests that the spike in Tunnelling and Remote Access on 18 May was aligned with a major online game update.

## Overall Application Group Session: % Change Against Baseline

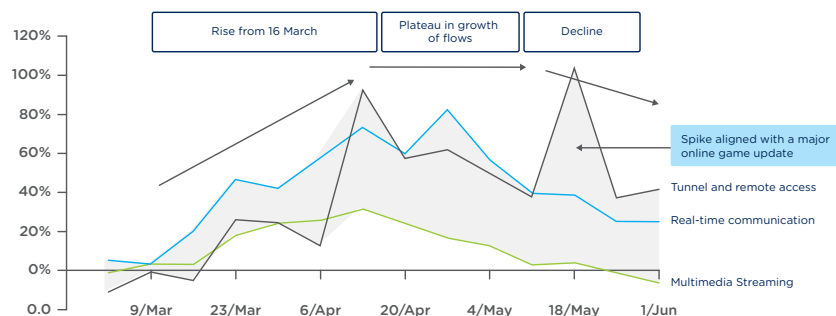


Figure 10. Application Sessions Growth

<sup>17</sup> 'Australia's coronavirus lockdown - the first 50 days', The Guardian, May 2020, [www.theguardian.com/world/2020/may/02/australias-coronavirus-lockdown-the-first-50-days](https://www.theguardian.com/world/2020/may/02/australias-coronavirus-lockdown-the-first-50-days)





## Actions Taken

Anticipating changes to consumer behaviour and increased demand aligned with the implementation of social distancing and lockdowns, NBN Co was keen to help ensure network reliability and maintain levels of customer experience expected of the network. To that end, technical and management teams took a number of proactive steps to manage changes, including analysis and modelling of potential impacts and actions, industry engagement, capacity management and commercial response.

### 5.1 Analysis and Modelling

Throughout the early period of 2020, NBN Co technical and engineering teams began exploring the potential impacts of social distancing measures on Australian broadband network traffic. This included engagement with various international peers as well as analysis and modelling of potential scenarios to help design and implement a management plan.

Based on international feedback, teams focussed on key aspects of the daily traffic profile, including:

- an anticipated increase in downstream peak (typically at 9pm at night)
- an anticipated increase in the downstream traffic during the day as workers moved from offices to homes to conduct business and increased their use of online collaboration tools
- an anticipated impact on upstream traffic with increases due to video conferencing and collaboration tools

The results of this analysis were used internally to enable capacity planners to prepare for the predicted changes and also shared with Retail Service Providers (RSPs).



## 5.2 Industry Engagement

Recognising the broader ecosystem context of supporting customer experience, NBN Co worked with the telecommunications industry to encourage information-sharing and collaboration. Discussions were facilitated through four key industry forums designed to enable rapid decision-making and rapid collaborative responses to support customer experience with the ultimate goal to keep Australians connected and productive throughout the pandemic.

- **Special Working Group**

Established in consultation with industry at the request of the Minister for Communications, Cyber Safety and the Arts for the purpose of information gathering and sharing, and coordination across industry. The Special Working Group was comprised of major telecommunications service providers and chaired by NBN Co with the remit to share relevant information and discuss emerging engineering, security or operational issues in relation to COVID-19. The Special Working Group played a key role in assessing demand, evaluating potential responses and aligning their implementation across industry players.

- **Streaming Provider Forum**

Comprising international and national streaming service providers, the forum provided a platform for the discussion and consideration of how Streaming services could support and assist in the management of increased network loads and the maintenance of customer experience. NBN Co provided insights into overall traffic increases observed on the network, helping to enable streaming providers to make informed decisions about measures they implemented. Participants in the Streaming Provider Forum implemented a number of actions which supported the forum's goals in a timely manner. Their actions consisted of either: defaulting videos to SD, removing UHD bitrate, lowering bitrates or implementing CODEC reconfiguration. It was estimated by forum participants that without these measures, traffic peaks may have been up to 10 per cent higher during the analysis period. Note: similar actions were implemented in Europe, where the EU Internal Market Commissioner Thierry Breton called on streaming services implement measures

to prevent additional strain on Europe's internet infrastructure<sup>18</sup>.

- **Video Conferencing Provider Forum**

Comprising international and national video conferencing service providers, the forum discussed and considered options for managing increased network utilisation with a focus on the upstream impacts and helping to maintain customer experience. A number of participants implemented SD as the default setting for conferencing. NBN Co provided Video Conferencing Provider Forum with insights into sharp and substantial increases in the upstream traffic, specifically in areas under more stringent lockdown measures, assisting video conferencing providers to make informed decisions about the measures they implemented to reduce the upstream traffic load.

- **Gamer/Platform Forum**

Comprising international gaming creators and platform publishers, this forum discussed and considered options for managing increased network utilisation with a focus on game software updates to help industry coordinate capacity planning. Game updates during this period contributed significantly to a number of consecutive all-time network utilisation records. Members of the Gamer/Platform Forum took actions including providing NBN Co and Retail Service Providers with key information about the date, time and size of upcoming new release and software updates. Information was also shared by NBN Co to help inform how game companies managed software downloads throughout the period, including data to show how game updates drove peaks in downstream traffic. Additionally, NBN Co established an online portal to share gaming specific information directly with Retail Service Providers.

<sup>18</sup> 'EU asks Netflix and other services to stream in SD to ease internet burden', Engadget.com, March 2020, [www.engadget.com/2020-03-19-eu-netflix-sd-streaming-to-serve-internet.html?guccounter=1](http://www.engadget.com/2020-03-19-eu-netflix-sd-streaming-to-serve-internet.html?guccounter=1)



### 5.3 Capacity Management

Under normal conditions, capacity planning typically involves predictable growth, with customer usage increasing over time and as new customers are added to a network. Network augmentation (sometimes requiring physical changes to the network) generally requires time to plan and implement. An inherent risk in network management is that large and sudden changes in demand can cause a degradation in service before planned augmentation measures are put in place.

The rapid and substantial change in network demand and traffic profile experienced as a result of, among other things, COVID-19 social distancing and lockdown measures meant that nbn was required to implement a number of actions to help ensure the nbn™ network would service requirements and customer experience expectations. While a wide range of initiatives were taken throughout the network, the below list offers a sub-set of some of the more notable actions taken to help ensure sufficient capacity in a number of different areas of the nbn™ network during the analysis period:

- **HFC Network**  
Capacity upgrades and augmentation of around 480 HFC nodes for downstream and around 920 for upstream.
- **Transit Capacity**  
Capacity augmentation of more than 1,000 nodes in the transit network.
- **Transit Architecture Augmentation**  
New capabilities were rapidly delivered to provide options to double backhaul link capacity and provide increased efficiency in the core aggregation network under surge conditions.

The following actions were implemented to increase network visibility and insights:

- **Increased Capacity Monitoring**  
Enabled nbn™ operations teams to identify and action when port thresholds crossed above 85 per cent capacity.
- **Reporting Enhancements**  
CVC, CVC/NNI and upstream utilisation to gain further insights and enable detailed assessment.

### 5.4 Commercial Response

To support Retail Service Providers (RSPs) during the surge in network demand, NBN Co offered to waive charges for 40 per cent additional wholesale capacity (CVC) compared to a February baseline. The quantum of additional capacity offered was determined following discussions with international peers. The initiative was designed as a buffer to support RSPs to manage additional traffic as social distancing and lockdown measures were applied and more people were relying on broadband to support their work, education, entertainment and social needs. Additionally, NBN Co established a \$150 million financial relief and assistance fund to help internet providers to support their residential and small and medium business customers affected by the COVID-19 pandemic.





## Key Insights

Social distancing and lockdown measures implemented to manage the impact of the COVID-19 pandemic contributed to significant changes in broadband user behaviour and unprecedented increases in broadband network traffic. The experience has brought into focus the critical role of fast and reliable broadband to support the economy and society.

In general, we observed an increase in demand in line with the implementation of more stringent social distancing measures, however this tended to plateau or stabilise over time, as was observed in international peer operators. To an extent, demand was driven by people doing more of the things they did previously, including keeping entertained with streaming video, however changes in the traffic profile through the day, particularly for upstream traffic highlighted the prevalence of video conferencing for remote work, education and connecting with family and friends.

It is worth noting that while traffic increased substantially through the day, it never exceeded the Evening Busy Hours peak. However, Evening Busy Hours downstream utilisation tended to peak up to 60 minutes earlier in the evening and we also observed a 'fattening' of the profile at the beginning and end of the day, with recognisable lifts in downstream utilisation starting earlier in the morning and remaining later into the night compared to the baseline.

Higher upstream utilisation was observed earlier in the day and sustained consistently throughout the day reflecting the use of video-conferencing applications. Upstream traffic increases were typically in a range of 40 per cent to 110 per cent over baseline during the analysis period. Growth was also observed during the Evening Busy Hours, with typical increases of 10 per cent to 35 per cent over baseline.

Customers also used more during the months analysed. For downstream, we observed increases of 5 per cent to 20 per cent in peak utilisation when comparing to the late February baseline while for upstream there was growth of between 20 per cent and 70 per cent in peak utilisation.

Despite such a sudden and substantial change in demand, the **nbn**<sup>™</sup> network performed well during the analysis period. A number of factors contributed to this, however a significant part was the unique approach to industry engagement and collaboration, which allowed the timely and contextual sharing of information, and development and implementation of measures by different participants in the market.



## Conclusion

NBN Co technical and engineering teams began exploring the potential impacts of COVID-19 throughout the early parts of 2020, engaging with international peers as well as conducting analysis and modelling of potential scenarios to help design and implement a management plan.

The implementation of social distancing and lockdown measures had a sudden and substantial impact on network demand and traffic profile as large numbers of people began working remotely from home as well as engaging in online education, consuming streaming video entertainment and connecting with family and friends online.

These changes had demonstrable impacts on **nbn**<sup>™</sup> network utilisation, including substantial peaks in downstream and upstream utilisation, as well as changes to the 24-hour usage profile with substantial growth in the business hours period, growth in data volume, and changes to application usage.

Despite additional customer demand, the **nbn**<sup>™</sup> network performed well throughout the period. In August 2020, broadband monitoring company cable.co.uk released analysis<sup>19</sup> based on over 364 million broadband speed tests that showed an average drop in speed of 6.38 per cent across 114 countries with social distancing and lockdown measures in place. Australia was shown as one of only a handful of countries that improved its internet speed, with a gain of 5.3 per cent.

In its role as a wholesale-only, open access network operator, NBN Co was in a unique position to work together with a broader industry ecosystem, to facilitate discussions and information sharing to help enable rapid decision-making and rapid collaborative responses to support customer experience with the ultimate goal to keep Australians connected and productive throughout the pandemic.

<sup>19</sup> How global broadband speeds changed during COVID-19 lockdown periods, cable.co.au, <https://www.cable.co.uk/broadband/speed/broadband-speeds-covid-19-lockdown>, 4 August 2020





## Disclaimer

This document is provided for information purposes only. This document is subject to the information classification set out on this page. If no information classification has been included, this document must be treated as 'nbn-Confidential: Commercial' and must not be disclosed other than with the consent of NBN Co. The recipient (including third parties) must make and rely on their own inquiries as to the currency, accuracy and completeness of the information contained herein and must not use this document other than with the consent of NBN Co.

Copyright © 2021 nbn co limited. All rights reserved.