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nbn's submission on the Draft FYSO 22-27

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Final

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Thank you for the opportunity to comment on the 'Five-year spectrum outlook 2022–27 and 2022–23 work program, Draft for consultation', including the priorities outlined in the proposed annual work program.

nbn's spectrum requirements and strategies have been developed to enable it to meet the Government's Statements of Expectations and the Statutory Infrastructure Provider (**SIP**) regime and our role as default SIP for Australia. This includes the Federal Government's expectation that **nbn** will assist in reliably and affordably meeting the current and future broadband needs of households and businesses, including regional and remote areas in Australia, and continue to upgrade the network technologies to support Retail Service Providers (**RSPs**) to meet demand from end users and improve customer experience.[1]

As more Australians are changing the ways they work, with more people working from home due to the COVID-19 pandemic, **nbn**'s fixed wireless (**FW**) and satellite network services play a critical role in meeting the digital connectivity needs and lifting the digital capability for all Australians. As of 28 April 2022, there were approximately 382,000 and 110,000 active FW and satellite services respectively.[2]

nbn is required by legislation to operate as a wholesale only, open access, non-discriminatory operator. In doing so, **nbn** has developed wholesale products that RSPs use as inputs to their own retail products. This is intended to level the playing field in the Australian telecommunications industry, enhancing competition and innovation, and providing greater choice for customers across the country.

The Federal Government and nbn's $750m FW network investment

The recent announcement by the Federal Government of a $750m investment for **nbn** 's FW network, comprising of a Federal Government contribution of $480m and $270m by **nbn,** will allow **nbn** to fast-track an uplift of the performance of the FW network including the introduction of 5G technology in the millimetre wave (**mmWave**) and increased deployment of cmWave, as well as uplift satellite service performance. This investment will form part of the government and **nbn**'s response to the 2021 Regional Telecommunications Review which recommended enhancements to **nbn**'s FW and satellite services in response to a step-change in demand for data and broadband services in rural and regional areas.

The key benefits of the $750m FW network investment are expected to be as follows:

- Improved performance of the entire expanded FW network, with the FW network capable of achieving 'typical wholesale busy period speeds' of at least 50Mbps (download).[3]
- Improved satellite network performance, due to decongestion of the more heavily used beams with ~120,000 satellite-only premises (including ~25,000 active users) able to access FW, once the FW footprint is expanded. We also anticipate that the satellite network will be capable of offering enhanced data limits for the Sky Muster and Sky Muster Plus product users.
- Subject to industry consultation, potential for RSPs to offer FW products with a possible maximum wholesale download speed of up to 100 Mbps across the entire footprint, with up to an estimated 85% of the footprint also able to access potential maximum wholesale download speed of up to 250 Mbps. This

[1] See NBN Co Ltd Statement of Expectations 26 August 2021 at https://www.nbnco.com.au/content/dam/nbn/documents/about-nbn/policies/soe-shareholder-minister-letter-2021.pdf

[2] https://www.nbnco.com.au/corporate-information/about-nbn-co/corporate-plan/weekly-progress-report

[3] The 'typical busy period speed' will be an estimate based on a sample of nbn FW wholesale services and will measure the average speed at certain points in each hour of the busy period between 7-11pm to identify a 'typical busy period speed', in line with the methodology outlined in the ACCC's Broadband Speed Claims Industry Guidance Paper (October 2020).

limitation of 85% availability is directly related to **nbn**'s current spectrum holdings. **nbn**'s interest in acquiring more spectrum in the 3.4 – 4.0 GHz frequency range, to address the remaining 15%, is detailed further in this submission.[4]

- Upgrading the regional network will assist in bridging the digital divide, estimating that this initiative could support an additional $6.1 billion in regional GDP over FY 2022 - 26.[5]

How will nbn's existing spectrum be used as part of the $750m FW network investment?

While the FW network upgrade path is subject to final design, we intend to leverage our existing FW spectrum holdings (2.3 GHz, 3.4 GHz, and 28 GHz) on our current FW sites to improve FW performance across the footprint and enhance network coverage.

Our analysis indicates that the FW network uplift, using existing spectrum holdings, will enable up to 100 Mbps for the entire expanded FW footprint. The increased capacity upgrades, in conjunction with an accelerated deployment of our 28GHz holdings, is also expected to enable the capability of up to 250 Mbps for an estimated 85% of the FW footprint. The corresponding proposed products are subject to consultation and the following limitations:

- For effective use of our 28 GHz band mmWave spectrum it is anticipated clear line-of-sight is required, as such, we estimate that not all FW customers will be able to access services using mmWave spectrum. The actual performance of mmWave spectrum in the field is unlikely to be apparent for another 12 months at a minimum.
- In some areas, where **nbn** holds less cmWave spectrum holdings than in other areas of the FW footprint (i.e. existing 2.3 and 3.4 GHz band holdings), the higher speed 250Mbps capability would only be available to a limited subset of users who can attain clear line-of-sight with mmWave spectrum in those areas.

As a result of the limitations in mmWave spectrum performance and smaller cmWave spectrum holdings in particular geographies, **nbn** is seeking the opportunity to solve this 85% limitation through the acquisition and deployment of additional spectrum in the 3.4 – 4.0 GHz frequency range.

nbn's FW uplift relies on the deployment of a significant amount of capacity in the 2.3 GHz and 3.4 GHz bands by increasing frequency reuse, the deployment of new antenna configurations to promote higher spectral efficiency, as well as deployment of equipment to leverage our 28GHz holdings. The new site designs will improve the cost per Mbps deployed, supporting the capacity for the ~ 382,000 existing customers. The high-speed capabilities of up to 100 Mbps and up to 250 Mbps will require carrier aggregation, currently only supported in the version 3 WNTD. **[C-i-C]** **[C-i-C]**. The high-speed capabilities, which are subject to consultation, are proposed to be delivered to customers with an existing version 1 and version 2 WNTD as part of an 'on-demand' upgrade when ordering a high-speed service. The deployment strategy for the version 4 WNTD is to be finalised, but it is currently anticipated that older WNTDs will be upgraded with the new version 4 WNTD, which will support the 28 GHz band as well as the 2.3 GHz band and 3.4 – 4.0 GHz frequency range. **[C-i-C]** **[C-i-C]** The existing NTDs deployed to the ~382,000 existing FW customers are not 5G compatible and the generally long lifespan of these devices means that there is no regular replacement schedule required.

[C-i-C] **[C-i-C]**

[4] Any new speed tiers or changes to FW products is subject to consultation with industry which may alter the design, contractual terms, product specifications and/or go-to-market approach.

[5] $750 million investment to 5G-enable nbn® Fixed Wireless to deliver faster speeds to regional Australia | nbn (nbnco.com.au)

The uplift delivered by the capacity upgrades, improved tools and accelerated deployment of 5G technology is designed to maximise the benefits for regional Australians with the upgrades anticipated to be complete by, approximately, the end of 2024.

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The new WNTDs that we will be rolling out **[C-i-C] [C-i-C]** will be compatible with our existing spectrum holdings and any 3.4 - 4.0 GHz band holdings acquired as part of the ACMA's future allocation processes.

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What additional spectrum is nbn exploring for use as part of the $750m FW network investment and for future FW network upgrades generally?

Our interest in the opportunity to acquire 3.4 – 4.0 GHz frequency range spectrum falls within the following four categories:

- **Protecting nbn's existing outer metro 3.4 GHz spectrum holdings from interference.** This spectrum is the only spectrum that **nbn** has available for **nbn**'s fixed wireless (FW) network to service the outer metro fringe areas of Sydney, Melbourne, Adelaide, Perth, and Brisbane. We consider that the ACMA needs to continue to balance the need to protect **nbn**'s existing and planned services and ensure **nbn** is not unreasonably constrained in its ability to deploy new technologies in future with the utility of the urban / inner metro excise spectrum.
- **Delivering all FW network customers the up to 250 Mbps capability.** Acquiring additional spectrum for our FW geographic areas **[C-i-C] [C-i-C]** to address the estimated 15% of FW network customers, that will be unable to access the up to 250 Mbps capabilities, to be provided as part of the $750m FW network investment. **[C-i-C] [C-i-C]**
- **Defragmenting 3.4 GHz regional spectrum licences.** The acquisition of spectrum and subsequent trading with other spectrum owners as required will ensure that existing regional spectrum holdings can be more efficiently utilised and facilitate more carrier aggregation technology solutions.
- **Long-term customer experience requirements.** Acquiring additional spectrum for the expanded FW footprint more generally required, given the projected increase in traffic volume, the increase in FW customers and the need to meet growing customer experience requirements. The new version 4 WNTDs to be rolled out **[C-i-C] [C-i-C]** are compatible with this spectrum and the need to have an ecosystem that is compatible with acquired spectrum is critical to meeting demand in a timely and cost effective manner. Given the proposed long term tenure of these licenses, we also need to consider our future capacity requirements as part of our business case for acquiring spectrum in the upcoming allocations.
- **[C-i-C] [C-i-C]**

[C-i-C] [C-i-C]

What additional spectrum is nbn investigating more generally given the forecast increase in demand and performance by FW end users?

3.8 – 4.0 GHz apparatus licences

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The newly announced $750m uplift in investment in the FW network and the resulting expanded FW footprint, together with the proposed offering of higher-speed tier products subject to consultation is expected to drive strong growth in the take-up of our FW service and the volume of data consumption from homes and businesses across Australia. This is in conjunction with the projected increase in traffic over time generally.

In addition, while our 28 GHz mmWave spectrum will be used to its greatest utility, we expect that many of our customers will not be able to rely on mmWave as a capacity solution into the future given the propagation limitations. **[C-i-C] [C-i-C]** With the proposed licence term potentially till 2030, **nbn** must consider long term needs now and secure sufficient spectrum holdings now in suitable bands taking into account our existing and planned network equipment (notably, the version 4 WNTD with its n77 band compatibility) to ensure capacity demands can be met in the back end of the 2020's and early 2030's (noting renewal considerations would be investigated at a later date).

- *Why is this spectrum desired?*
  As mentioned above, **nbn** considers that the 3.8 – 4.0 GHz frequency range would be the likely expansion option for customers who are not able to leverage mmWave due to path constraints. Accordingly, **nbn** is sourcing a new version 4 WNTD device that will provide support for 5G in the wider n77 band as defined by 3GPP (3300 – 4200 MHz which includes **nbn**'s existing 3.4 GHz band holdings) to ensure that **nbn**'s opportunity to secure this potential capability over the coming decade is optimised. Version 4 WNTD will also support **nbn**'s existing 28 GHz and 2.3 GHz band holdings. **nbn**'s investment in the version 4 WNTD, from a financial and resourcing perspective, will be considerable and the device is envisaged to be deployed progressively over the coming decade to enable the use of wider spectrum assets, 5G technology, and also to retire older WNTD devices, with lifespans as long as 10 years.
  If access to sufficient holdings in this band is unable to be secured by **nbn**, **nbn**'s ability to meet new customer experience and product needs in the future beyond that to be delivered by the $750m network investment (i.e. up to 100 Mbps and given existing spectrum holdings, for 85% of customers - up to 250Mbps capability) in a timely and cost effective manner would be severely constrained.
- *Why are our existing holdings insufficient*?
  - In some areas of the FW footprint, our existing cmWave spectrum assets are already fully deployed and all practical spectral efficiency and frequency reuse options in planning to be fully leveraged to maximise capacity.
  - We anticipate that the average data volume demand, served by our existing cmWave spectrum (i.e. our 2.3 and 3.4 GHz holdings), will grow significantly over the next few years, particularly in uplink data compared with today's volumes, with some areas expected to grow significantly more due to local factors. This increase is driven by the planned expansion of the FW footprint to accommodate an additional 120,000 currently satellite premises (20% increase in premises to be serviced using the FW network), the inevitable growth of data volume demand (BCAR's[6] demand

[6] Demand for fixed-line broadband in Australia 2018–2028 (infrastructure.gov.au), page 38

forecast is roughly 100% growth by 2030 from the 2022 baseline), and with our 28 GHz band mmWave holdings expected to be effective for a limited number of premises **[C-i-C]** **[C-i-C]** due to path characteristics.
    - Our network planning indicates that there is a clear direct relationship between our capacity to meet data demand and our spectrum holdings, and the improvements in spectral efficiency, noting that frequency reuse available under 5G is expected to be modest in the context of our current, and anticipated, performance levels.
    - As an example, the growth of data used per subscriber, and the growing number of subscribers will accelerate the rate at which sites have their existing spectrum holdings 'fully deployed'. Additionally, the ability to offer new products or services in the future may require additional spectrum.
    - Pending the field results of mmWave performance in the field **[C-i-C]** **[C-i-C]** where terrain and clutter characteristics may see mmWave provide reliable connectivity to less than the baseline **[C-i-C]** **[C-i-C]** assumption we hold today.
- *How much spectrum desired and in what frequency range?* We would be seeking **[C-i-C]** **[C-i-C]** spectrum in the 3.8 – 4.0 GHz frequency range as apparatus licences. **[C-i-C]** **[C-i-C]**
- *When?* **[C-i-C]** **[C-i-C]** **nbn** will require additional spectrum to facilitate practical re-farming of its 4G technologies to 5G **[C-i-C]** **[C-i-C]** and at the same time to meet the expected subscriber numbers and data volume demand growth. While these needs may not present across the entire FW footprint, **nbn** would be keen to secure the necessary holdings to de-risk the potential for a situation of insufficient spectrum availability compatible with the planned network (particularly, the version 4 WNTD) in the back half of the decade.

[C-i-C] **[C-i-C]**

3.4 GHz regional spectrum licences

We support the ACMA making the spectrum in the '3.4 GHz regional band' available as spectrum licences noting that this would assist in defragmenting the regional spectrum in the 3400 – 3575 MHz range.[7] We agree that larger contiguous holdings will reduce service deployment costs.

We are investigating the business case for acquiring additional 3.4 GHz regional band spectrum which is also a key dependency to defragmenting our existing regional spectrum licensed holdings.

- **[C-i-C]**
    - **[C-i-C]**
- *When?* **nbn** has equipment capable of retuning to the target spectrum ranges remotely in many cases and we would seek to deploy any acquired spectrum as soon as possible. We support the spectrum licences commencing immediately enabling the usage subject to operating around or reaching commercial agreements with incumbents during the reallocation period.

Additional comments on Draft FYSO

We have provided our comments below on other aspects of the Draft FYSO.

[7] This is the 3.4 GHz regional band is defined in the 'Proposal to re-allocate 3.4 and 3.7 GHz consultation paper' as spectrum in the frequency ranges: 3400–3425 MHz in major regional centres 2, 3400–3442.5 MHz in regional area 1, 3475–3492.5 MHz in regional areas 1 and 2, 3492.5–3510 MHz in major regional centres, and regional areas 1 and 2, 3510–3542.5 MHz in major regional centres 2 and regional area 1 3475–3575 MHz in regional Western Australia central.

To assist homes and businesses with making the most of their internet experience, and for an improved customer experience, **nbn** also provides guidance on how to enhance Wi-Fi capabilities around the relevant premises. **nbn** supports the ACMA's continued investigation into possible changes to class-licensing arrangements in Australia in the existing 5 GHz and 6 GHz bands for RLAN use, and we support the ACMA's decision in relation to the lower 500 MHz of the 6 GHz band to provide more spectrum to accommodate next generation Wi-Fi devices and allow for the increasing traffic being carried over Wi-Fi networks. This further allocation of the 6 GHz band will enhance the reliability and performance of Wi-Fi capabilities and ultimately the capabilities of reliable and high speed in-premise networks through which customers access **nbn**'s network and the RSP product offering.[8]

Based on currently available information, we support the ACMA considering spectrum licence renewal 5 years from expiry, with the preferred outcome identified no later than 2 years from expiry. Our 2.3 GHz and 3.4 GHz licences expire in 2030 and are critical to the supply of our FW network across the entire footprint, and subsequently **nbn**'s ability to meet the Government's Statement of Expectations and our SIP obligations and our objective of bridging the digital divide for regional Australians. This spectrum is used as a coverage layer with the use of our 28 GHz mmWave holdings (and any acquired 3.8 GHz holdings) used as a capacity layer. Our FW network investment decisions require long-term certainty with the equipment and available technology options which determines the products that we can offer to RSPs and is influenced by our spectrum holdings

We support the ACMA releasing a discussion paper in Q2 2023CY on how the ACMA intends to determine whether a licence is in use in considering renewals. We note that the $750m FW network upgrade will accelerate our deployment timelines for the use of our 28 GHz AWLs and that this spectrum is critical to improving the customer experience that we offer on the FW network and the products that we can offer to our RSPs, including the subject to consultation, the proposed high speed tier products discussed above

We support the ACMA continuing to monitor the 40 GHz (37 – 43.5 GHz), 46 GHz (45.5 – 47 GHz) and 47 GHz (47.2 – 48.2 GHz) band. However, the option of deploying future satellites with end-of-life for the existing satellites of 2030/2031 continues to be considered within **nbn**'s satellite strategy and we would like to reiterate the relevant spectrum requirements for this option.

- **nbn** notes that it will rely on unconstrained access to spectrum in the 40 and 50 GHz bands for future satellite gateways, which would require access to part of the 37.5 - 42.5 GHz band (that could overlap with that required for user links), and all the 47.2 - 50.2/50.4 - 51.4 GHz band being allocated to the Fixed Satellite Service and excluded from consideration for mobile use in Australia.
- Separately, **nbn** would like to reiterate that it is keen to ensure additional spectrum is made available for satellite services relevant to nbn's satellite upgrade path by amending the relevant Class Licence to enable the following additional space-to-earth bands:
    - 20.2 - 21.2 GHz **[C-i-C] [C-i-C]**; and
    - 2.5 GHz in the 37.5 - 42.5 GHz range **[C-i-C] [C-i-C].**

[8] Steps to boost your Wi-Fi | nbn (nbnco.com.au)

[C-i-C]

[C-i-C]