GREX CONSULTING

Independent Expert Report
nbn SAU Variation Expenditure

October 2023

Final

Contents

Part C: Expenditure Assessment – NBN Co processes, prudent and efficient expenditure

1. Part C summary

- Through the process described in detail in this Part C, an assessment has been made of the prudency and efficiency of NBN Co's proposed expenditure proposed in the SAU Variation.
- Across the initiatives, programs and other expenditure items described by NBN Co in the ACCC Briefings, an assessment is made of the (combined) prudency and efficiency of the expenditure proposed in the SAU Variation, with the following major call outs from the assessment being:
    - *Majority of programs and other expenditure items described by NBN Co have been assessed as "Yes" or "Qualified Yes",*
    - *"Inconclusive" assessment for prudency and efficiency of expenditure for the Network Upgrade Initiative (FTTN-FTTP Build and FTTC/FTTN-FTTP Connect) (SAU Supporting Submission Part F, App. A, 2.5 - Capability),*
    - *"Inconclusive" assessments for the prudency and efficiency of the HFC Capacity capital expenditure initiative categorised as Take-Up & Usage (SAU Supporting Submission Part F, App. A, 2.3 - Take-Up & Usage), the Fixed Wireless Upgrade (SAU Supporting Submission Part F, App. A, 2.5 - Capability), and Direct Operating Costs (Assurance – Service Assurance, Network Assurance, and Network Maintenance) (Part F, App. A, 3.3).*
- Reasons for assumptions made and the qualification of assessments against the initiatives are described in section 7 and Appendix B.
- Documentation provided along with a description of both the ACCC Briefings carried out by NBN Co, and the subsequent RFI Process and the further process carried out since release of the draft Report is also described towards the end of this Part C to explain the process of assessment, with suggested improvements forming part of the recommended process described in Part D of this Report.

2. Process and Methodology

2.1. Introduction

DLA Piper has instructed Grex Consulting (Grex) to provide an expert opinion on both the efficiency and prudency of NBN Co's proposed capital and operating expenditure forecasts under the SAU Variation for the First Regulatory Cycle (FRC) from 1 July 2023 to 30 June 2026.

Grex's expert opinion on the prudency and efficiency of NBN Co's proposed expenditure forecasts is described in this Part C, with the findings taken from the expenditure assessment

carried out and described in this Report used to recommend a process that seeks to build on the existing IOP and SAU Variation processes adopted by NBN Co (set out in Part D).

2.2. Prudency, efficiency, and objectives

As described by NBN Co in its SAU Supporting Submission Part F, for the purposes of proposing the forecast expenditure set out in the SAU Variation NBN Co has not included a definition of "prudent and efficient" because:

"this recognises the complementary nature of prudency and efficiency and allows for some flexibility in how these concepts are practically applied over time to achieve the Expenditure Objectives"[1].

The AER[2] has described the concepts of prudent and efficient expenditure (which was referenced by NBN Co in SAU Supporting Submission Part F) as follows:

"Prudent expenditure is that which reflects the best course of action, considering available alternatives. Efficient expenditure results in the lowest cost to consumers over the long term. That is, prudent and efficient expenditure reflects the lowest long-term cost to consumers for the most appropriate investment or activity required to achieve the expenditure objectives".

Part C of this Report explains the assessment of the (combined) prudency and efficiency of each expenditure item described by NBN Co in the SAU Variation. In making this assessment, Grex has had regard to the description of prudcency and efficiency set out above together with the Federal Court and Australian Competition Tribunal guidance on the interpretation and application of these terms, in the context of assessing the expenditure of regulated infrastructure service providers, including that,

- **Prudent expenditure** has been held to be concerned with the exercise of sound judgement, being careful to avoid undesired consequences and managing carefully and with economy,[3] and
- **Efficient expenditure** has been considered in terms of the nature or timing of expenditure, including the extent to which there is evidence that, as far as practicable, the expenditure reflects optimal planning and design, and competitive costs, taking account local factors and the defined service standards for the business.[4]

Whilst a distinction could be drawn between the 'efficient costs' and 'prudent costs', in practice these concepts are often interlinked, such that a simultaneous assessment of the prudency and efficiency has been considered appropriate. As a result, Grex has expressed its expert opinion on the prudency and efficiency of NBN Co's expenditure forecasts as a "combined" rating against prudency *and* efficiency.

In undertaking the assessment of the prudency and efficiency of each expenditure item, where possible from the information provided in the ACCC Briefings and all other documentation relied upon in the preparation of this Report, Grex has had regard the items listed in section 19 of the Letter of Instruction, which are:

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[1] SAU Supporting Submission Part F, section 20.3, page 12.
[2] AER - Better Regulation - Expenditure Forecast Assessment Guideline for Electricity Distribution - August 2022, page 9.
[3] EnergyAustralia and Others [2009] ACompT 8 at [137].
[4] EnergyAustralia and Others [2009] ACompT 8 at [137].

- whether the relevant expenditure forecasts are prudent and efficient,

- any information provided by NBN Co in response to any requests you make for the purpose of preparing your report, including in any conferences with NBN Co that you attend for this purpose,

- the objective of the telecommunications access regime in Part XIC of the Competition and Consumer Act 2010 (Cth) to promote the long-term interests of end-users of carriage services or of services provided by means of carriage services,

- relevant government policies and directives relevant to NBN Co, the implication of those policies and directives on forecast expenditure,

- the approaches and methodologies adopted by NBN Co in determining its forecast expenditure and whether those approaches and methodologies reflect sound industry and regulatory practice,

- whether the materials or methodologies contained in the materials provided by NBN Co in support of its expenditure forecast (e.g. demand forecasting, forecast input costs including wages, and proposed service levels etc.) are based on sound technological, economic or financial logic, and reflect sound industry and regulatory practice,

- NBN Co's proposed cost allocation approach to allocating costs between its 'core' and 'competitive' services,

- Sound regulatory approaches to expenditure reviews, and

- Other matters that Grex has considered to be relevant as explained throughout the Report.

2.3. Yes, No, Qualified and Inconclusive

As explained above and further detailed below, in providing Grex's opinion on the prudency and efficiency of NBN Co's expenditure forecasts, each expenditure item described by NBN Co is assessed against a rating of "Yes", "Qualified Yes", "No", "Qualified No" or "Inconclusive" based on an analysis of the available information, which terms are defined as:

- **Yes:** means Grex considers the expenditure item is prudent and efficient,
- **Qualified Yes:** means Grex considers the expenditure item is likely prudent and efficient, however there are certain limitations which prevented Grex from reaching a concluded view. Such limitations include but are not always limited to a lack of detailed information of the relevant expenditure item to enable a sufficient assessment. The nature of these limitations is explained in section 7 and Appendix B,
- **No:** means Grex does not consider that the expenditure item is prudent and efficient,
- **Qualified No:** means Grex considers the expenditure is likely not prudent and efficient, however there are certain limitations which has prevented Grex from forming a concluded view. Such limitations include but are not always limited to a lack of detailed information of the relevant expenditure item to enable a sufficient assessment. The nature of these limitations is explained in section 7 and Appendix B, and
- **Inconclusive:** means Grex has not been able to provide a view on whether the expenditure is prudent and efficient due to a lack of available information which would support a fuller assessment. Where an expenditure item has been assessed as

inconclusive, an explanation of the information requested in order to assess these expenditure items, information received and any information not provided against each expenditure item is described in section 7, Appendix B and the RFI Process.

2.4. Steps for assessment

The following process was followed to review and assess the documentation provided and briefings given by NBN Co in support of its expenditure forecasts during the ACCC Briefings[5] and other documents relied upon in the preparation of this Report.[6]

The process and steps undertaken by Grex are summarised below:

- Information review and assessment, comprising the following steps:
    a. Report and data collation:
        i. Request existing information and data,
        ii. Attend ACCC Briefings,
        iii. Collect and review existing material and data, and
        iv. Request further information and clarification from NBN Co.
    b. Analysis and assessment:
        i. Document and information review and assessment,
        ii. Analysis and evaluation based on data gathered through the process described above, and
        iii. Document findings (in the report).
- Report development, comprising the following steps:
    a. Draft report
        i. Issue initial draft report,
        ii. Review and verify any further relevant new and revised information and clarifications provided by NBN Co, and
        iii. Gap analysis to identify areas for further investigation or opportunity.
    b. Final report
        i. Final report development and finalisation
        ii. Issue Final Report.

Through this process and steps, NBN Co has provided various briefings, data and responses to requests from both ACCC and Grex. This is described in detail in Appendix C but is illustrated below:

[5] The ACCC Briefings comprise the list of documents in Attachment A to this Part C and include the RFI Process.
[6] As listed in Attachment A to this Part C.

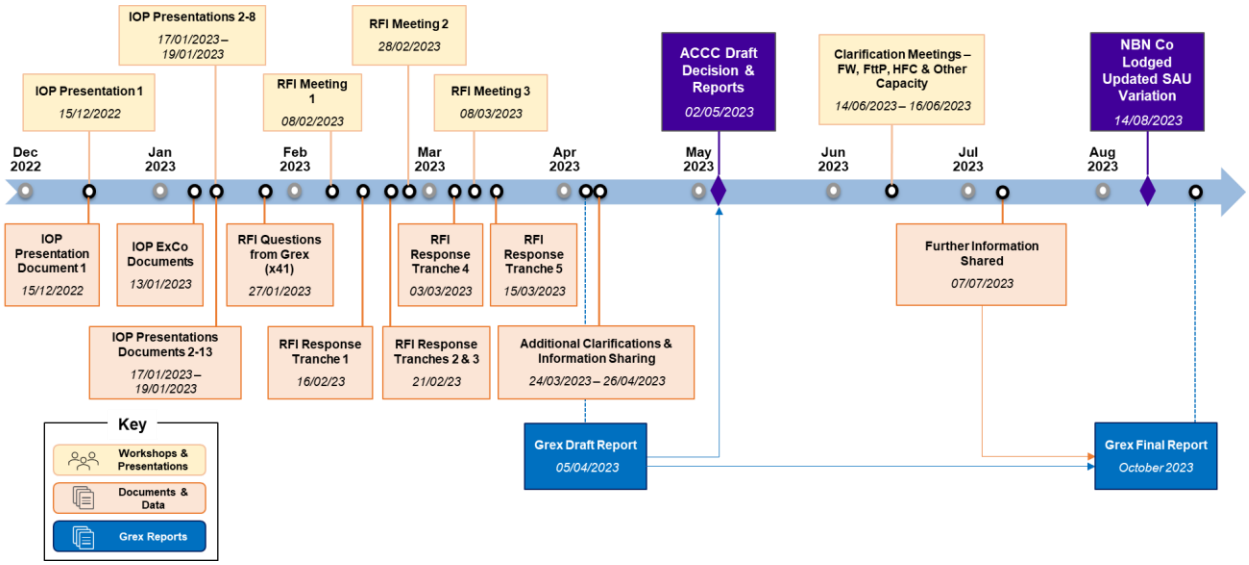

Table 1: Timeline of information shared and meetings conducted with NBN Co and ACCC in preparing both the draft and final Report [7]

[7] Further iterations of the draft report and the process to finalise the Report are described in more detail in Appendix C.

3. Assessment of NBN Co's approach to demand forecast & capacity planning

In addition to the assessment for prudency and efficiency of the expenditure items described in the ACCC Briefings and other documentation relied upon in the preparation of this Report[8], Grex has assessed NBN Co's demand forecast and capacity planning process, and made recommendations.

NBN Co's demand forecast and capacity planning is one of the main factors driving many of the 'Take-Up & Usage' and 'Capability' expenditure programs and items, the assessment outlined in this section supports the expenditure assessment described in section 7. Although high level in nature, wherever possible Grex has incorporated NBN Co's explanation of its demand forecasting and capacity planning into its assessment of the expenditure items described in section 7.

Grex also makes recommendations in this section to continue and improve reporting, monitoring and transparency in relation to demand forecasting and capacity planning by NBN Co through the First Regulatory Cycle.

3.1. Description of NBN Co's demand forecast & capacity planning process[9,10]

NBN Co has described in the ACCC Briefings how it has prepared demand forecasts as part of the most recent Integrated Operating Plan (IOP) that underpins NBN Co's FY23 Corporate Plan.

"IOP23" covers the years FY23 to FY26 and is the outcome of a bottom-up planning process that describes a detailed initial first year and forecast following 3 years ('1+3') plan. This process is updated on a yearly basis. Although it covers only four years, the IOP is informed by and aligned with much longer term (10-year) product and network roadmaps that are informed by long-term demand forecasts.

NBN Co's key demand forecasts relate to expansion (with incremental demand from the market to service new developments), take-up (including Speed Tier Mix) and peak usage. These forecasts feed into, and are to varying degrees, interdependent with the expenditure forecasts and the revenue and price forecasts.

The IOP expenditure forecasts rely on two sets of demand forecasts:

- high-level, **long-term demand forecasts** that drive the product and network roadmaps and strategic decisions on the evolution of the NBN network, and
- detailed **short-term to medium-term demand forecasts** that drive the business-as-usual opex and capex activity levels, including in relation to new initiatives (such as the Network Upgrade Initiative) once implemented.

The NBN Co forecast methodology forms input to the IOP process and includes the following key demand forecast items: **Network Utilisation, Active Premises/Services, and Speed Tier Mix (STM).**

[8] As listed in Attachment A to this Part C.
[9] SAU Supporting Submission Part F.
[10] 005 nbn ACCC Briefing – IOP23 – Demand Forecast Methodology - CONFIDENTIAL

3.1.1. Long-term (10-year) forecast

NBN Co appears to have well-developed methodologies for producing its long-term demand forecasts. Looking out over a 10-year horizon, NBN Co draws on a wide range of domestic and international sources to inform its models, including insights from CableLabs, the BCAR, OOKLA, Comcast, Cisco VNI, Sony, Microsoft, Deloitte, Nokia MS-ISA Application awareness platform, Omdia (previously Ovum) and the Australian Bureau of Statistics (ABS).

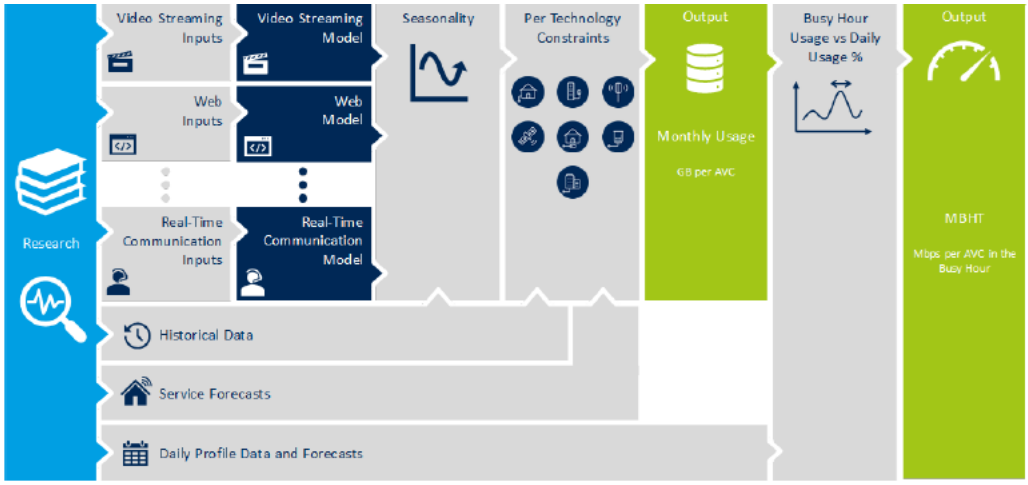

Figure 1: NBN Co's Forecasting Methodology for Usage[11]

NBN Co's long-term demand forecasts over the period to FY31 are summarised below:

- the number of TC-4 active services is forecast to grow by 17.90% overall from FY22 to FY31 with a CAGR of 1.85%. Over time, growth is driven largely by new developments,
- the TC-4 AVC STM is forecast to move upwards such that **the percentage on higher speed tiers (100 Mbps and above) in FY31 is 49.5%,** as compared to 18% in FY22 (end of year), and
- traffic per AVC activated is forecast to grow from June 2022 to June 2031 in terms of **Mean Busy Hour Throughput (MBHT) by 142% (CAGR 10%) downstream and 330% (CAGR 18%) upstream**, and in terms of Monthly Data Volumes by 138% (CAGR 10%) downstream and 398% (CAGR 20%) upstream.

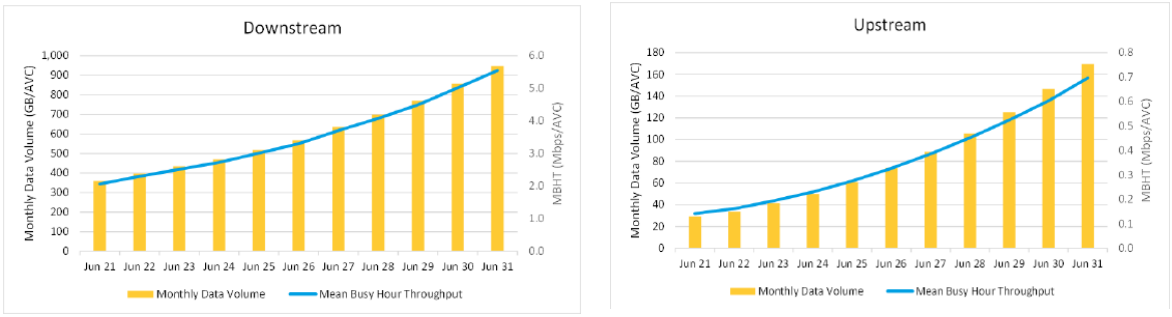

Figure 2: NBN Co's long-term usage and MBHT forecast

3.1.2. Short- to- medium-term (4-year) forecast

NBN Co has described in the ACCC Briefings how it forecasts short-to medium-term demand on the NBN network on a detailed month-by-month basis, seasonally adjusted, for the four years covered by IOP23 (updated yearly as part of the IOP process). In addition, NBN Co forecasts a range of other demand factors relevant to the IOP.

NBN Co's key demand forecasts over the **next four years (FY23 to FY26)** identified by NBN Co in the ACCC Briefings are summarised below[11].

- **Expansion: premises ready to connect (RTC) are forecast to grow by 5.0%** overall, with a CAGR of 1.2% driven by market demand to extend the NBN network into new developments,
- the **number of premises activated** (cumulative) is forecast to **grow by 4.6%** overall,
- the TC-4 AVC STM is forecast to shift progressively towards higher speed tiers, with the percentage of services 100 Mbps and above increasing from 18% to 35%,

[redacted]

- traffic per AVC activated is forecast to grow overall in terms of MBHT by 44% (CAGR 9%) downstream and 102% (CAGR 19%) upstream, and
- Monthly Data Volume (GB per AVC) is forecast to grow overall by 43% (CAGR 9%) downstream and 117% (CAGR 21%) upstream.

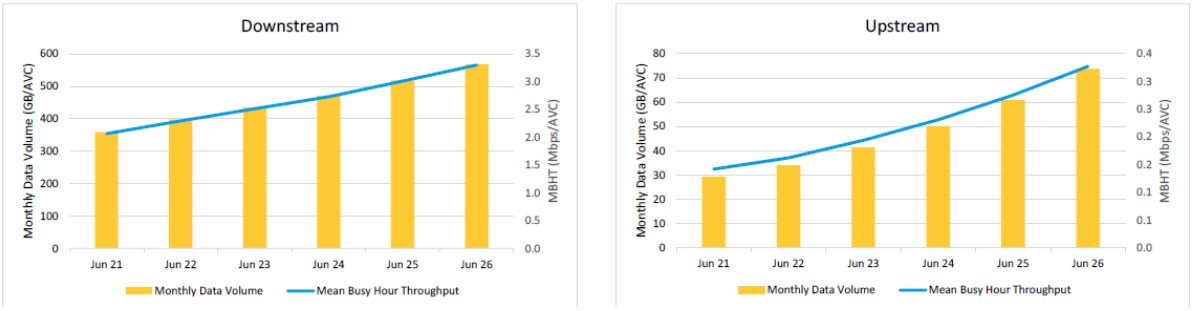

Figure 3: NBN Co's short-term usage and MBHT forecast

NBN Co has also highlighted its' ***"good track record of producing stable and reliable network utilization forecasts"***[12] over the last 10 years by underscoring the relatively high level of accuracy of its' forecast demand versus Actual usage for Monthly Data Volume, however, calls out the unpredictability of end-user behaviour and the potential for new applications that could easily affect demand e.g., reduced Active AVC vs 3-year forecast for 2021 and 2022 due to COVID.

[11] SAU Supporting Submission Part F.
[12] 002 nbn ACCC Briefing - IOP23 - Network Roadmap - CONFIDENTIAL

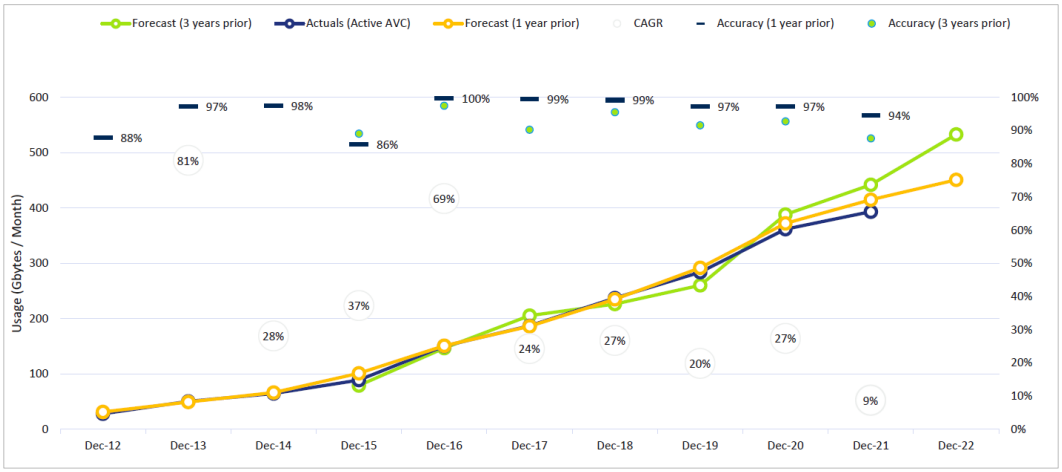

Figure 4: NBN Co's historical forecast vs. actual usage[13]

Given the variability of end-user behaviour and application demand, it is reasonable for NBN Co to incorporate and allow for an appropriate level of contention when designing and dimensioning the network i.e., allowance for intermittent contention during peak network usage. However, the duration and impact of this contention (congestion) on end-users should be minimised by appropriate planning and capacity management.

3.2. Findings & Recommendations

- While there is alignment of NBN Co's average forecast volume demand and average actual volume usage, it does not demonstrate the underlying performance of end-user services that may have been constrained or congested by the NBN Co network and consequently result in the average Volume usage alignment i.e., capped network capability may limit or inhibit end-user behaviour and use of the services.
- NBN Co appears to have well-developed methodologies for producing its short and long-term demand forecasts. However, NBN Co does not appear to report network-based performance metrics that demonstrate NBN Co's observance to identify, monitor, report and remediate network congestion within the network that affects end-user performance i.e., generally only focused on average utilisation of shared network resources[14].

3.2.1. Long-Term Demand Forecast & Capacity Planning

3.2.1.1. Findings

- The overall network usage demand forecast approach and methodology described is based on aggregated data usage at the highest level.
- Whilst the long-term demand forecast and capacity planning approach is defined, its linkage to major capital expenditure capacity upgrade projects such as FTTN to P upgrade and HFC network upgrade and the associated benefits that these would provide is not clear.

[13] 002 nbn ACCC Briefing - IOP23 - Network Roadmap - CONFIDENTIAL
[14] NBN Co - SAU supporting submission - Part C Non-price terms - 2 December 2022

3.2.1.2. Recommendations

- Grex recommends that interdependencies and the corollary benefits of expenditure items proposed by NBN Co that provide capacity improvement through the uplift in capability are clearly defined and correlated.
- Key metrics and measures should be introduced and/or improved to clearly identify and demonstrate where there is degradation in the underlying performance of all end-user services that may have been constrained or congested by the NBN Co. Particular regard should be taken to improving measurement and reporting of congestion on services provided by NBN Co to its customers where NBN Co is proposing to include CVC as part of a combined service bundle (i.e., a clearer delineation between the CVC NBN Co's customer has purchased and congestion in the network not caused by the customer not buying "enough" CVC).
- Future assessment of capacity-related expenditure will be improved where NBN Co clearly and demonstrably highlights the benefits provided by its expenditure items and long-term demand forecast and capacity planning activities.

3.2.2. Business as usual capacity management

3.2.2.1. Findings

- For day-to-day capacity management of the network, the ACCC Briefings and RFI Process documentation provided a high-level overview, however, lacked detail particularly in relation to:
    - Current capacity upgrade thresholds,
    - Approach to upgrade methods and their prioritisation, and
    - Target capacity threshold for various network segments across access, transit and aggregation networks.
- It is noted that NBN Co is obliged to take remedial action on a shared network resource, if the 30-minute average utilisation exceeds the 90% utilisation threshold for at least three separate days within a rolling 30-day period, however, this is only on the shared network resources, which is specifically defined as between POI and OLT/AAS/CMTS/EPG for respective technologies as illustrated below[15], i.e. this does not address the network segments between NTD and OLT/AAS/CMTS/EPG, thus does not represent the E2E network segments within the boundaries of NBN Co.

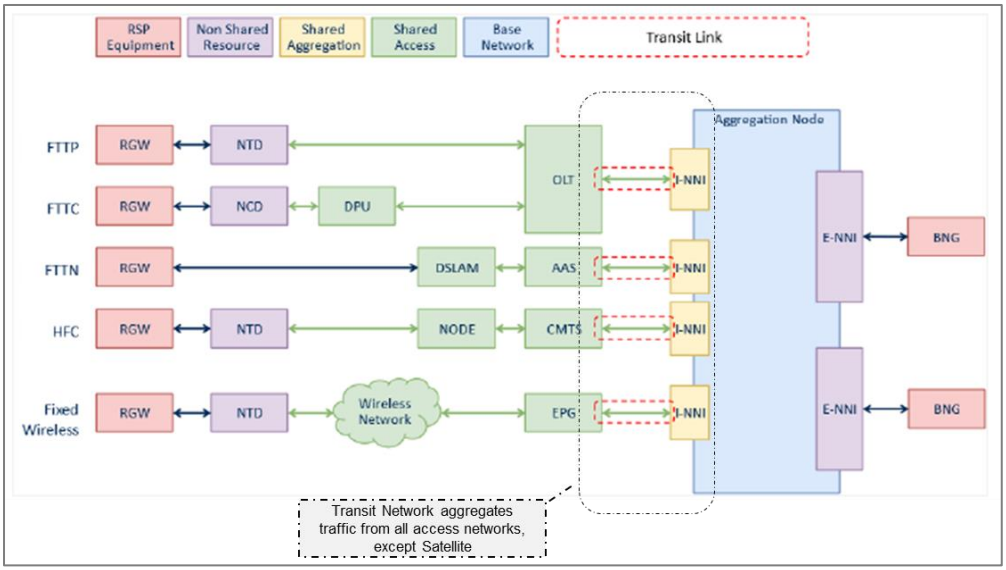

Figure 5 E2E Network Illustration E2E Network Illustration[15]

- Additionally, NBN Co provides monthly progress reporting[16] across a number of metrics. These include the average number of minutes of bandwidth congestion per week/ per service and Fixed Line Network Congestion. These indicate from the review and assessment that:
- Reported average bandwidth congestion across the NBN access network is approximately 25 minutes per week per premise – compared with 18 minutes per week in January 2022. This measure excludes Sky Muster™ satellite. The congestion is a measure of Connectivity Virtual Circuit Allocation by RSP's, which is calculated across all bandwidth purchased by all phone and internet providers across the entire network (CVC congestion) – this construct is a fundamental capacity limitation and constraint, and defines the overall network demand (including the shared components – see below). Given the progressive removal of the CVC construct, this metric is unlikely to be appropriate (recommendations relating to the metrics are described in the following section).
- There has been no Fixed Line Network Congestion[17] for the past 12 months (January 2021 – January 2022). The estimate provides monthly average percentage of homes and businesses who experience NBN access network congestion (as per NBN Co's congestion measures for Fixed Line networks excluding NBN Fixed Wireless and Sky Muster™ satellite). The reported metrics are calculated and based on the utilisation of certain parts of the NBN Fixed Line access network that are shared by phone and internet providers.
- Access and transit network capacity thresholds that have been briefly outlined in IOP23 Usage & Demand Profile document[18] indicate that NBN Co provides overhead capacity to facilitate unexpected fluctuations in capacity demand, as well accommodate and allow for lead-time to upgrade network components where these capacity thresholds are

[15] NBN Co - SAU supporting submission - Part C Non-price terms - 2 December 2022, pp 23-24
[16] https://www.nbnco.com.au/corporate-information/about-nbn-co/updates/dashboard-january-2023
[17] https://www.nbnco.com.au/corporate-information/about-nbn-co/updates/dashboard-january-2023
[18] IOP23 Usage & Demand Profile - Exco – 220209 (Date: 23/02/2022)

beginning to be exceeded by general traffic growth. However, it is not clear how these thresholds are used together with the 90% shared network resources threshold described above, to effectively manage network capacity upgrade.

3.2.2.2. Recommendations

It is recommended that key metrics be defined, measured, and reported to identify the location, level and impact of the contention and congestion within the network (shared and dedicated network resources), with particular emphasis on end-user experience.

Additionally, it is recommended that all occurrences of network congestion (including potential instances) impacting end-users are measured and reported. Such reporting should include congested network links / nodes / ports / segments as part of existing / proposed regular reporting process to ACCC. Possible detailed metrics would include:

- Location of congestion (link, node/site, segment),
- Date, time, duration of congestion,
- Network performance details during congestion such as: utilisation %, bandwidth/throughput, latency, packet/frame loss, jitter, and
- Impacted AVCs.

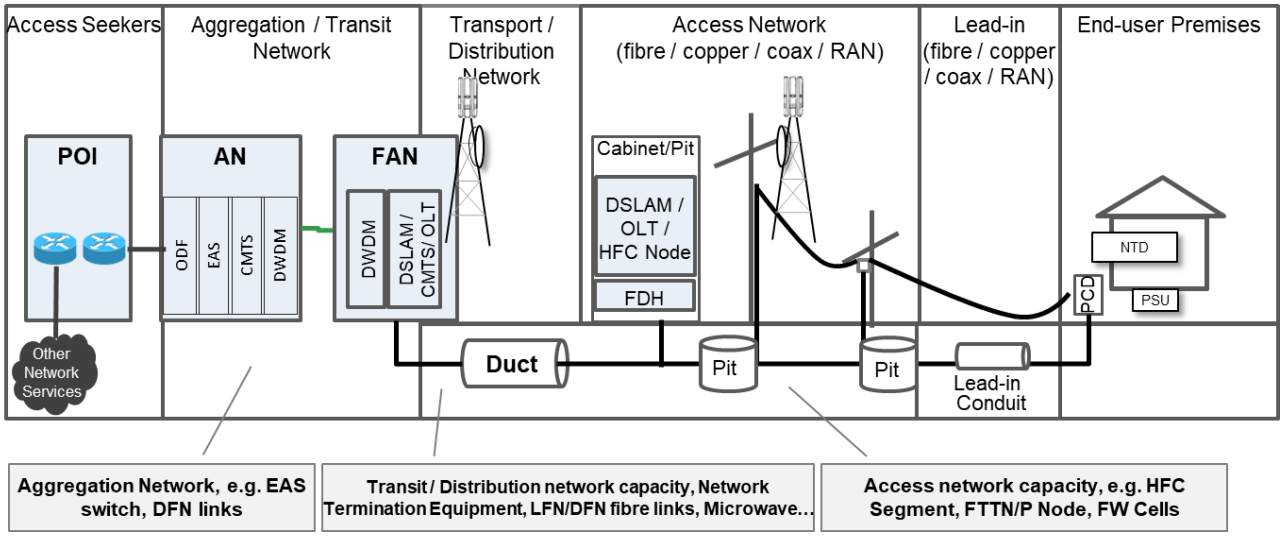

Figure 6: E2E Network – Potential Network Congestion Points

3.2.3. Speed Tier Mix (STM) Forecast

3.2.3.1. Findings

It appears that NBN Co's STM mix forecast of higher speed tier demand (100 Mbps and higher) is on the high side, compared with other industry research such as BCAR forecast:

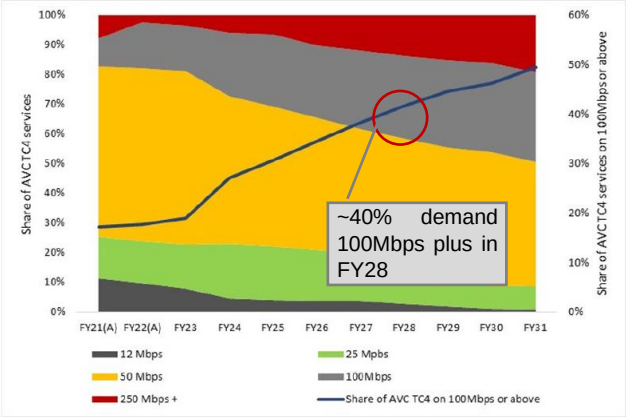

Figure 7: NBN Co STM demand forecast[19]

Households (percentile)	Bandwidth in 2018 (Mbps)	Bandwidth in 2028 (Mbps)
50%	14	29
75%	18	39
90%	22	48
95%	24	56
98%	28	66
99%	29	66
99.9%	35	78

~10% demand 50Mbps plus by 2029

Figure 8: BCAR household demand forecast[20]

3.2.3.2. Recommendation (forecasting and planning only)

As several major capital expenditure initiatives are predicated on end-users migrating to 100Mbps or higher speed tiers (such as FTTN/C to P connect, FW network upgrade), the method and assumptions of this forecast may require further refinement. Further analysis of these upgrade expenditure items is described in section 7 and Appendix B.

[19] SAU Supporting Submission Part F.
[20] Australian Government Bureau of Communications and Arts Research – Demand for fixed line broadband in Australia 2018 2028 working paper, July 2020.

4. Overview of NBN Co's FRC expenditure

This section provides a high-level overview of NBN Co's forecast expenditure for the First Regulatory Cycle and some other trends that Grex observed through the process of assessment of NBN Co's expenditure program. The purpose of this section is provide context for NBN Co's expenditure program as a whole. Where these high-level observations have informed Grex's assessment of the prudency and efficiency of individual expenditure items, this is explained in section 7.

All values presented and assessed within this Report are derived from the values presented in NBN Co's SAU variation as submitted to ACCC on 30 November 2022. Grex notes that the capital and operating expenditures presented in the updated SAU variation submitted by NBN Co to ACCC on 14 August 2023 differ from those presented in the 30 November 2022 version, with some of the difference explained by differing escalation factors.

4.1. Expenditure Overview

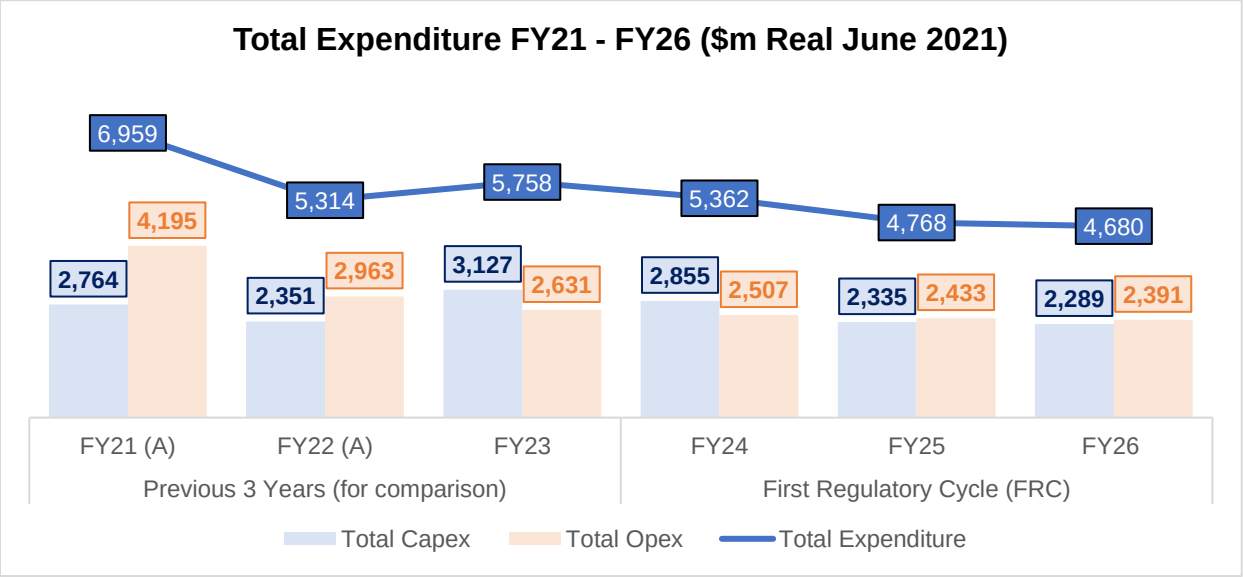

Figure 9 Total Expenditure FY21-FY26 ($m Real June 2021)

Total expenditure is decreasing every year during the FRC at a CAGR of 7%, and the combined expenditure throughout the FRC is 18% less than the previous three years (FY21-FY23).

Capital expenditure experiences a sharp increase in FY23, primarily driven by the FTTN to FTTP Network Upgrade across both built and on-demand connect proposed expenditure, as well as an increase in spend on the Fixed Wireless Upgrade initiative. From FY23 onwards proposed capital expenditure continues to decrease, at a CAGR of 10% over the FRC. This decrease is driven by reductions in proposed expenditure across Connect & Assure, Copper Remediation on FTTN Network, FTTN to FTTP Build, Fixed Wireless Upgrade, and IT capex.

Operating expenditure decreases significantly from FY21 to FY22, largely due to a major reduction in Subscriber Payments which then cease in FY23. Over the FRC, operating

expenditure is forecast to decrease at a CAGR of 2%. This decrease is driven by material reductions in proposed expenditure across Service Assurance (excluding FTTP), FTE costs, Outsourced Services (specifically Extended Workforce), and IT and Software. The overall effect of the reductions is tempered, however, by a 1% CAGR increase in Infrastructure Payments over the FRC, which at 37% of spend comprises the largest operating expenditure item.

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Cost Type	Category	Total 3-year Value ($m)		Variance between FY21-FY23 & FY24-FY26	Category Proportions (%)		Expenditure FY21-FY26 ($m)							Compound Annual Growth Rate (%)	
		FY21-FY23	FY24-FY26		FY21-FY23	FY24-FY26	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26	FY21-FY26	FY21-FY23	FY24-FY26
Capex	Expansion	1,191	607	-49.0%	14.5%	8.1%	660	286	245	215	191	201	-21%	-39%	-3%
	Take-up & Usage	2,316	1,353	-41.6%	28.1%	18.1%	1,041	669	606	503	426	424	-16%	-24%	-8%
	Maintaining	301	180	-40.2%	3.7%	2.4%	95	80	126	92	55	33	-19%	15%	-40%
	Capability	3,180	4,360	37.1%	38.6%	58.3%	501	981	1,698	1,643	1,364	1,353	22%	84%	-9%
	Other Capex	1,252	978	-21.9%	15.2%	13.1%	468	334	450	402	300	276	-10%	-2%	-17%
	Total	**8,242**	**7,479**	**-9.3%**	**100%**	**100%**	**2,764**	**2,351**	**3,127**	**2,855**	**2,335**	**2,289**	**-4%**	**6%**	**-10%**
Opex	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	794	851	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Direct Operating Costs	2,131	1,717	-19.4%	21.8%	23.4%	731	751	649	595	562	560	-5%	-6%	-3%
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	831	665	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	606	503	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
	Service Level Rebates	55	23	-58.2%	0.6%	0.3%	20	24	11	9	7	7	-19%	-26%	-12%
	Subscriber Payments	1,397	-	-100.0%	14.3%	0.0%	1,214	168	15	-	-	-	-100%	-89%	-
	Total	**9,789**	**7,331**	**-25.1%**	**100%**	**100%**	**4,195**	**2,963**	**2,631**	**2,507**	**2,433**	**2,391**	**-11%**	**-21%**	**-2%**
Total Expenditure		**18,031**	**14,810**	**-17.9%**	**-**	**-**	**6,959**	**5,314**	**5,758**	**5,362**	**4,768**	**4,680**	**-8%**	**-9%**	**-7%**

Table 2 Total Expenditure Overview

4.2. Capex Proposed Expenditure

Capital expenditure is decreasing during the First Regulatory Cycle at a CAGR of 10%. Reductions in category-level proposed expenditure are present across all categories, however, key material reduction items over the FRC can be seen within Capability and Other Capex. These items include FTTN-FTTP Build, which tapers off over the FRC (whilst the related connection capex increases), the Fixed Wireless Upgrade, which reduces at a CAGR of 29%, and IT (Systems Engineering) which reduces at a CAGR of 21%.

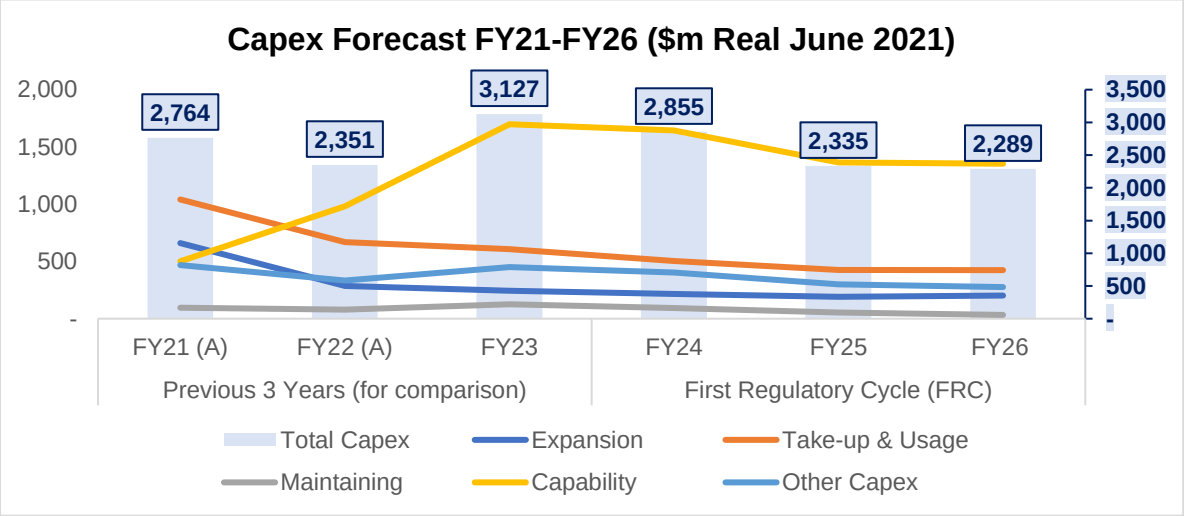

Figure 10 Capex Forecast FY21-FY26 ($m Real June 2021)

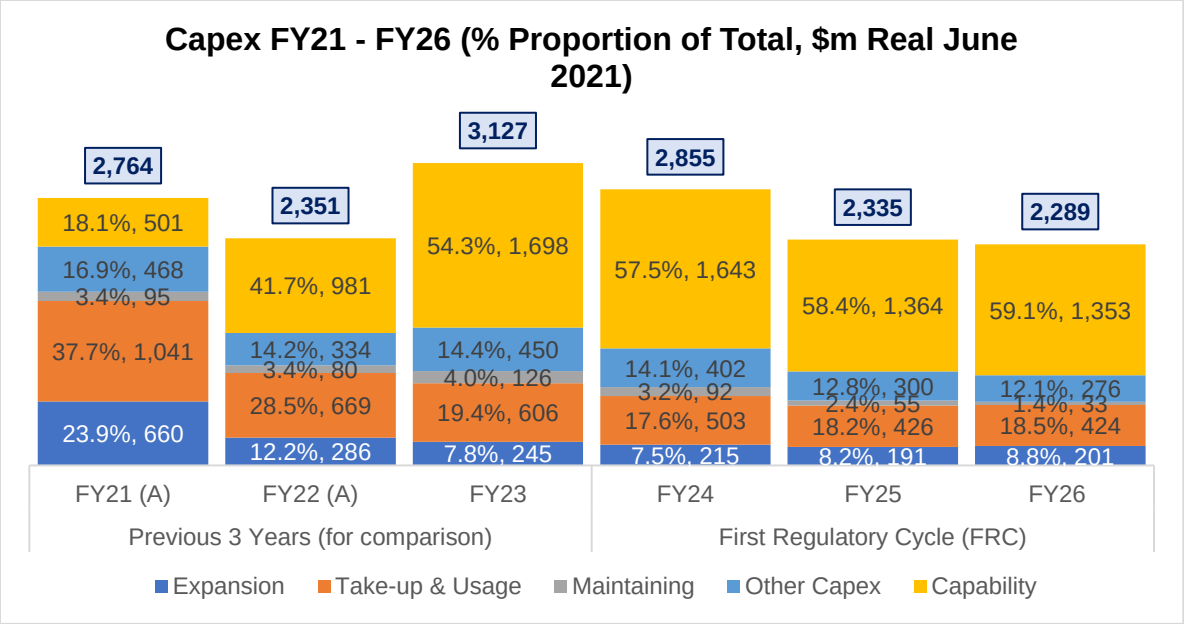

Figure 11 Capex FY21 - FY26 (% Proportion of Total, $m Real June 2021)

Comparing the FRC proposed expenditure against the previous period (FY21-FY23), significant reductions are present across all categories except for Capability, which has 37% more capital proposed over the FRC due to the upgrade of ~3.5m premises to FTTP which includes build and connection proposed expenditure, $2.3b and $833m over the period, respectively. 'Other' proposed expenditure increases within Capability include the Fixed Wireless Upgrade and Regional Co-Investment.

Despite the overall reduction in spend between the two 3-year periods evident, some items within the categories increase materially. HFC Capacity proposed expenditure is 81% higher than FY21-FY23, and Commercial Works are 39% higher.

4.3. Opex Proposed Expenditure

Operating expenditure is decreasing at a rate of 2% CAGR over the FRC. This is driven by decreases in proposed expenditure across all opex categories except Infrastructure Payments, which is increasing at a CAGR of 1% over the FRC.

Opex Category	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Infrastructure Payments	794	851				
Direct Operating Costs	731	751	649	595	562	560
Labour	831	665				
Other Opex	606	503				

			[redacted]			[redacted]
Service Level Rebates	20	24	11	9	7	7
Subscriber Payments	1,214	168	15	-	-	-
Total Opex	4,195	2,963	2,631	2,507	2,433	2,391

Table 3 Opex FY21-FY25 ($m Real June 2021)

[redacted]

Opex Category	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Infrastructure Payments	18.9%	28.7%	[redacted]			
Direct Operating Costs	17.4%	25.3%	24.7%	23.7%	23.1%	23.4%
Labour	19.8%	22.4%	[redacted]			
Other Opex	14.4%	17.0%				
Service Level Rebates	0.5%	0.8%	0.4%	0.4%	0.3%	0.3%
Subscriber Payments	28.9%	5.7%	0.6%	0.0%	0.0%	0.0%

Table 4 Opex FY21-FY26 Proportions (% Real June 2021)

Comparing the FRC proposed expenditure against the previous regulatory period of FY21-23, the material changes are:

- a 100% reduction in Subscriber Payments, due to the completion of disconnection from legacy Telstra and Optus networks,
- a 19% reduction in direct operating costs, driven by improved efficiency as well as FTTN to FTTP migration, and

[redacted]

Despite the overall reduction in spend between the two 3-year periods evident, some items within the categories increase materially. Network Operating Costs are 4% higher in the FRC than in the previous 3 years. This is driven by increases across Rack Power, Pole Rental, Spectrum / Apparatus Licences, Satellite Outsourced Services (139%), Fixed Wireless Site Rental, and Site and Network Access. Other opex items that are higher in the FRC include the TUSMA Levy, Insurance (62%), and Vendor Support Contract Costs.

4.4. Flow-On Effects of Capex Initiatives

A number of NBN Co's capex initiatives reduce expenditure items across capex and opex. The table below summarises this across the capex item, its description, as well as the affected expenditure item and description of the effect.

Capex Item	Description	Impacted Item	Consequence Description
Expansion – Initial Build	The completion of the initial build (i.e., going from 'build' to 'run') carries inherent flow-on effects	**Opex - Labour**	Reduction of approx. [redacted] through the reduction in capex investment and build activity required during the build phase
		Capex – Connect & Assure	Reduction of new build related connection truck rolls
		Opex - Subscriber Payments	No forecast expenditure for disconnections from legacy networks under the Telstra Arrangements
Capability – Network Upgrade Initiative - FTTN to FTTP Upgrade	The build and subsequent on-demand connection of premises within the upgraded FTTN to FTTP footprint will result in lower costs across multiple expenditure items	**Opex - Direct Operating Costs – Assurance, Restoration and Maintenance: FTTN Service Assurance**	Fewer active FTTN services due to upgrades will result in less FTTN-related Service Assurance opex
		Opex - Direct Operating Costs – Assurance, Restoration and Maintenance: FTTN Network Assurance	Fewer active FTTN services due to upgrades will result in less FTTN-related Network Assurance opex
		Opex - Direct Operating Costs – Assurance, Restoration and Maintenance: FTTN Network Maintenance	Fewer active FTTN services due to upgrades will result in less FTTN-related Network Maintenance opex
		Maintaining Capex: Copper Remediation on FTTN Network	Copper remediation will not be required on FTTN services that are upgraded to FTTP
Other Capex – IT (Systems Engineering) - Enterprise Simplicity	Decommissioning of 166 applications across NBN Co's IT function	**Opex - Labour**	Reduction of approx. [redacted] is expected through the Enterprise Simplicity Programme
		Capex – Other Capex – IT (Systems Engineering)	Reduced IT & Systems capex through simplified applications

		Opex - Other Operating Costs – IT and Software Costs	BAU IT & software costs reduction through simplified applications

Table 5 Flow-On Effects of Capex Initiatives

4.5. Differences between Proposed Expenditure and Associated Volumes and Unit Costs

As part of the RFI Process unit costs and volumes were provided for a selection of the initiatives and cost items. Plotted below are the proposed expenditures as presented in NBN Co's SAU Supporting Submission Part F, the proposed expenditures as calculated from the RFI response (volumes multiplied against unit costs), and the difference expressed as a total and as a percentage.

When further clarification was sought, NBN Co advised that:

> ***"The Rate and Volume in most cases will not fully account for the costs. This is because we have provided the Key Cost Drivers/KPIs to manage performance and expenditure activity but in almost all cases there will be other costs that are not tracked at a rate and volume level (e.g., overheads, on-costs, one-off expenses, minor spend). Additionally, for Capex the build costs can occur over a series of months, or the rate might be an estimate at completion for the entire footprint cost. Therefore, the rate and volume in any given period will not align."***

The above RFI response notwithstanding, significant differences are noted, including three instances where the RFI-calculated total exceeds the proposed expenditure presented in NBN Co's SAU Supporting Submission Part F.

5. Reconciling the BBM to the IOP

This section explains how the expenditure forecasts for individual expenditure items (which formed part of NBN Co's IOP23 process) which Grex assessed in section 7, reconcile with the expenditure forecasts used in NBN Co's BBM, which forms part of its proposed SAU Variation.

NBN Co has based its (overall) expenditure forecasts for the First Regulatory Cycle on analysis and forecasts that it has prepared as part of its IOP23 process.

The differences between NBN Co's IOP23 expenditures when compared to its BBM expenditures were explained by NBN Co. In summary, capex differences were due to adjustments for movement in construction in progress, and indexation to June 2021, and opex differences were due to an adjustment for indexation to June 2021. The differences were for the 30 November 2022 submission, and Grex notes that these differences may have changed with the 14 August 2023 updated SAU variation. The differences and reconciliations are explained in greater detail throughout this section.

For capex, as described in the ACCC Briefings and RFI Process, whilst the IOP process is an integral and critical component of how NBN Co plans and seeks approval of its operating plan, there is no direct link to the SAU Variation proposal in terms of ongoing monitoring and reporting. Further, there is no direct correlation to the detailed processes and budgets allocated to the various initiatives and programs described by NBN Co in the ACCC Briefings and the BBM.

This is understandable as the BBM has a specific function, which is to calculate annual maximum allowable revenue (ABBRR in the SAU) in order to inform pricing constructs.

The expenditure forecasts contained in NBN Co's proposed SAU Variation are set out in its BBM model. While the BBM is an important regulatory tool which uses expenditure forecasts and other inputs to determine NBN Co's ABBRR and pricing, it does not contain sufficient information to enable a detailed assessment of whether those expenditure forecasts are prudent and efficient.

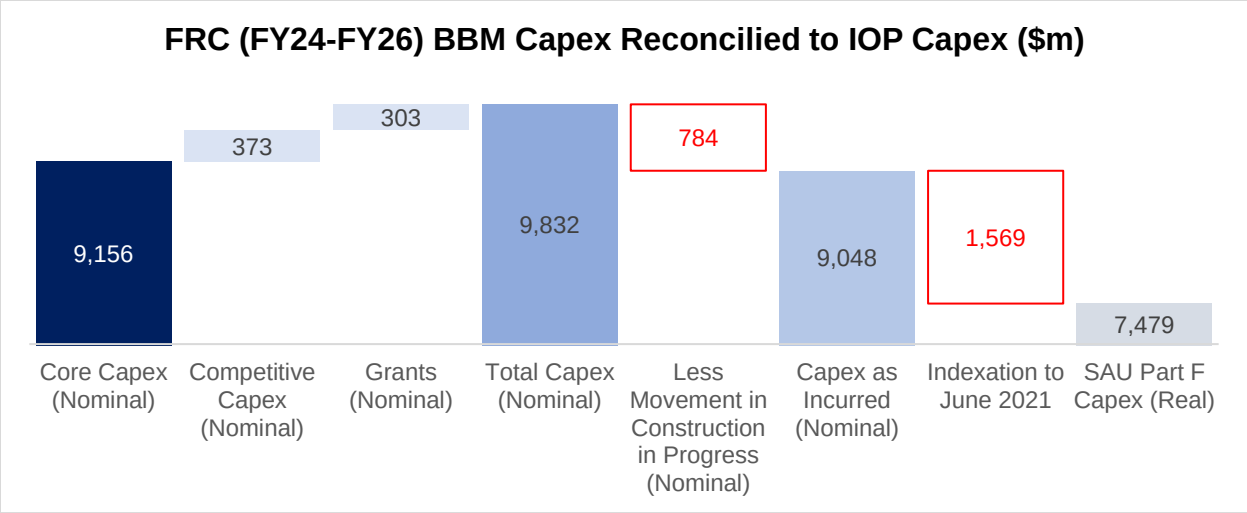

Figure 15 BBM to IOP Capex Reconciliation

The above chart illustrates the relationship between the IOP total capex and the BBM total capex proposed by NBN Co in its proposed SAU Variation. As described above, there is no direct linkage between the initiatives / expenditure items as outlined in the IOP23 documentation described in Appendix C and the capex forecasts included in the BBM. The chart shows the reconciliation of the total nominal capex as presented in the BBM to the real capex as presented in the IOP, as provided by NBN Co during the RFI process described in Part D of this Report and pictured below.

Capex $m's	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Capex BBM @ Nominal Table F4 of submission				**3,470**	**2,884**	**3,175**
Add: Back Grants @ Nominal				100	101	102
Less: movement in construction in progress				231	154	399
Capex BBM @ Nominal - as incurred				3,339	2,831	2,878
Building Block Model - June on June CPI %		6.14%	6.25%	3.69%	3.69%	3.69%
Index rate to convert to real June 2021 dollars	1.000	0.942	0.887	0.855	0.825	0.795
Capex BBM @ Real				**2,855**	**2,335**	**2,289**
Capex SAU Table @ Real-Table F8 of submission				**2,855**	**2,335**	**2,289**

Figure 16 Capex BBM & IOP Reconciliation RFI Response

Grex has reviewed the various expenditure forecasts and determined that the key differences between the numbers are the basis of the forecast development (as-commissioned vs as-incurred), Government grants, movement in construction in progress (CIP) due to the development basis, and indexation to June 2021, which is the base year of the real figures presented in the IOP:

- **As-incurred vs as-commissioned:** NBN Co's IOP capex forecast is on an as-incurred basis and has been converted to an as-commissioned basis in nominal terms for the BBM with the assumption of an average 6-month lag between when capex is incurred and when it is commissioned. This is implemented using half year capex profiles – for example, as-commissioned capex for FY23 is equal to the sum of as-incurred capex in H2 FY22 and as-incurred capex in H1 FY23.
- **Grants:** a number of NBN Co's forecast capex activities are supported by Government grants. These grants are separately accounted for in the BBM and, consistent with this, all forecasts of capex presented in the IOP reflect the 'gross' amount of capex NBN Co will incur in the First Regulatory Cycle (rather than the 'net' amount after accounting for the grants). As reflected in Figure 15, in order to reconcile between the capex presented in the BBM and the capex presented in the SAU Supporting Submission Part F, the value of grants must be added on to the BBM total capex. This is because the value of grant funding is not included within the BBM or RAB, but is included ("baked in") within the initiative and expenditure item-based capex projections presented in SAU Supporting Submission Part F.
- **Construction in progress (CIP):** CIP is a mechanism whereby NBN Co can factor in commissioned construction costs that have not yet been transferred to a permanent asset account. This is important in the BBM due to the effect on ABBRR. However, as the IOP is presented on an as-incurred basis, CIP costs are not relevant and therefore must be removed in order to reconcile the BBM capex with the IOP capex. NBN Co recognises in the carrying amount of an item of property, plant and equipment the value of assets in the course of construction. For the purposes of the actual and forecast information, consistent with the BBM, construction in progress is not allocated to items of property, plant and equipment or intangible assets, and is reported as an aggregate value as at the start and end of each financial year.
- **Indexation**: numbers presented in the BBM are shown in nominal terms. The IOP uses real values in order to better explain the profile of spend over time. In order to compare the BBM values to the IOP values, BBM values must be indexed to June 2021 as per the process followed in IOP23.

The only difference between the BBM operating expenditure and the IOP operating expenditure provided is the indexation to June 2021.

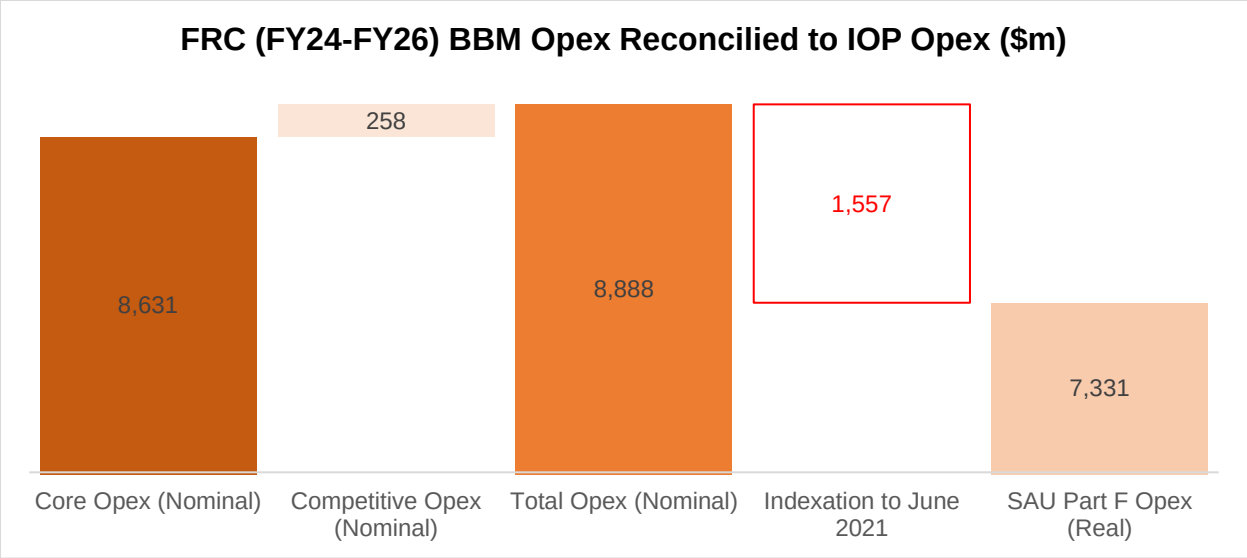

Figure 17 Opex Reconciliation[21]

As with capex, the calculations to reconcile opex from the BBM to the IOP (pictured below) were provided by NBN Co during the RFI Process described in Attachment A.

Opex $m's	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Opex BBM @Nominal - Table F4, 2G.2.1 of submission				**2,932**	**2,950**	**3,007**
Building Block Model - June on June CPI %		6.14%	6.25%	3.69%	3.69%	3.69%
Index rate to convert to real June 2021 dollars	1.000	0.942	0.887	0.855	0.825	0.795
Opex BBM @ Real				**2,507**	**2,433**	**2,391**
Opex SAU Table @ Real - Table F15 of submission				**2,507**	**2,433**	**2,391**

Figure 18 Opex BBM & IOP Reconciliation RFI Response

[21] Competitive Opex calculated as the difference between Total Operating Expenditure and Core Regulated Services as provided in "Public version – Forecasts in support of SAU Variation", 16 December 2022.

6. NBN Co's Core & Competitive Cost allocation assessment

This section assesses NBN Co's cost attribution approach for capital expenditure between Core Regulated and Competitive services.

The approach described by NBN Co can be summarised as follows:

- Allocate capex types that are directly attributable to Competitive Services,
- Identify whether the remaining asset costs in an asset category are solely related to a single connection cost category (FTTx, HFC, Fixed Wireless, Satellite) or, if not, the costs are classified as either Overhead, Shared or Shared-FL (Shared Fixed Line) reflecting that the costs are spread across multiple cost categories incorporating both Core Regulated Services and Competitive Services, and
- If a cost is not attributed to a single cost category, the asset is allocated by either of premises passed, premises connected or provisioned bandwidth.

6.1. Allocation of Shared Costs

The BBM calculations are based on the Premises Passed/Connected and Provisioned Bandwidth. The percentage allocation based on these parameters provides a simple mechanism, that can provide an approximation of the use of shared infrastructure. It does not consider other service parameters that differentiate competitive services such as the SMB Enablement initiative to deliver business grade services.

6.1.1. Service Parameters

Service parameters are not considered in the BBM calculations, that relate to enhanced service support levels and agreements, enhanced network quality of service parameters for the provisioned bandwidth, and shared systems infrastructure for assurance, and IT platforms. The network data usage profile, for an enterprise, may also result in different utilization of shared resources, beyond what the provisioned bandwidth indicates. The performance characteristics can vary between the enterprise service profile and a typical residential service profile.

6.1.2. Summary and Recommendation

Without considering service and usage parameters in the BBM model, the calculation does not reflect the different service levels of Competitive Services.

As Competitive Services there is a need to monitor the appropriateness of the competitive percentage and parameters applied for the shared infrastructure between regulated core and competitive services. This is to ensure costs are allocated according to the service characteristics.

It is recommended that competitive percentage regarding shared infrastructure should also consider the materiality of additional parameters to the provisioned bandwidth in the modelling including (i) service quality, (ii) service standards (e.g., enhanced availability/reliability, customer support for fulfillment and assurance), and (iii) data usage afforded to Enterprise customers.

Some possible key cost metrics to be monitored and identified for Competitive Services that can impact the cost allocation across the shared network include:

- Labour (program/project resources, internal workforce management, operations and assurance of shared network and IT infrastructure),
- Facilities (Data centres),
- Shared Network Infrastructure costs across multiple premises (e.g., transit, switches/routers),
- Network and Service Assurance (e.g., network/service incidents),
- Data Centre Footprint & Costs,
- Network/Service Incidents Type and Resolution Time (per product),
- Network Performance metrics (per product) including network usage,
- Service Quality metrics (per product),
- Technology Finance Costs metrics (e.g., GL codes, number of assets (and type)) (per product),
- Network Capacity Modelling and Forecasts (per product)[22], and
- Assets/inventory (including configuration database, network and service model and network/service inventory).[23]

6.2. Directly Allocated Competitive Costs

The majority of Competitive Costs presented in the BBM are allocated directly [redacted] The below chart illustrates the known and assumed IOP components that comprise Competitive Capex.

[redacted]

[22] Lifecycle capacity upgrades of shared network infrastructure was not considered in the business case beyond the initial years to cater for increased Enterprise Ethernet data usage.
[23] It is noted that the Enterprise Simplicity program is expected to improve this business capability, and NBN Co's desire to be adopt a data-driven operating model.

The chart depicts how Competitive Capex is built up within the BBM, the indexation required to convert the BBM value from nominal to real terms, and the items that comprise the IOP real Competitive Capex.

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7. Expenditure assessment

This section provides a summary of our assessment of the prudency and efficiency of each major expenditure item. Further details of our assessment of each expenditure item are set out in Appendix B.

The initiatives and programs described by NBN Co in the ACCC Briefings have been described in Part B of this Report and are assessed based on the information provided to ACCC by NBN Co in the ACCC Briefings and the RFI Process where relevant.

The assessment of each expenditure item is based on the initiative described and forecast by NBN Co for the First Regulatory Cycle.

The order of the assessment below follows the order of description given by NBN Co in both the SAU Supporting Submission Part F and the ACCC Briefings which mapped across to the categories of expenditure described.

A fuller description of the assessment for each of the expenditure items assessed is provided in Appendix B to this Part C.

The prudency and efficiency of each expenditure item described is assessed against a rating of “Yes”, “Qualified Yes”, “No”, “Qualified No” or “Inconclusive” as explained in section 2.3.

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Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
Capital Expenditure Assessment						
Expansion – Initial Build (Part F, App. A, 2.2)	BAU	$52m	Access and ownership transfer of relevant Telstra legacy assets Resolution of serviceability issues for held orders due to necessary civils works. NBN Co described this as subject to large variation	[redacted]	Reduced activity	**Qualified Yes**
Expansion – New Development (Part F, App. A, 2.2)	BAU	$555m	Bring premises in new developments to ready to connect phase		BAU: Ongoing activity	**Qualified Yes**

[24] 017 ACCC RFI - nbn Response - Tranche 4 - CONFIDENTIAL
[25] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL
[26] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[27] 009 nbn ACCC Briefing - IOP23 - New Developments - CONFIDENTIAL

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
Take-Up & Usage – HFC Capacity (Part F, App. A, 2.3)	Initiative	$277m	Increase HFC network Down Stream (DS) and Up Stream (US) capacity on-demand	[redacted]	DAA upgrade and outside plant modernization plan not provided	**Inconclusive**
Take-Up & Usage – Transit Capacity (Part F, App. A, 2.3)	BAU	$275m	Increase transit network capacity on-demand		BAU: Ongoing activity	**Qualified Yes**
Take-Up & Usage – FTTx Capacity (Part F, App. A, 2.3)	BAU	$34m	Increase FTTx network capacity on-demand		BAU: Ongoing activity	**Qualified Yes**
Take-Up & Usage – Truck Rolls (Connect) (Part F, App. A, 2.3)	BAU	$421m	Customer Connect (first time), achieve 67% saving compared with FY21-23		BAU: Ongoing activity	**Qualified Yes**

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
				[redacted]		
Take-Up & Usage – Truck Rolls (Reconnect) (Part F, App. A, 2.3)	BAU	$112m	Customer reconnect, achieve 16% saving compared with FY21-23		BAU: Ongoing activity	**Qualified Yes**
Take-Up & Usage – Truck Rolls (CSA) (Part F, App. A, 2.3)	BAU	$234m	Customer service assurance (<30 days from connect), achieve 38% saving compared with FY21-23		BAU: Ongoing activity	**Qualified Yes**

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
				[redacted]		
Maintaining – Copper Remediation (Part F, App. A, 2.4)	BAU	$148m	Maintain copper network quality		BAU: Ongoing activity	**Qualified Yes**
Maintaining - Pole Replacement (Part F, App. A, 2.4)	BAU	$3m	Replacement of NBN owned poles for aerial network		BAU: Ongoing activity	**Yes**
Maintaining – LTSS (Part F, App. A, 2.4)	BAU	$28m	Minor upgrades and minor lifecycle replacements for LTSS		BAU: Ongoing activity	**Yes**
Capability – FTTN to FTTP Upgrade (Part F, App. A, 2.5)	Initiative	$2,295m	Enable 3.5m FTTN premises and 1.5m FTTC premises the ability to access FTTP services	First 2m premise passed by Dec 2023 Next 1.5m premise passed by Dec 2025 [redacted]	Finish build by FY26	**Inconclusive**
Capability – N/C to P Connect (Part F, App. A, 2.5)	Initiative	$950m	Migrate FTTN and FTTC end-users to higher speed tier FTTP services on-demand		On-Demand	**Inconclusive**

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
				[redacted]		
Capability - FW Upgrade (Part F, App. A, 2.5)	Initiative	$747m	Achieve 50Mbps TWBPS across all sites All FW premises 100/20 capable, 85% premises 250/20 capable Migrate 120k satellite end users to FW network		Complete all sites upgrade by Dec 2024 Site upgrade post Dec-2024 to maintain committed speeds	**Inconclusive**
Capability - SMB Enablement (Part F, App. A, 2.5)	Initiative + BAU	[redacted]	Demand is planned to increase significantly in FY24-FY26 for nbn Enterprise Ethernet services		This is an ongoing BAU activity. Initial project activities are small and mostly planned for FY21-23	**Not Applicable**
Capability - Regional Co-Investment (Part F, App. A, 2.5)	Initiative	$72m	Contracted upgrade programs. Government co-investment of $300m		Co-funding programs until 2033	**Qualified Yes**
Capability – Other (Part F, App. A, 2.5)	BAU	[redacted]	Tech choice program (funded up-front) and Business Satellite Service enhancements		BAU: Ongoing activity (Tech Choice)	**Qualified Yes**
Other - IT (Systems Engineering)	BAU and Initiative	capex: $617m among			BAU: Ongoing activity	**Qualified Yes**

[28] "[CIC] NBN Co – SAU supporting submission – Efficiency of NBN's expenditure and demand forecasts – 16 December 2022 ("SAU Supporting Submission Part F"), Section A.2.5 Capability, Page 49-50"

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
(Part F, App. A, 2.6)	(e.g., ES25)	which ES25 accounts for $43m (7% of Systems Engineering)	• Optimisation, rationalisation & modernisation of legacy systems • 23% decrease in IT & Software opex (~$130m savings due to ES25, from $566m in FY21-23 to $436m in FY24-26)	[redacted]	Enterprise Simplicity program is initiative planned to complete in FY25. SEO Roadmap includes Horizon 2 and 3 extending to FY31+	
Other - Other Network (Part F, App. A, 2.6)	BAU	$209m	BAU network engineering & security, and operations activities		BAU: Ongoing activity	**Qualified Yes**
Other – Facilities (Part F, App. A, 2.6)	BAU	$50m	Capitalised SME costs for initiatives		BAU: Ongoing activity	**Yes**
Other - Commercial Works (Part F, App. A, 2.6)	BAU	$103m	Cost recovery (construction) due to request of third parties such as property owners, government		BAU: Ongoing activity	**Yes**
Operational Expenditure Assessment						
Infrastructure Payment (Part F, App. A, 3.2)	BAU	[redacted]	Use of Telstra infrastructure such as ducts, exchanges, and fibre	[redacted]	BAU: Ongoing activity	**Yes**

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
				[redacted]		
Direct operating costs – Network Opex (Part F, App. A, 3.3)	BAU	$682m	Opex required to physically operate and maintain the NBN network	The following data has been provided: Rack power: usage and rate Network power: volume and unit cost Pole rental: volume and yearly rental Apparatus license: volume and unit cost FW site: site volume and rental.	BAU: Ongoing activity	**Qualified Yes**
Direct operating costs - Assurance, Restoration & Maintenance (Part F, App. A, 3.3)	BAU	$760m	Service assurance, network assurance and network maintenance	Service assurance: truck roll volume and unit cost by technology Network assurance and network maintenance expenditure ***Assessment note:*** *Unit cost decreases are based on NBN Co's referenced weather pattern forecast and assumed efficiency improvements which have not been received and reviewed for this Report.*	BAU: Ongoing activity	**Inconclusive**
Other Network Costs (Part F, App. A, 3.3)	BAU	$278m	Freight distribution & supply, vendor support contract and others such as fleet vehicle and security	Expenditure breakdown only	BAU: Ongoing activity	**Yes**

Item	Initiative or BAU Activity	Forecast FRC Expenditure ($)	FRC Goal (as described by NBN Co)	FRC Volume & Unit Cost Target[24,25,26]	Deployment Plan	Prudent & Efficient?
Labour Costs (Part F, App. A, 3.4)	BAU Initiatives Enterprise	[redacted]	[redacted]	[redacted]	Progressively to FY26	**Qualified Yes**
Other Operating Costs (Part F, App. A, 3.5)	BAU	[redacted]	Outsourced Services, Advisory, IT & Software Costs, Marketing, Facilities, TUSMA Levy, Insurance, Other expenses	Expenditure breakdown of outsourced services, IT & software breakdown, internal costs are provided	BAU: Ongoing activity	**Qualified Yes**
Service Level Rebate (Part F, App. A, 3.6)	BAU	$23m	Service Level Objectives (failed to meet)	Expenditure breakdown for the following rebates provided: New service never worked. Daily connection rebate Daily service fault rectification rebate Daily missed appointment rebate – connection Daily missed appointment rebate – service fault	BAU: Ongoing activity	**Qualified Yes**
Subscriber Payments (Part F, App. A, 3.7)	BAU	$0m	Disconnection of legacy networks (Initial build)	Zero forecast expenditure	BAU: Ongoing activity	**Not Applicable**

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8. Glossary

Selected terms used in this Report are set out and described below. For the most part these terms are sourced from the documentation provided as listed in Attachment A to this Report together with the SAU Variation itself. Where there is any inconsistency between a term below and the SAU Variation, the term used in the SAU Variation will apply.

Term	Description
AAS	Access Aggregation Switch
ABBRR	Annual Building Block Revenue Requirement
ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
AER	Australian Energy Regulator
ARPU	Average Revenue Per User
AVC	Access Virtual Circuit
BAU	Business As Usual
BBM	Building block model
BSS	Business Satellite Services
CAA	Centralised Access Architecture
CAGR	Compound annual growth rate
Capex	Capital Expenditure
CMTS	Cable Modem Termination System
CNI	Common Network Infrastructure
CPE	Customer Premises Equipment
CPI	Consumer Price Index
CVC	Connectivity Virtual Circuit
DAA	Distributed Access Architecture
DFN	Distribution Fibre Network
DOCSIS	Data Over Cable Service Interface Specifications
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
DWDM	Dense Wavelength-Division Multiplexing
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortisation
ES25	Enterprise Simplicity 2025
FRC	First Regulatory Cycle (1 July 2023 to 30 June 2026)
FTE	Full Time Equivalent
FTTB	Fibre-to-the-Building
FTTC	Fibre-to-the-Curb
FTTN	Fibre-to-the-Node
FTTP	Fibre-to-the-Premises
FTTx	Fibre-to-the-Building, Fibre-to-the-Curb, Fibre-to-the-Node, and Fibre-to-the-Premises
FW	Fixed Wireless
FY	Financial Year
GBE	Government Business Enterprise

Term	Description
Gbps	Gigabits per second
HFC	Hybrid Fibre Coaxial
HST	High Speed Tiers
ICRA	Initial Cost Recovery Account
IOP	Integrated Operating Plan
IRR	Internal Rate of Return
IWF	Internal Field Workforce
LFN	Local Fibre Network
LTIE	Long-term interests of end-users
LTSS	Long Term Satellite Service
MAC-PHY	Media Access Control - Physical
MBHT	Mean busy hour throughput
Mbps	Megabits per second
mmWave	millimetre Wave
MTM	Multi-Technology Mix
NBN	National Broadband Network
NBN Co	National Broadband Network Company Pty Ltd
OLT	Optical Line Terminals
Opex	Operating Expenditure
POI	Point Of Interconnection
PM	Project Management
RAB	Regulatory Asset Base
RCIF	Regional Co-investment Fund
RFI	Request for Information
RSP	Retail Service Provider
RTC	Ready-to-connect
SAED	Site Acquisition, Environment and Design
SAU	Special Access Undertaking
SIP	Statutory Infrastructure Provider
SMB	Small and Medium-sized Businesses
SOE	Statement of Expectations
STM	Speed Tier Mix
TAND	Technical Aggregation Node and Development
TC	Traffic Class
TC-4	Traffic Class 4
TFR	Total Fixed Remuneration
TOW	Ticket of Work
TSA	Temporary Staff Arrangement
TUSMA	Telecommunications Universal Service Management Agency
TV	Terminal Value
TWBPS	Typical Wholesale Busy Period Speeds
UFA	Universal Fibre Architecture
USO	Universal Service Obligation
VO	Voice Only
WAPC	Weighted Average Price Control
WBA	Wholesale Broadband Agreement
WNTD	Wireless Network Termination Device

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Appendix A: Further context – expenditure objectives, expenditure factors and themes

As summarised in Part B of this Report, NBN Co has provided a description of its expenditure processes and proposed approach to the First Regulatory Cycle and beyond through various documents, including the SAU Variation and its supporting submissions.

NBN Co has specified in the SAU Variation[29] how its considers that its forecasts of expenditure (capital and operating) reasonably reflect the prudent and efficient expenditure that an operator in NBN Co's position would incur in achieving the following objectives:

i. meeting the expected demand for products and services,
ii. complying with all Regulatory Requirements,
iii. implementing a project or program which is the subject of a Government Policy Project Notice, and
iv. maintaining and improving the quality, reliability, safety, security and integrity of supply of any products and services, including by meeting the Benchmark Service Standards which are to apply in the relevant Regulatory Cycle.

Together, these "Expenditure Objectives"[30] are given further context by NBN Co in its SAU Supporting Submission Part F, including in relation to government policy[31], demand forecasting methodology, product and network roadmaps, risk and governance[32].

Additionally, the SAU Variation specifies the following Expenditure Factors[33] in forecasting the prudent and efficient expenditure that an operator in NBN Co's position would incur in achieving the Expenditure Objectives:

i. actual and expected Relevant Expenditure in previous Regulatory Cycles, and historical trends in Relevant Expenditure,
ii. expected end user willingness to pay for NBN Co's products and services, including as to connections, speed requirements, data volumes, quality and reliability,
iii. the extent to which Relevant Expenditure includes expenditure to address the concerns of Access Seekers and Consumer Advocacy Groups as identified by NBN Co in the course of its engagement with such persons,

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[29] SAU Variation, Schedule 2G.2.5.
[30] CONFIDENTIAL] "nbn Special Access Undertaking Variation 2022 – Supporting submission, Part F: Efficiency of nbn's Expenditure and Demand Forecasts", November 2022, Chapter 20.4, Expenditure Objectives, Page 12-13
[31] NBN Co describes the Statement of Expectations and more broadly government policy. For the purposes of this Report the latest Statement of Expectations has been reviewed. It is also noted and acknowledged that NBN Co is subject to external governance frameworks including but not limited to the Commonwealth GBE – Governance and Oversight Guidelines and the Public Governance, Performance and Accountability Act 2013 (Cth) (PGPA Act) and related legislation and guidance materials ("PGPA Requirements").
[32] SAU Supporting Submission Part F, A.1.4, pages 32 – 37.
[33] SAU Variation, Schedule 2G.2.5.

iv. current and reasonably anticipated future market conditions, including the extent to which NBN Co must adjust product and service quality to meet competition,

v. NBN Co's procurement and governance framework, and whether NBN Co's asset management and planning framework reflects generally accepted industry standards and practice,

vi. NBN Co's ability to finance Relevant Expenditure,

vii. the substitution possibilities between Operating Expenditure and Capital Expenditure, and

viii. any other relevant matters.

Additionally, through the assessment process described in this Report, NBN Co has described a further set of expenditure themes as defined through its IOP[34]. These themes are described by NBN Co as building on NBN Co's purpose, vision, strategic objectives and needs to drive the expenditure plans, and recognise and reflect the operating environment and regulatory requirements.

The most recent IOP23 describes six expenditure themes which focus on the promotion of the long-term interests of end users (LTIE) include:[35]

- End user experience,
- Successful partnerships,
- Resilient and reliable network,
- Upgrading and evolving the network over time,
- Build a sustainable, efficient business, and
- Supporting regional and remote Australia.

These descriptions from NBN Co are given within the broader context of the regulatory regime which seeks to promote the LTIE (Long Term Interests of End-Users) of carriage services and services provided by means of carriage services, whereby the CCA[36] requires the ACCC to consider whether the following broad objectives are being met:

- promoting competition in markets for listed services,
- achieving any-to-any connectivity in relation to carriage services that involve communications between end-users,
- encouraging the economically efficient use of, and economically efficient investment in the infrastructure by which these services are supplied, and any other infrastructure by which these services are, or are likely to become capable of being supplied, and
- provide for the end-users' economic interests, which includes sustainably lower prices, increased quality of service and greater diversity and scope in product offerings.

[34] 001 nbn ACCC Briefing – IOP23 Expenditure Overview – CONFIDENTIAL, "IOP23 Expenditure Themes",
[35] "001 nbn ACCC Briefing – IOP23 Expenditure Overview – CONFIDENTIAL", Page 6, IOP23 Expenditure Themes
[36] Competition and Consumer Act, 2010 (Cth), section 152AB(2).

NBN Co also discussed some matters that were additional to the above objectives, factors and themes when explaining its view that the forecast expenditure items were prudent and efficient. Most notably, NBN Co looked to support its key capital projects based upon claimed consistency with government policy, as made evident in the Statement of Expectations (SOE). It is unclear from reviewing the contemporaneous documentation of NBN Co's IOP23 process whether the expenditure objectives and factors that have been proposed in the SAU variation were driving NBN Co's decision making at that time. Rather, the IOP23 documentation was centred around six themes which are connected less directly to the more general concepts of prudency and efficiency.

In summary, Grex has given regard to the Expenditure Objectives and Expenditure Factors as an input into the expenditure forecasts prepared by NBN Co and described in this Report.

Appendix B Detailed assessment description

To support the findings from the assessment summarized in the previous section, this section describes the detailed assessment Grex has carried out, and Grex's expert opinion on the prudency and efficiency of each major expenditure item.

CAPITAL EXPENDITURE

1. Expansion - Initial Build[37]

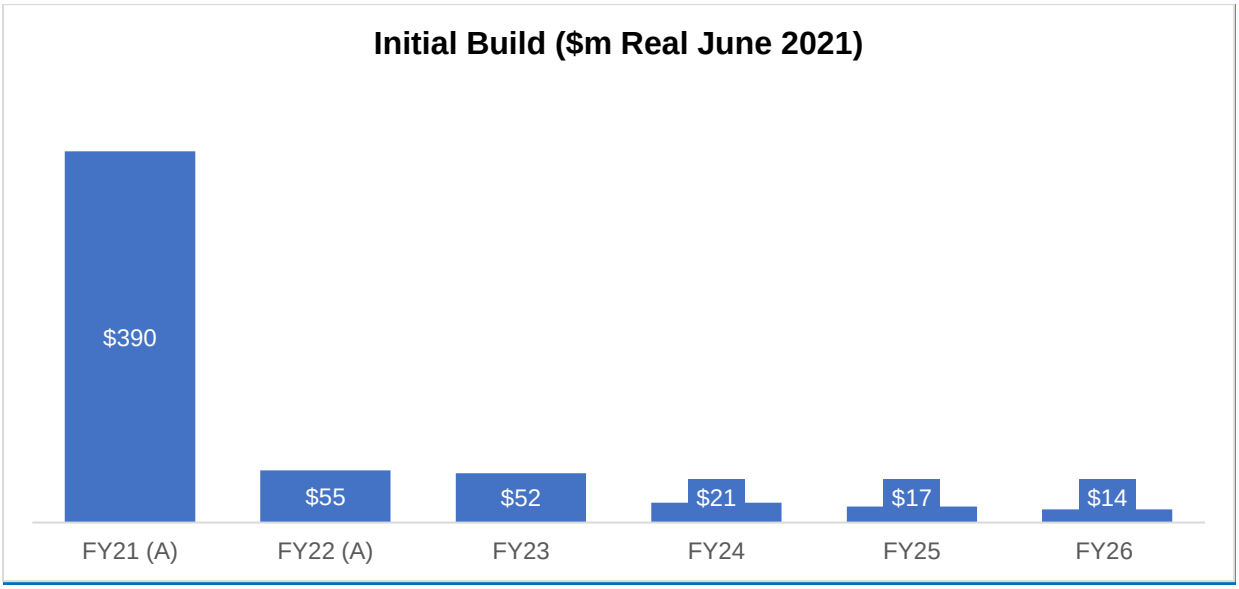

Figure 20 Initial Build ($m Real June 2021)[38]

The NBN network is treated as built and fully operational. However, $52m during the FRC is forecast in capital expenditure under "Expansion" in the SAU Variation. This relates to two areas:

- Expenditures related to the Telstra Arrangements for data and support requirements concerning the access and ownership transfer of relevant Telstra legacy assets, such as lead-in conduits. No volume or unit cost metrics have been provided, and
- Resolution of serviceability issues for a small remaining group of first-time connections to the NBN network that became held orders due to the necessary civil works required to facilitate connection. The average cost per premise for held order remediation is [redacted] with a range of [redacted][39]. No volume data has been provided.

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes**, as:

- This represents the remaining connections from the Initial Build that required civil works, and transfer of Telstra legacy assets.

[37] SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.2, Expansion Page 41
[38] SAU Supporting Submission Part F
[39] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL (RFI #20).

- The cost per premise is significantly higher than new connections, but this reflects the different nature of the connection requiring additional civil works and contracted Telstra arrangements and Grex considers this reasonable in the circumstances.

2. Expansion - New Developments - Build[40]

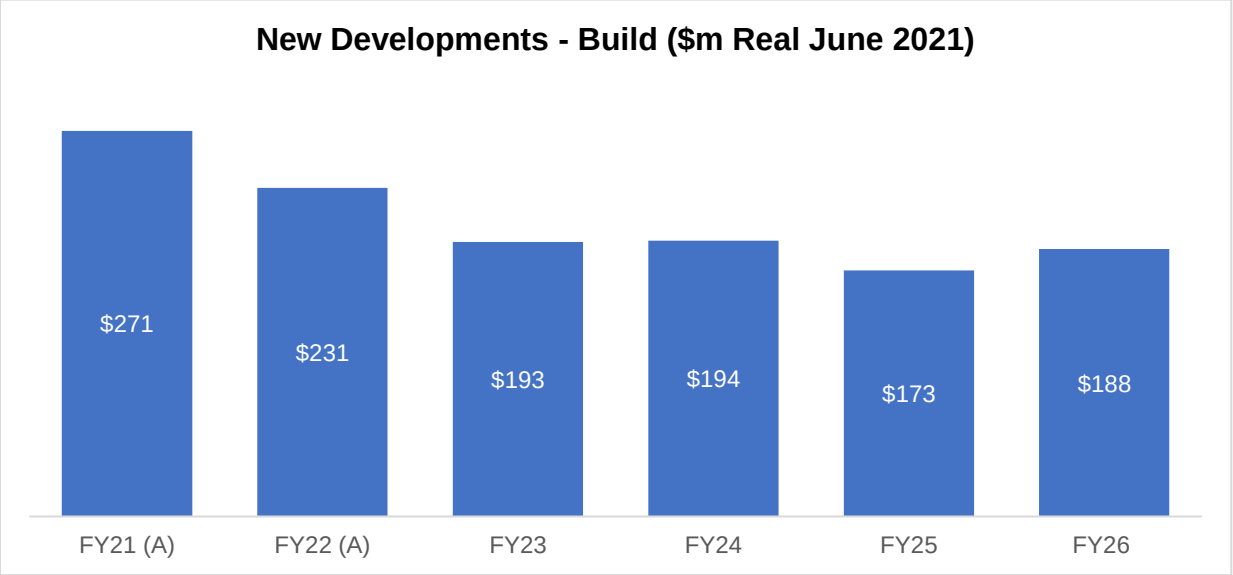

Figure 21 New Developments - Build ($m Real June 2021)[41]

The New Developments initiative represents most of the capital expenditure forecast by NBN Co under "Expansion" in the SAU Variation and ACCC Briefings, with a forecasted $555 million over the Forward Rollout Cost of the total $607 million for total Expansion, compared to $695 million from FY21-FY23 (-20%).

At present, New Developments total 1.2 million premises Ready to Connect (RTC), incurring $2.1 billion in build-related capex, which equates to an average of $1,750 per premise. Of the 1.2 million RTC premises, 91% have been delivered via Fibre to the Premises (FTTP), while the remaining 9% were delivered via Fibre to the Node (FTTN), Fibre to the Building (FTTB), Fibre to the Curb (FTTC), or Hybrid Fibre Coaxial (HFC).

This proposed capital expenditure only refers to the capital expenditures required to bring premises in new developments to ready to connect phase, while the capital expenditure for connecting individual premises to the network in the street falls under NBN Co's description of forecast expenditure for "Take-up & Usage". Build activities encompass the design and build of both the distribution network and in-estate component (LFN).

[40] Refer to "009 nbn ACCC Briefing – IOP23 – New Developments - CONFIDENTIAL" and SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.2, Expansion Page 41
[41] SAU Supporting Submission Part F

Figure 22: New Development Drivers[42]

New developments are classified as SD1s or SD2s, with SD1s being large developments of 8+ premises and accounting for 87% of volumes. SD2s are smaller developments of up to 8 premises, accounting for the remaining 13%. Volumes are influenced by national new developments and an assumed share for NBN Co as the population expands. Costs are influenced by technology type, distances involved, the number of premises per development, dwelling type (Single Dwelling Unit (SDU) vs. Multi-Dwelling Unit (MDU)), location (metropolitan vs. regional), and build type (residential vs. commercial).

[42] 017 ACCC RFI - nbn Response - Tranche 4 - CONFIDENTIAL

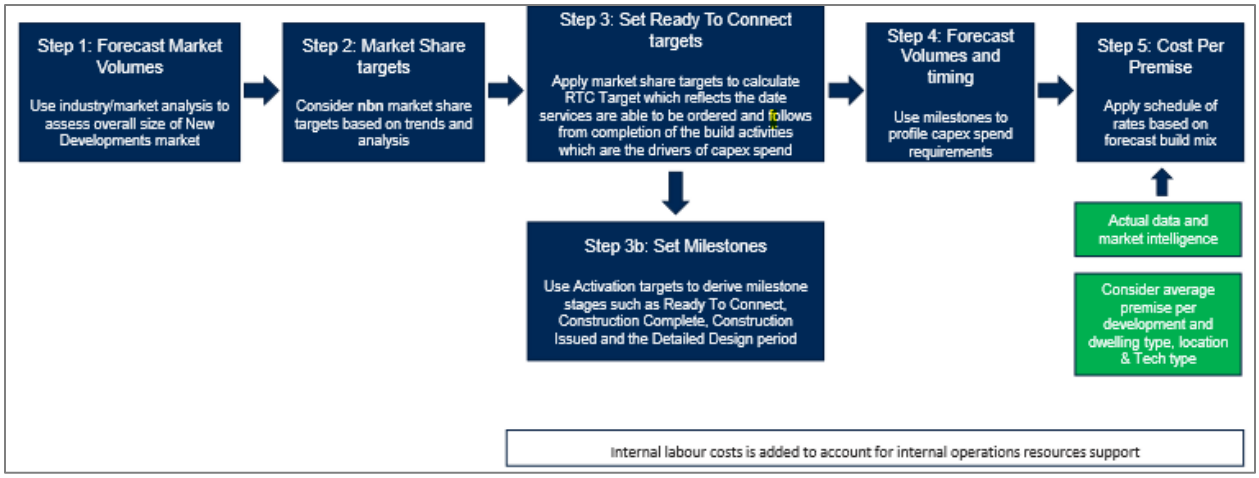

Figure 23: New Development – Build, Forecasting Approach

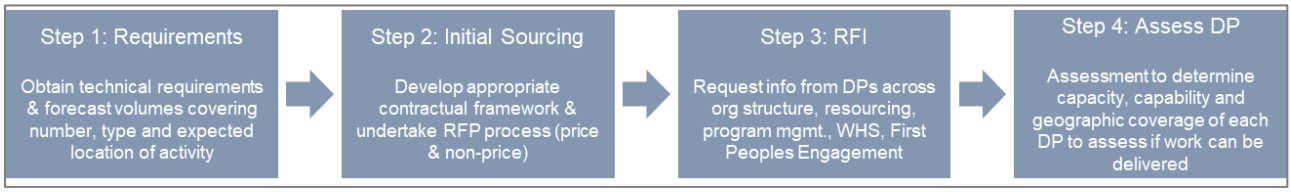

Figure 24: New Development – Build, Delivery Approach

Key risks for this initiative include construction-driven risks such as supply chain delays and resource shortages, as experienced during the Covid pandemic. Remedial action will be taken when required, such as implementing a fourth Delivery Partner to take on held order volumes. Successfully bidding for new development opportunities, determining the appropriate technology mix, and the average premises per development are also critical factors that are considered by NBN Co.

Volumes for national new developments are driven by:

- Population expansion,
- Number of Constructions commenced, and
- Assumed market share for NBN Co.

The costs drivers per premises for new developments include:

- technology type,
- distances involved,
- number of premises per development,
- dwelling type (SDU vs MDU),
- location (metro vs regional),
- build type (residential vs commercial), and
- internal labour and fixed contract overheads.

NBN Co has described how these costs are based on actual data and market intelligence, all of which appears reasonable and logical. NBN Co describes the reduction in Cost Per Premise (CPP) as a direct result of contract efficiencies, cost optimisation initiatives and a favorable movement in the build mix[43].

The key monitoring metrics per premises for new developments used by NBN Co include:

- Target outcome volumes: e.g., [redacted] and
- Costs Per Premises (CPP) annually to ensure efficiencies are realised.

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes**, as:

- This is a BAU activity that is necessary for having premises ready to connect for new developments. Further detailed information on the activity to qualify the assessment further was not made available during the RFI Process.
- There is a continued decrease in the Cost Per Premise over the FRC due to improved efficiencies.
- The expenditure is based on demand forecasts related to new planned developments.

However, Grex's opinion is qualified as further detailed information on the activity to enable the assessment of the expenditure forecast was not made available.

3. Take-up & Usage – HFC Capacity[44]

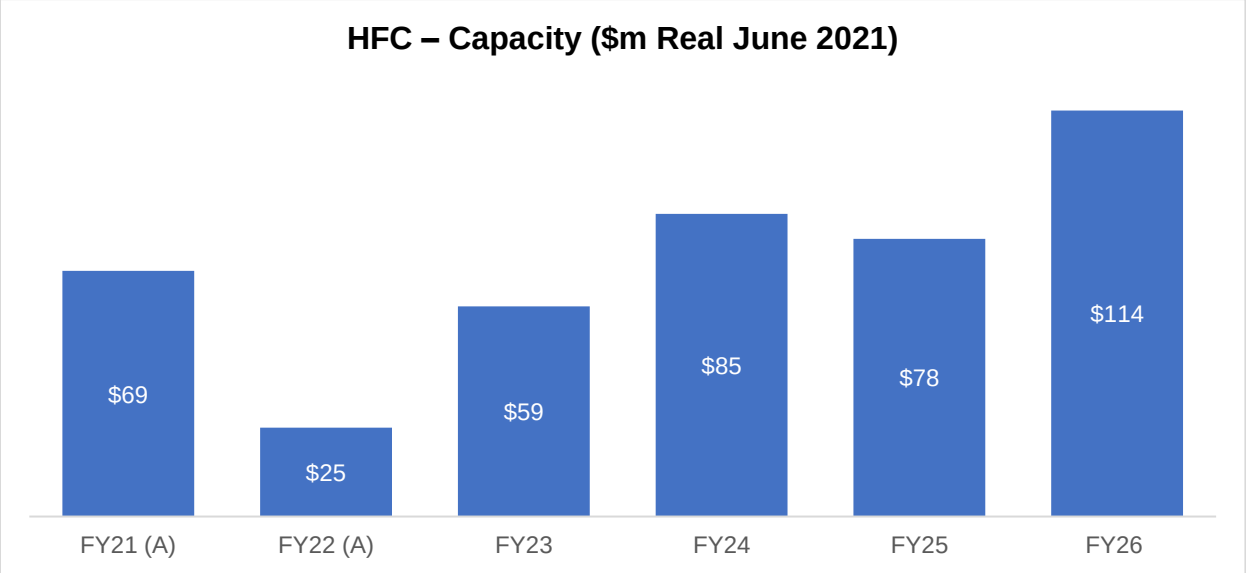

Figure 25 HFC – Capacity ($m Real June 2021)[45]

[43] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[44] SAU Supporting Submission Part F, Chapter A.2.3, Take-up and Usage, pages 41 – 43, with more detail provided in 010 nbn ACCC Briefing – IOP23 – Capacity – CONFIDENTIAL and through the RFI Process.
[45] SAU Supporting Submission Part F

Figure 26 HFC Capacity Upgrade - Breakdown provided 26 April 2023 ($m Real June 2021)[46]

NBN Co provided a breakdown of the HFC Capacity Upgrade on 26 April 2023 across Augments (Splits, Sherpa), Enterprise Licensing Agreement, Plant Modernisation/DAA, and Other. A further breakdown of Plant Modernisation/DAA was provided on 7 July 2023, illustrated below:

[46] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL

Figure 27 HFC Capacity Upgrade - Plant Modernisation / DAA Breakdown provided 26 April 2023 ($m Real June 2021) [47]

The expenditure allocations for Plant Modernisation / DAA provided on 7 July 2023 differed from those provided earlier in the process in FY23 and FY24, with allocations of $7.5m less and $0.1m greater, respectively. The remaining Forward Rollout Cost expenditure allocations match previous information. The below figure highlights this.

[47] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL

Figure 28 Plant Modernisation / DAA Expenditure Differences ($m Real June 2021)[48],[49]

NBN Co has advised[50] the reason behind the differences in values above.

NBN Co provided unit costs and volumes throughout the process, culminating in the below values across CAA augments, outside plant deployed, and DAA nodes deployed.

[48] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
[49] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[50] Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023

Figure 29 HFC Capacity Upgrade Unit Costs multiplied by Volumes ($m Real June 2021)[51],[52]

NBN's HFC network represents the second biggest technology in NBN Co's MTM in terms of homes passed (2.5m), just behind FTTN. The HFC network has been upgraded to DOCSIS 3.1 recently, as described by NBN Co.

Traditionally, "Node Split" has been the main method of increasing upstream and downstream capacity by splitting a single Radio Frequency (RF) segment covered by a single optical node into two segments by adding a second optical node. However, in the upcoming FRC and beyond, NBN Co has described how it is planning to adopt new technologies to increase the network capacity, namely Outside Plant Modernization and Distributed Access Architecture (DAA) Node Upgrade whereby:

- Outside plant modernisation, which includes replacement of RF amplifier and enables upstream spectrum expansion and future downstream spectrum expansion, and
- DAA involves moving the physical and MAC layer of the CMTS functions to the node (Remote MAC-PHY), as described in one of the IOP briefing sessions[53]. However, another supporting document provided in late Apr 2023 by NBN Co had described that Remote PHY (instead of Remote MAC-PHY) is the preferred DAA technology of

[51] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
[52] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[53] nbn/ACCC SAU - Expenditure Briefings – Capacity, 20th Jan 2023

choice[54]. DAA has been described as offering multiple benefits such as increased capacity, reduced latency, power and space reduction in exchanges, more cost economical digital optical fibres, and virtualisation/cloud-ready CMTS (remaining upper layer functions).

Grex notes that there is a change in HFC capacity solution to DAA from Node Split. NBN Co has advised[55] that DAA will be deployed as a node split, to digitise backhaul and drive the upstream from 85MHz to 204MHz

An illustration of these upgrade approaches is provided below:

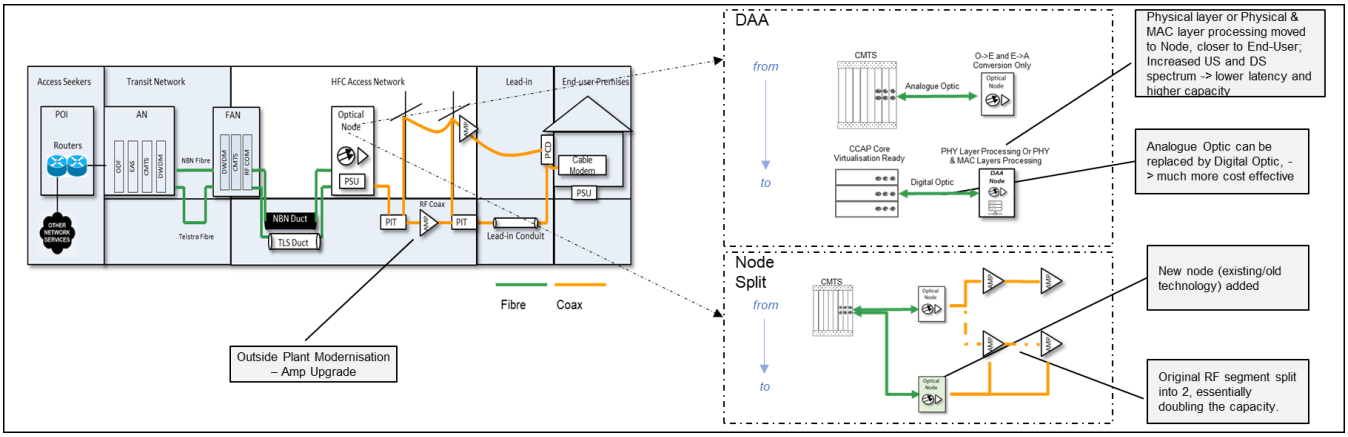

Figure 30: HFC network architecture, and capacity upgrade mechanisms through DAA and Node Split[56]

From the information provided through the ACCC Briefings and RFI Process, it is understood that both methods will offer upstream and downstream capacity uplift by allowing more downstream spectrum (up to 1.2GHz) and upstream spectrum (mid-split and high-split).

It has also been described by NBN Co that the high-level purpose of the initiative is to meet customer demand on a just-in-time model. However, no information on the specific target network capacity utilization as well as the current baseline network capacity and trigger thresholds for upgrade has been provided by NBN Co outside of the following high level volume (i.e. no units, rationale), as part of multi-year deployment plan[57]:

- Outside plant: 750, 750, 750
- DAA node upgrade: 50, 200, 200
- Physical Node Split: 28, 6, 49
- Virtual Node Split: 12, 2, 34
- Coax rebalance: 2, 7, 44

[54] 028 Board Paper 20th March 2023 DAA – CONFIDENTIAL
[55] Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023
[56] NBN Network Design Rules – June 2022. Note – diagram illustrated now shows generic DAA technology as opposed to Remote MAC-PHY only for accuracy to reflect most recent briefing from NBN Co.
[57] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

It is worth nothing that through the ACCC Briefings and RFI Process, the information presented on the details of Node Split was inconsistent, as explained below.

In late Apr 2023, NBN Co provided additional support information on its HFC capacity upgrade strategy, in particular a board paper dated March 2023 describing the DAA strategy. From the additional, more recent information, NBN Co describes its plans to upgrade the HFC network using DAA, with the long-term plan (10 years+) leaving options to migrate to FTTP. This approach is similar and aligned the approach being taken by other international cable operators in the US and Europe.

NBN Co provided additional written supporting information to ACCC on 7 July 2023. The written submission highlighted the following:[58]

- In Sep 2021, NBN Co considered and assessed three high level options regarding long term HFC upgrade strategy:

  1 – Do nothing, i.e., continue to augment HFC using current CAA architecture (e.g., through node splits);

  2 – Evolve to DAA and DOCSIS 4.0; and

  3 - Overbuild with FTTP.

  A high-level rationale provided by NBN Co indicated that Option 2 was preferred due to its optimal combination of forecasted capital expenditure, network performance and end-user experience.

NBN Co provided further written submissions on the overall HFC long term DAA strategy[59] as follows:

- The architecture decision to move to DAA was made in September 2021,
- A high-level roadmap from now (2023) until 2040 includes descriptions by NBN Co of:
  - Amplifier upgrades to enable the move of plant split from 65 MHz to to 204 MHz,
  - Deployment of DAA technology using Remote PHY. This description differs from the Remote MACPHY mentioned in the IOP briefing meeting for HFC dated 20 January 2023,
  - (Option to) Virtualise remaining CMTS functions. Major equipment and chipset vendors have also expressed willingness to support CMTS and DAA equipment in the mid-term,
  - Scaled deployment of DFN/LFN fibre into HFC in coordination with DAA deployment, and
  - (Options to) Eventually migrate HFC services to FTTP and decommission HFC.

As part of its more recent briefings, NBN Co described a change in direction with a decision to deploy Remote PHY (as communicated in April 2023) from Remote MAC PHY (as communicated in IOP briefing session on 20 January 2023).[59] To explain this recent decision, NBN Co has cited

[58] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[59] 028 Board Paper 20th March 2023 DAA – CONFIDENTIAL

global industry alignment to Remote PHY, led by US Tier 1 cable operator Charter along with its own assessment from a capital efficiency, supply chain risk, solution simplicity, time to market and technology debt perspective and further communication/alignment with US tier 1 cable operators (including a senior executive visit to US and Europe in early 2023).

In documentation provided in July 2023, NBN Co has also described different technology options to increase HFC capacity including:[60]

- increasing upstream capacity by using high-split (204 MHz) with an 85 MHz channel plan through amplifier upgrade[61], then
- deploying NBN's Universal Fibre Architecture (UFA) which supports both DAA,
- (options for) eventual FTTP overbuild (if chosen in the future), deploying DAA through node upgrade which further increases upstream capacity through high split, while deploying battery backup to increase resiliency, and
- increasing downstream capacity by upgrading passive devices.

NBN Co also provided a more granular breakdown of DAA upgrade and Outside plant modernisation (amplifier upgrade) as part of this additional explanation. [62]

Some risks have been identified and described by NBN Co such as technology choice and dependency on Foxtel users migrating off the HFC network. Other risks are assumed to include:

- Early DAA Deployment:
    - DAA deployment using Remote PHY would be one of the first in the Asia Pacific region. Although with many Tier 1 US operators deploying this technology[63,64,65,66,67,68], the risks are lower (see above note on assessment by NBN Co of its decision from a capital efficiency, supply chain risk, solution simplicity, time to market and tech debt perspective).
    - Delivery partners may have limited experience and skills of DAA deployment, which could cause potential delays, and installation quality issues. NBN Co has indicated it is working with the industry to increase available resources with skills and experience[69].
- External factors limiting upstream and downstream capacity:
    - Delayed Foxtel customer migrations impacts both Upstream and Downstream capacity upgrade. It is required for the key high-split upstream capacity uplift which utilise up to 204MHz for upstream traffic. There are existing Foxtel

[60] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[61] Wording in this bullet point has been amended to reflect further explanation provided by NBN Co (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).
[62] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[63] https://www.lightreading.com/cable/ccap-next-gen-nets/comcast-eyes-scale-deployments-of-remote-phy-in-2018/d/d-id/746421
[64] https://www.lightreading.com/cable-tech/cable-harmonizing-around-comcasts-daa-path-harmonic-ceo-says-/d/d-id/781470
[65] https://www.lightreading.com/cable-tech/charter-changes-approach-for-its-cable-access-network---sources-/d/d-id/781338
[66] https://www.nctatechnicalpapers.com/Paper/2021/2021-modernizing-cox-communication-s-access
[67] https://www.lightreading.com/cable-tech/10g/with-83000-daa-nodes-deployed-comcasts-10g-network-upgrade-remains-on-track/d/d-id/783815
[68] https://www.lightreading.com/cable-tech/charter-plots-big-multi-gig-network-wireless-upgrades/d/d-id/782333
[69] 010 nbn ACCC Briefing - IOP23 - Capacity - CONFIDENTIAL

customers present in 9,307 HFC segments, among which 664 segments are critical to the DAA strategy. Delayed Foxtel customer migrations may trigger 'regret' Node Split activities to increase capacity[70]. Among NBN Co's provided documentation on 7 July 2023, this particular risk appears likely to be mitigated by Foxtel turning off all broadcast HFC channels by 31 Oct 2023 and NBN Co and Telstra's commercial agreement to shut down remaining Foxtel HFC channels on the nbn network by 31 October 2023[71].

- Upstream capacity in particular is also limited by the reservation of DOCSIS upstream channels for Telstra use, which can only be freed up if all Telstra customers migrate off the segment. This limitation would have an impact to the total upstream capacity.

- 'Regret' Node Split expenditure.
  - If a node split has to be performed instead of outside plant modernisation or DAA node upgrade, this is potentially 'Regret' investment that incurs technology debt, as any Node added as part of Node Split, which uses current technology, will need to be upgraded to DAA node in the future[72].
  - The information provided NBN Co on Node Split has been inconsistent throughout the RFI process, e.g., '019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL' only listed DAA and amplifier upgrade volume in the IOP extract, yet mentions node split volume in the risk description, '020 ACCC RFI - Grex consolidated - nbn Response 24 March – CONFIDENTIAL' has a different set of node split volume, without any DAA and amplifier upgrade data.
  - Using the node split volume and unit cost provided in '020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL', the expenditure attributed to physical node split, virtual node split and coax rebalancing is ~$21m. This compares to total FRC expenditure forecast of $277m. This indicates that the majority of the capacity upgrade is met by amplifier upgrade and DAA node upgrade (although with no unit cost information provided), which makes technological sense. Further information provided by NBN Co includes unit cost for DAA and outside plant modernisation which account for $~125m[73]. The remaining costs of ~$130m are attributed to DFN, LFN, labor and integration, and Other, without further breakdown[73].
  - The risk section of '019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL' states that there is an 'exponential need' for node splits in FY26 and FY27, with volumes many times of that documented in '020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL'. This could be interpreted to means that the expenditure on node split could be significantly higher than $21m.
  - The above inconsistency introduces challenges in the assessment as

[70] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL
[71] NBN Co has recently advised that this process is progressing (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023)
[72] NBN Co has advised that any "regret spend" will be limited (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).
[73] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL

1) it is not clear if node split is part of the capacity upgrade program and what the forecast volume is,

2) if node split is part of the capacity upgrade program, the trigger point for node split and the drivers of the node split volume are unclear, and

3) for any node/segment that requires capacity upgrade, the prioritisation / selection criteria to choose between node split which is current and soon-to-be legacy technology, and long-term technologies such as amplifier upgrade, DAA node upgrade are not clear.

In conclusion, the prudency and efficiency of this expenditure is **inconclusive**, as some of the information provided indicates that the expenditure forecasts are prudent and efficient, including:

- NBN appears to have considered different options in the early stages of a decision-making process including a 'Do Nothing' scenario as the base case. A high-level roadmap to reach target state over four phases, until 2040, is described.
- NBN Co's strategic choice of upgrading the HFC network using DAA technology appears to align with industry practice, with the long-term goal of eventual conversion to FTTP through progressive extension and deepening of fibre into the network.
- The choice of Remote PHY, as the preferred DAA technology, aligns with international cable operators, especially Tier 1 US cable operators who operate some of the largest HFC networks in the world.
- There appears to be continued support from key vendors on key HFC product development over the coming years.
- As requested through the RFI Process, NBN Co has now provided a breakdown of DAA upgrade expenditure forecast for the FRC, which includes: Outside plant modernisation, DFN, LFN, inside plant, DAA build & cutover, labour and other costs. NBN Co also provided a unit cost break down for DAA build and cutover.
- Program risks and mitigation strategies have been described.

However, Grex has not been able to form a conclusive view on the prudency and efficiency of this expenditure item as there are a number of risks and uncertainties relating to the project that remain and do not appear to have been addressed at this stage:

- Whilst a high-level roadmap of HFC evolution to 2040 is described,[74] a corresponding (even high-level) business case (e.g., financial model, cost benefit analysis, detailed optionality assessment) has not been provided.
- There is no detailed roll out / deployment plan and no expenditure forecast breakdown for the overall program (except for the previously described FRC period breakdown, and the total Capex estimate for the three high level options[75]), and corresponding capacity demand analysis.

[74] 028 Board Paper 20th March 2023 DAA - CONFIDENTIAL
[75] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 – CONFIDENTIAL (page 35).

- While high long term (target state) benefits to end users are broadly described such as enabling 5Gbps / 2Gbps product and improving network availability, more detailed description of improvement to end-user experience, that is aligned to the program, has not been provided beyond what was provided by NBN Co in section 4.1.1 of 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 – CONFIDENTIAL.
- The rationale of continuing with node splits to augment capacity is not clear. This is legacy technology, increasing the risk of a technology debt being incurred.
- Whilst the forecast volume of amplifier upgrades and DAA node upgrades for the FRC has been provided, the underlying model and calculations to support these volumes have not been provided for the purposes of this assessment.
- The information on high level HFC evolution optionality, choice between Remote PHY and Remote MACPHY, and high-level roadmap until 2040 were all provided in the later stages of the assessment process, specifically between April and July 2023. It is unclear how these are incorporated within the IOP23 decision making process (however, this does not impact this assessment).
- Over the course of Grex's assessment of this expenditure item, it has become clear that this program is in the early stages of assessment, and decision-making on preferred approach. The information on volume and unit cost for the FRC has been provided over many iterations by NBN Co during the RFI process. At times inconsistent information was provided. For example, whether or not node split will be used and the volume of node splits. Whilst Grex updated its assessment, taking into account the evolving decision process and analysis, it highlights that this program is still in its early stages.

4. Take-up & Usage – Transit - Capacity[76]

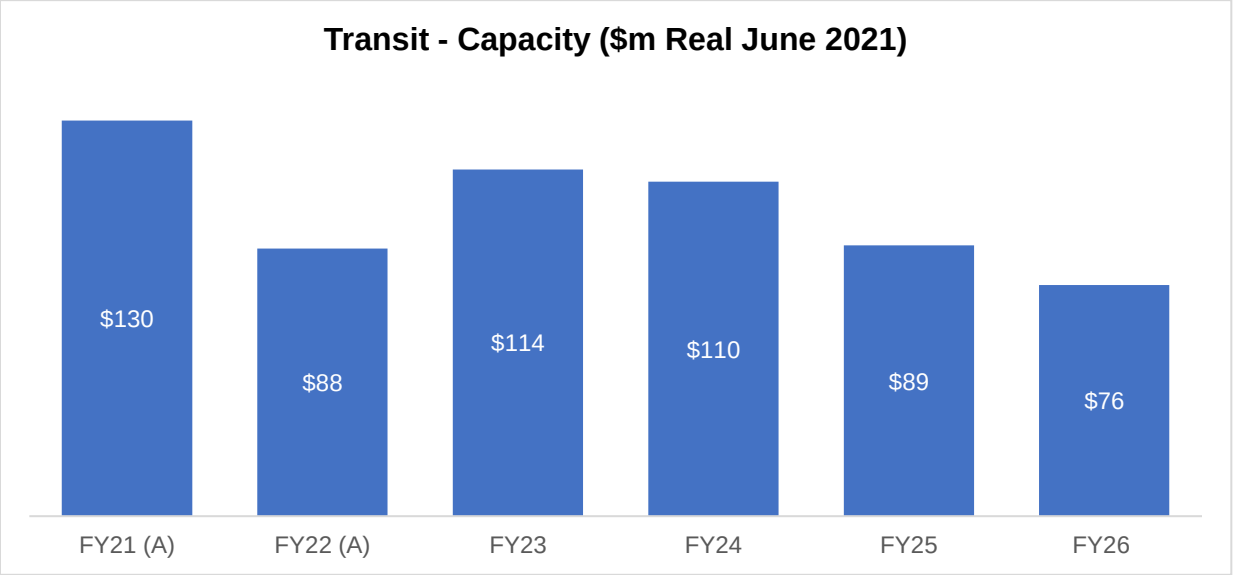

Figure 31 Transit - Capacity ($m Real June 2021)[77]

The Transit Capacity Upgrade is one of the Capacity Upgrade initiatives described by NBN Co in the ACCC Briefings and RFI Process. The transit network is responsible for aggregating traffic from all access networks (except for Satellite, see Figure 32)

The objective of the initiative is to upgrade transit network capacity to meet customer demand in line with forecast traffic growth. It involves just-in-time capacity upgrade of 1) Port Capacity 2) Network/link capacity.

Capex estimate is $275m forecast over the FRC, compared to $332m FY21-FY23 (-17%).

[76] 010 nbn ACCC Briefing - IOP23 - Capacity - CONFIDENTIAL
[77] SAU Supporting Submission Part F

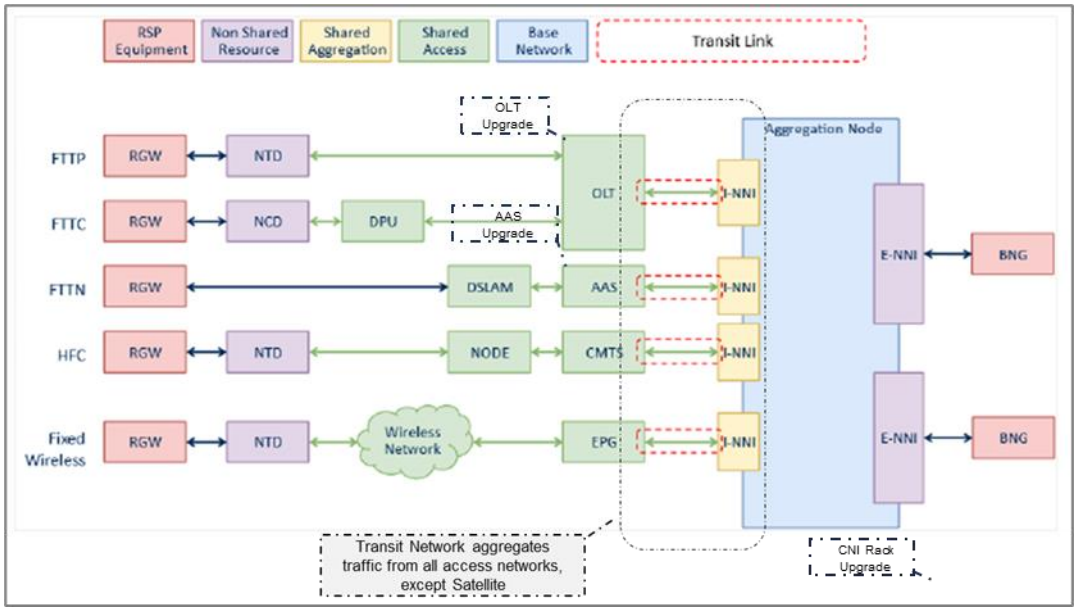

Figure 32: Transit Network Illustration[78]

The volume drivers, in general, are the transit devices and links that need to be upgraded, based on pre-defined trigger points of the capacity usage.

The most recent NBN OpCo reports[79] have listed the following items as part of the Transit Network Capacity Upgrade: CNI Racks, OLTs, AAS, Exchange Readiness. Additional information provided by NBN in April 2023 offered descriptions of these upgrade methods[80]:

- CNI Racks: Equipment and installation services with Common Network Infrastructure racks to secure active equipment held within fibre access node, POIs and aggregation node deports,
- OLTs: The active fibre terminal equipment to provide GPON services,
- AAS: Access Aggregation Switch upgrade to increase capacity, and
- Exchange Readiness: Change work requests undertaken by Telstra with their owned exchange facilities to house additional NBN Co equipment.

Expenditure calculated from the provided volume and unit cost data equates to ~$69m, which is a component of the SAU Variation forecast of $275m. Volume and unit cost metrics for each upgrade method are also illustrated in the figure below.

[78] NBN Co - SAU supporting submission - Part C Non-price terms - 2 December 2022, p24
[79] 013 ACCC RFI – FY213 Opco Report Jan-23 Final – CONFIDENTIAL
[80] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL

Figure 33: Transit Capacity Upgrade Volume & Unit Cost Targets[81]

[81] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

Figure 34 Breakdown of Transit - Capacity Capex ($m Real June 2021)[82]

NBN Co has since provided additional information, in April and July 2023, to account for the remaining ~$206m of expenditure included in the SAU Variation expenditure forecast, as shown above. The cost has been attributed to[83]:

- Aggregation evolution: [redacted]. This was provided on a whole of Forecast Rollout Cost basis and as a result is not included in the above figure.
- Other capacity such as DWDM, TAND: [redacted]. This largely includes Fixed Wireless ([redacted]), Business Fibre Zones ([redacted]) and Connected Communities ([redacted]), plotted in the figure below.

[82] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[83] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL

Figure 35 Breakdown of Transit - Capacity 'Other Capacity' Capex ($m Real June 2021)[84]

- ACT levy, labour and overhead: [redacted]. As part of further supporting documentation provided to ACCC on 7 July, these amounts were further broken down to: [redacted] on ACT Infrastructure Levy and [redacted] on Labour & Overheads[85].

In conclusion, the prudency and efficiency of this expenditure is assessed as "Qualified Yes" for the following reasons:

- Grex considers transit capacity upgrades as a BAU activity, whilst cost expenditure appears reasonable as it includes different upgrade methods as well as labour and overhead costs.
- NBN Co has provided descriptions of various upgrade methods, although a detailed description of benefits and more granular cost breakdown were not provided.

However, Grex's opinion on this expenditure item is qualified as there were limitations in the information provided by NBN Co supporting the expenditure forecast for this item:

[84] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[85] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL

- A full breakdown has been provided for 25% of the total expenditure forecast for this item but not in as much detail has been provided for the remaining 75% where the breakdowns in figures 35 and 36, plus the [redacted] identified for aggregation evolution show a high-level breakdown of the non-unit cost expenditure.
- No description of the four capacity upgrade methods was detailed by NBN Co through the ACCC Briefings, including any explanations of trigger points for capacity upgrade, upgrade methods and target capacity thresholds.
- There is no underlying model, calculations and assumptions supporting the provided unit cost.

Grex requested further detailed information from NBN Co to support Grex's assessment of this expenditure item. This information was not made available. However, a consolidation, analysis and assessment of the provided information was eventually provided by NBN Co. Based on this information, Grex considers that the expenditure is likely prudent and efficient, however, we do not have sufficient information to provide a concluded view on this.

5. Take-up & Usage – FTTx Capacity Upgrade[86]

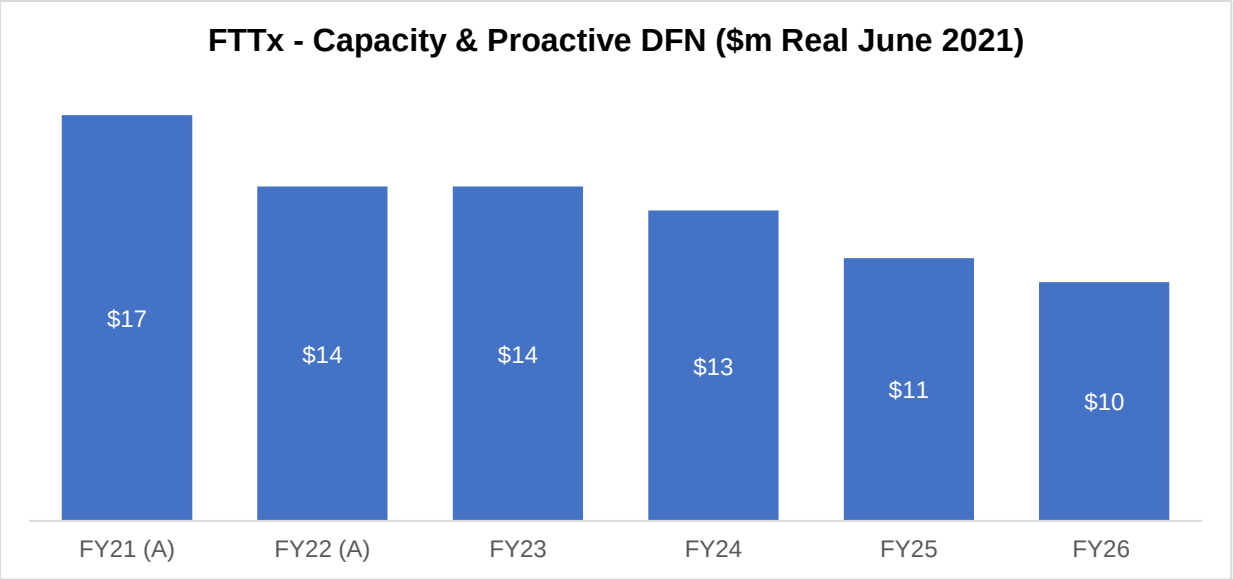

Figure 36 FTTx - Capacity & Proactive DFN ($m Real June 2021)[87]

The FTTx Capacity Upgrade is part of overall Fixed Line Capacity Upgrade initiative, along with the HFC capacity upgrade and Transit capacity upgrade initiatives.

The objectives of this initiative are to:

- Upgrade capacity to meet forecasted customer demand, and
- Minimise 'wasted / regret' capex spend on legacy technologies (vs. FTTN/C/B upgrade).

[86] 010 nbn ACCC Briefing - IOP23 - Capacity - CONFIDENTIAL
[87] SAU Supporting Submission Part F

The scope includes just-in-time capacity upgrade of FTTx nodes and DFN cables. Capex expenditure forecast is $34m over the FRC, compared to $45m FY21-FY23 (-24%).

Volume drivers are the number of FTTx nodes and FDN cables to be upgraded. Generally, for DFN cable/fibre upgrade, the length of fibre is typically the main cost driver, as fibre deployment is labour intensive (e.g., trenching, laying ducts) and incurs high cost.

The cost expenditure items, and volume & unit cost target for each upgrade method is shown below. It is noted that:

- DSLAM expenditure is quite small, and assume to be required lifecycle management, with inflight FTTN to P network upgrade program taken into consideration.
- The total FRC expenditure from the RFI response was initially calculated to be ~$20m which is significantly different to the SAU Variation forecast of $34m.
- NBN Co subsequently provided additional information, between April and July 2023, that shows the remaining ~$14m as allocated to management, overhead & PM (project management) costs[88]. A further breakdown was provided by NBN Co that shows ~$6.8m is attributed to DFN Capacity Management and ~$7.5m attributed to Overhead and PM fees[89].

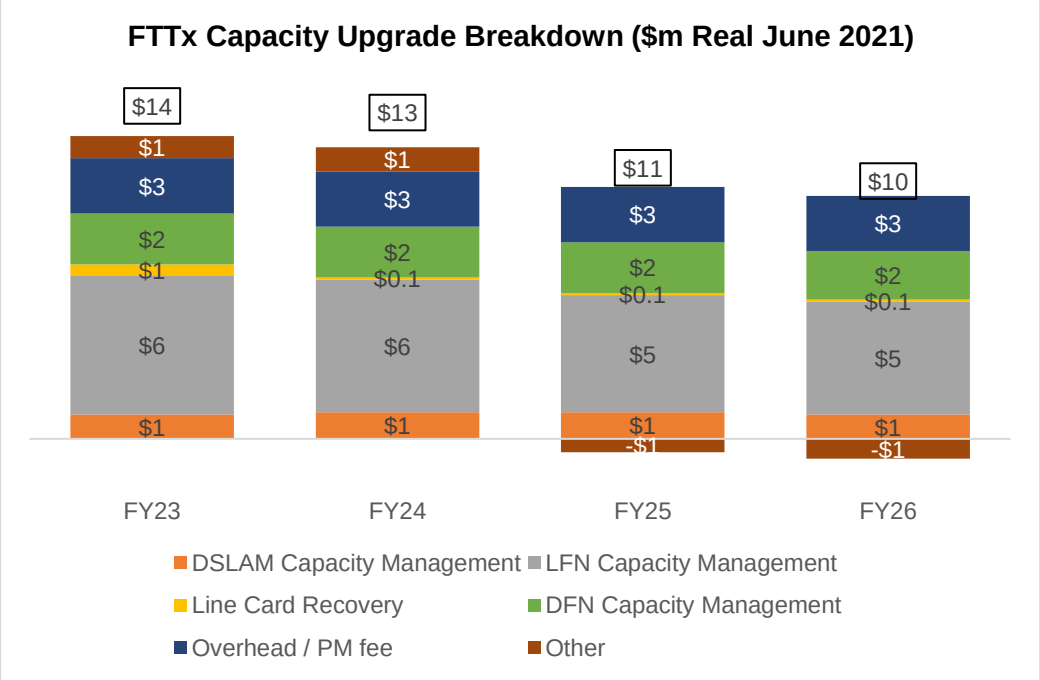

Figure 37 FTTx Capacity Upgrade Expenditure Categories[90],[91]

[88] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
[89] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[90] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
[91] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL

Figure 38: FTTx Capacity Upgrade Volume and Unit Cost Target[92]

In conclusion, the prudency and efficiency of this expenditure is assessed as "Qualified Yes" for the following reasons:

- This is an ongoing required BAU activity,
- It is assumed the forecast expenditure on DSLAM upgrade is required lifecycle management, with inflight FTTN to P network upgrade program taken into consideration.
- Detailed cost breakdown of LFN capacity management and DSLAM capacity management are provided, which appear reasonable.

However, Grex's opinion on this expenditure item is qualified as there were limitations in the information provided by NBN Co supporting the expenditure forecast for this item:

- Total management, overhead & PM costs account for ~41% (which appears to be a significant proportion of overall costs in this item) of total expenditure forecast.[88] This is further broken down to DFN capacity Management and Overhead and Project Management fees.
- There is no underlying model, calculations and assumptions supporting the provided unit cost.

6. Take-up & Usage – Connect & Assure[93]

The NBN Co truck roll activities, as part of the Take-up & Usage capex category comprise: -

- Customer Connect,
- Customer Reconnect, and

[92] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[93] SAU Supporting Submission Part F, Chapter A.2.3, Take-up and Usage, pages 41 – 43, with more detail provided in 008 nbn ACCC Briefing – IOP23 – Truck Rolls – CONFIDENTIAL and through the RFI Process.

- Customer Service and Assurance

For example, this includes ticket of work for customer connect/reconnect requests.

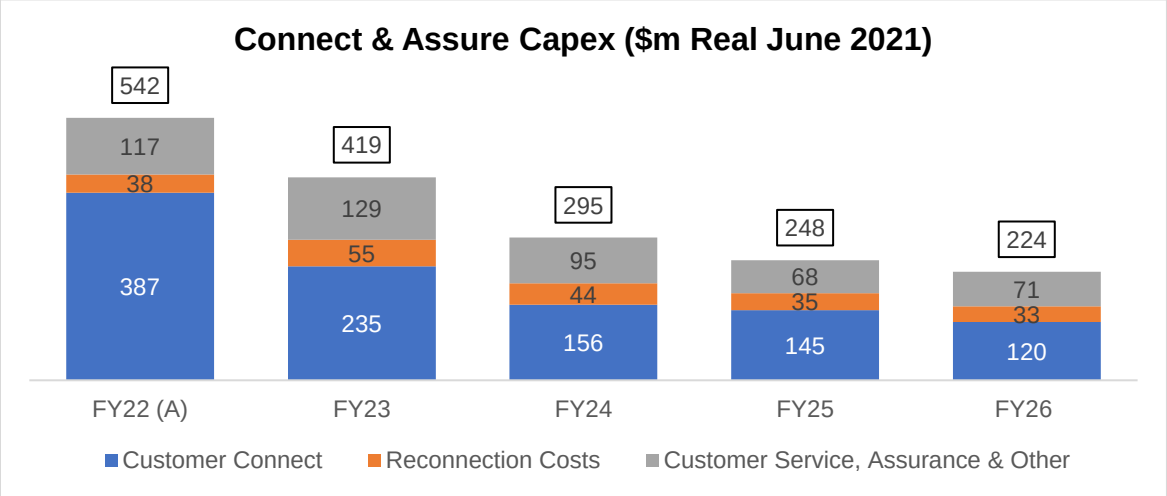

Figure 39 Connect & Assure Capex ($m Real June 2021)[94]

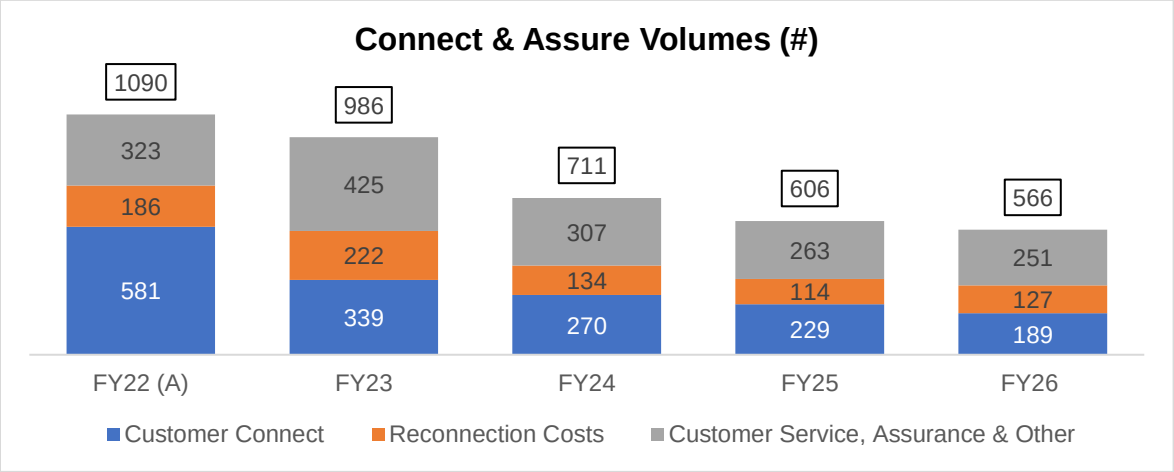

Figure 40 Connect & Assure Volumes[95]

The related NBN Co truck roll activities for Take-up and Usage category related to operating expenditure comprise: Service Assurance, Network Assurance, and Network maintenance.

Truck Rolls is an ongoing business as usual activity with a focus on productivity gains, including the truck roll reduction program (relevant to Customer (Re)Connect). There are forecast savings including reductions in the incidence of the end-user not being in attendance and repeat truck rolls, i.e., the average cost per (Re)connection is forecast to decrease over time in real terms.

Volumes for truck rolls are driven by end-user demand (e.g., New Developments), Customer Experience (i.e., Customer assurance and related service and network Incidents) and maintenance activities. The corresponding monitoring metrics tracked include the truck roll

[94] SAU Supporting Submission Part F
[95] SAU Supporting Submission Part F

volumes, activity type (connect or assure), technology type, Customer not in attendance (NIA), and Use of Self-Replacement Kits (SRKs).

Costs are controlled by a ticket of work (TOW) and are driven by Delivery partner rates, materials, overheads, internal labour costs and technology.

Truck Rolls savings are predominantly the result of the reduction in scale because of the completion of the initial build phase of the NBN network. This has resulted in the reduction in Truck Rolls volumes for take-up and usage needed for end-user connection and service assurance. Revenue is generated directly from these activities, with volumes driven by user and market demand to connect or re-connect. Other reasons for the overall expenditure and volume reduction, as described by NBN Co, are:[96]

- FTTP: reduction in the % of connections requiring remediation and the cost of that remediation by implementing cost control processes.
- FTTN: lower remediation assumptions and increased internal labour efficiency.
- HFC: initiatives to reduce the base rate of the delivery partner and increased internal labour efficiency.
- FTTB: increased internal labour efficiency.
- For FTTC re-connection specifically, there is a higher % of refurbished equipment driving cost reduction.
- Customer service assurance (within 30 days of re-connection) reduction is also due to broader Truck Roll reduction program that is to drive down volume for service assurance across technologies.

Related service assurance costs have decreased with the decrease in (re)connect volumes. There has also been a corresponding decrease in unit costs for (re)connect. This decrease in unit cost implies a further decrease in capex beyond the decrease in volumes. This is not fully reflected in the overall capex savings, with the overall decrease in capex not in proportion to the reported decrease in volumes and unit cost.

In conclusion, the prudency and efficiency of this expenditure is assessed as “Qualified Yes” for the following reasons:

- Capex reductions for connect and assurance result from savings from reduced Truck Roll volumes due to completion of initial build phase.
- There is a corresponding decrease in unit costs for (re)connect, indicating improvements.

However, Grex’s opinion on this expenditure item is qualified as there were limitations in the information provided by NBN Co supporting the expenditure forecast for this item:

- The breakdown and modelling of the activities, improvement initiatives undertaken and market demand that drive the expenditure has not been made available by NBN Co. This information would have assisted Grex to better understand this forecast and the overall benefits/improvements including service quality that may be delivered.

[96] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

- The overall capex reduction was expected to be higher in proportion to the combination of volume reduction and decrease in unit costs. More detailed costs and modelling against the activities and initiatives undertaken can assist to better understand the overall efficiency (and any risk) for the forecast.
- Customer Service Assurance savings are also dependent on the Fixed Line Upgrade migrations of FTTN/C to FTTP.

Understanding the detailed costs and modelling, and the reason that the reductions are not in proportion to the decrease in volumes and unit costs may lead to the discovery of further insights. Therefore, it is recommended that NBN Co expand the system capabilities and detail in monitoring, and reporting of metrics (e.g., data and analytics, delivery partner management) that are in place on the expenditure to verify the trend in reduced volume and unit costs for (re)connect, and the increase in quality (i.e., reduction in assurance costs).

7. Maintaining - Copper Remediation on FTTN Network[97]

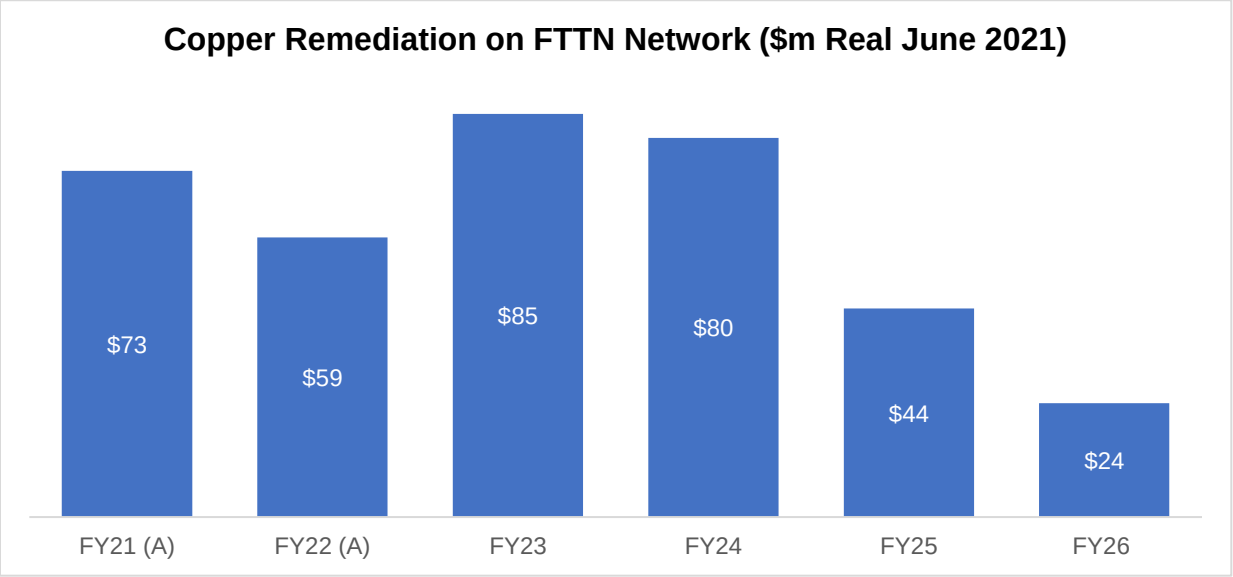

Figure 41 Copper Remediation on FTTN Network ($m Real June 2021)[98]

The “Maintaining” categorisation used by NBN Co for forecast capital expenditure largely relates to ongoing Copper Remediation for the FTTN network to offset asset degradation due to time and weather events, i.e., the key maintenance capex initiative is to remediate or replace ageing or degrading copper assets.

NBN Co has described how it will continue to maintain quality for premises served by all access technologies, including the FTTN network. This is specified by the Benchmark Service Standards incorporated in the SAU.

[97] Refer to “010 nbn ACCC Briefing – IOP23 – Capacity - CONFIDENTIAL” and SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.4, Maintaining Page 43-44
[98] SAU Supporting Submission Part F

The Capex for the ongoing copper remediation on FTTN network to keep up with time-based degradation is forecast for $148m over the First Regulatory Cycle (i.e., 2% of the overall capex spend).

Volumes for the copper remediation are driven by:

- Expected degradation of the copper network: There are ~110k underperforming FTTN premises which do not meet 25/5Mbps, and expected to increase to 212k in FY25 without intervention[99].
- The interaction of the degradation of copper assets with the FTTN to P network upgrade and connect initiatives.

It is noted that the volume and speed of migration of FTTN premises to FTTP (including the underperforming ones described above), subject to the network being ready and end-users willingness to migrate, will have a direct impact on the copper remediation program and the proposed benefits of reduced expenditure.

The key cost metrics for copper remediation initiative include:

- Expected degradation of the copper network,
- The interaction of the degradation of copper assets with the forecast network upgrade initiatives for migrations from FTTN to FTTP network, and
- Length and location of the copper remediation of the FTTN network.

In conclusion, the prudency and efficiency of this expenditure is assessed as “Qualified Yes” for the following reasons:

- This is a required BAU activity.
- Total expenditure per financial year has been provided for the purposes of this assessment, and this is business as usual activity.

However, Grex’s opinion on this expenditure item is qualified as there were limitations in the information provided by NBN Co supporting the expenditure forecast for this item as further detailed information was not made available by NBN Co during the RFI Process.

[99] 010 nbn ACCC Briefing - IOP23 - Capacity - CONFIDENTIAL

8. Maintaining - Pole Replacement[100]

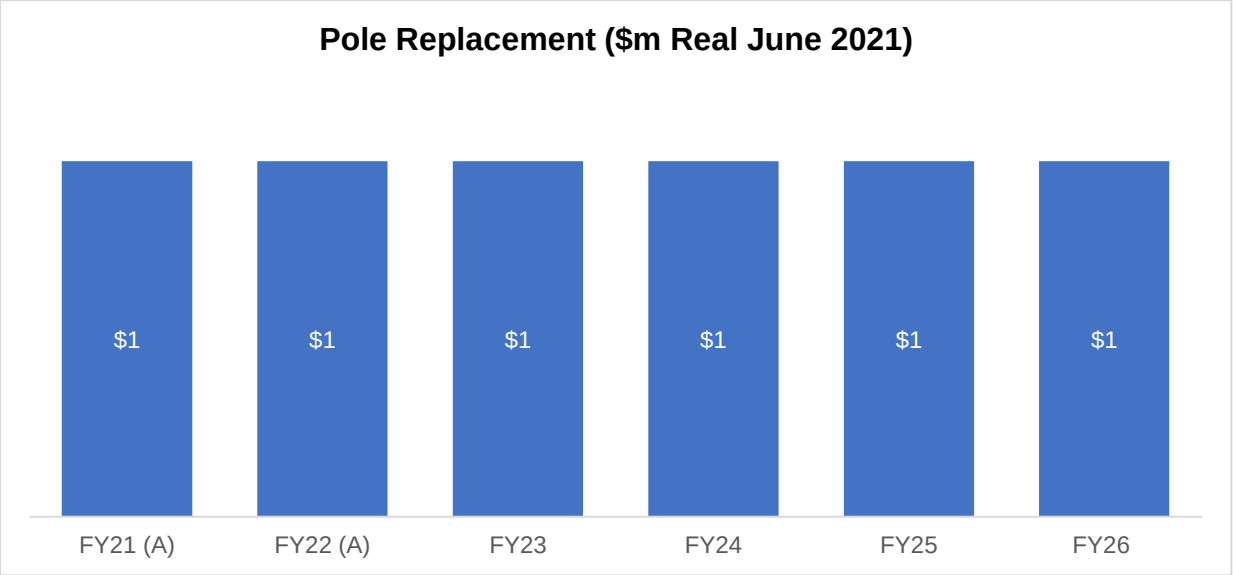

Figure 42 Pole Replacement ($m Real June 2021)[101]

Pole Replacement is targeted for those limited parts of the network deployed aerially on NBN-owned poles. More commonly NBN leases poles owned by local electricity distribution network, with those costs falling under pole rental. The forecast Capex for pole replacement is $3m over the FRC (0.04% of the overall Capex spend).

The volume driver for pole replacement is:

- Number of Poles requiring replacement (i.e., Quality)

The cost driver for pole replacement is:

- Construction costs for each pole.

The key monitoring metrics for pole replacement include:

- Number of Poles replaced against forecast target,
- Cost per pole replacement, and
- Useful life of the poles.

The prudency and efficiency of the expenditure is assessed to be **Yes**, as:

- This is a necessary BAU activity for maintenance of existing infrastructure to provide network availability.
- The costs provided appear to be reasonable, and this represents a small expenditure, dependant on location and nature of works.

[100] SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.4, Maintaining Page 43-44
[101] SAU Supporting Submission Part F

9. Maintaining - Long-Term Satellite Service[102]

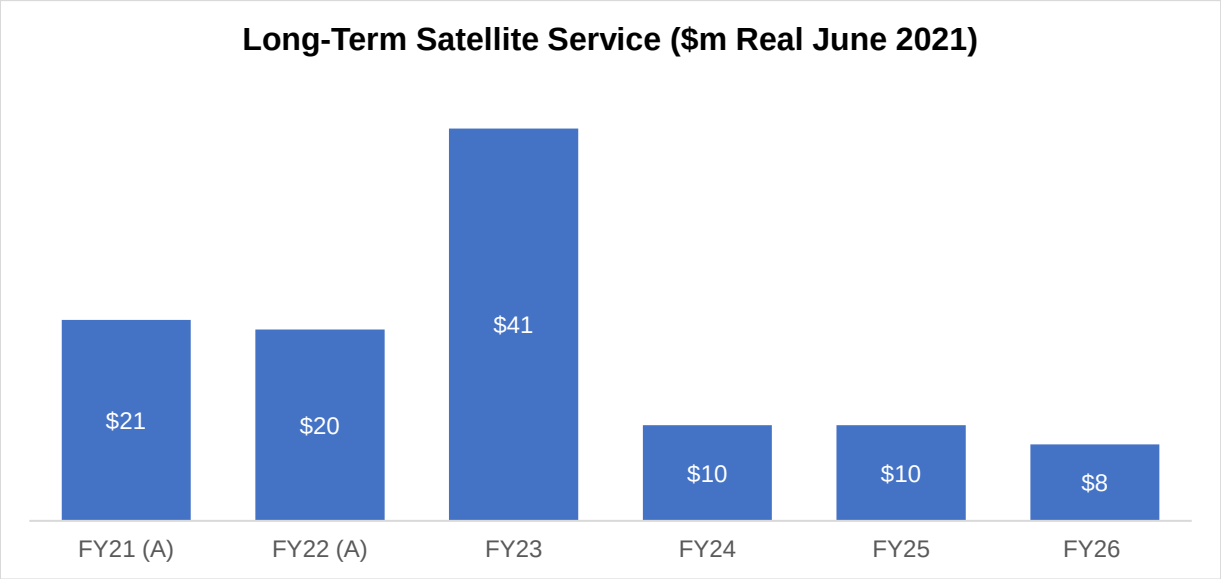

Figure 43 Long-Term Satellite Service ($m Real June 2021)[103]

This initiative provides for minor upgrades (e.g., security patches), minor lifecycle replacements (from FY23) and ongoing capex on the Long-Term Satellite Service (LTSS) network.

This forecast is for $28m over the FRC (0.4% of the overall Capex spend).

Volumes for the long-term satellite is driven by:

- Number of upgrades, and
- Number of lifecycle replacements.

The key cost metrics for long-term satellite initiative include:

- Cost per upgrade, and
- Cost per lifecycle replacements.

The key monitoring metrics for long-term satellite initiative include:

- Number of satellites upgrades/replacements and cost for the program.

The prudency and efficiency of the expenditure is assessed to be **Yes**, as:

- BAU activity for maintenance of existing infrastructure for upgrades and replacements
- Based on the type of activity and the expected variability, and the information provided, and this represents a small expenditure related to upgrades and replacements.

[102] Refer to "007 nbn ACCC Briefing – IOP23 – Regional Upgrades - CONFIDENTIAL" and SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.4, Maintaining Page 43-44
[103] SAU Supporting Submission Part F

10. Capability – Network Upgrade Initiative – FTTN-FTTP Build and FTTN/FTTC – FTTP Connect[104][105]

FTTN to FTTP Network Upgrade and FTTN/C to P Connect are the two biggest initiatives in the FRC, accounting for ~31% & 13% respectively of the total capital expenditure. Together, the initiatives will enhance and uplift the capability of ~3.5m FTTN premises and ~1.5m FTTC premises, by upgrading the networks to FTTP. Other benefits include reduced service assurance expenditure due to fewer incidents on FTTP network, and reduced copper remediation expenditure[113].

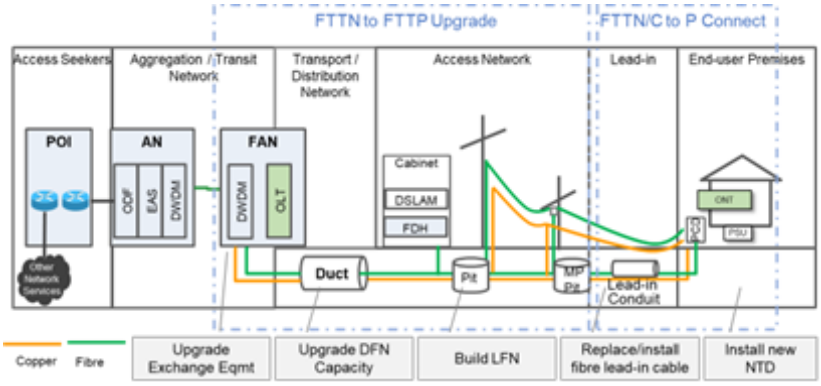

Figure 44 – FTTN to P Network Upgrade & N/C to P Connect - an illustration

[104] SAU Supporting Submission Part F, Chapter A.1.10, Key changes from the March Variation supporting submission, page 36 with further detail provided in 003 nbn ACCC Briefing – IOP23 – Fixed Line Upgrade – CONFIDENTIAL.
[105] Following a further process of information sharing and clarifications post release of the draft Report, further clarifications to the definitions of FTTN-FTTP Build and FTTN/FTTC – FTTP Connect are now incorporated into this expenditure assessment.

FTTN to P Network Upgrade

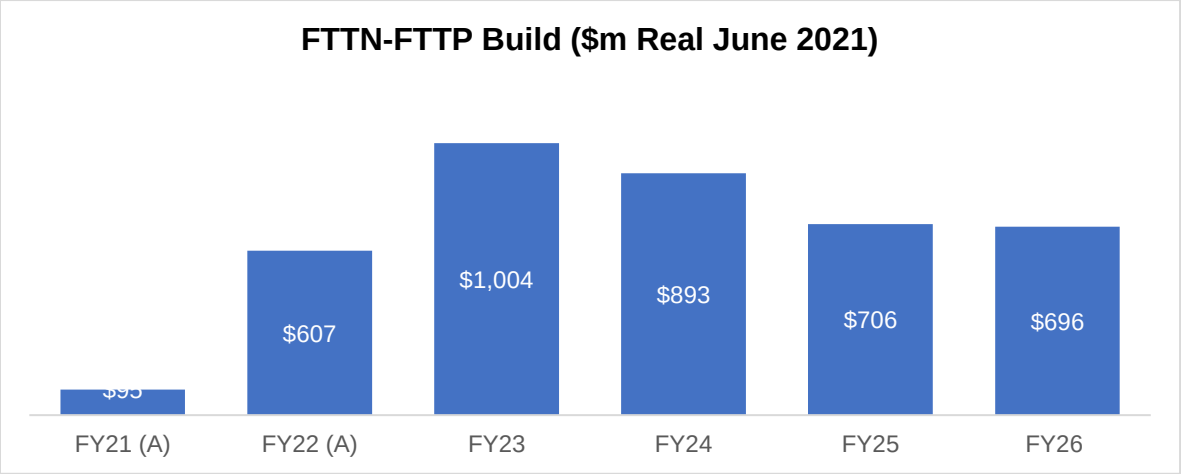

Figure 45 FTTN-FTTP Build ($m Real June 2021)[106]

FTTN to FTTP Network Upgrade primarily involves the building of the local fibre network (LFN) in place of the original copper access network, and the upgrade of DFN capacity and Exchange equipment. NBN Co has described that the rollout is expected to be completed by FY26, with the first 2.0m premise passed to complete by end of 2023 and the remaining 1.5m premise passed to complete by end of 2025. Total forecast expenditure of the initiative is ~$2.3b in FY24-FY26 with the total program costing more than ~$4b[107]. Note there is no LFN upgrade required to support FTTC to P Connect. [redacted]

For FTTN-P build, the volume is largely dependent on the existing FTTN network footprint/areas to upgrade, with the target to complete all LFN build and capacity upgrade within the FY24-26 cycle. For specific area selections, NBN Co uses the following selection criteria[108]:

- Forecast cost per premises to upgrade in an area are lower,
- Anticipated higher demand for higher speed tiers,
- Deployment speed and agility,
- Maximum benefits to customers, and
- NBN Co has also described that to date thus denser ADAs have been prioritised (i.e., areas with an average of ~190 premise vs. national average of 150 premise per ADA).

The volume metrics being tracked and monitored by NBN Co are[109]: Design issued, Construction commenced, Construction completed, Premises ready for migration, Premises ready for order. These are reported at a national level at present. It is recommended that more

[106] SAU Supporting Submission Part F
[107] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL
[108] 003 nbn ACCC Briefing - IOP23 - Fixed Line Upgrade - CONFIDENTIAL
[109] 013 ACCC RFI - FY23 Opco Report Jan-23 Final - CONFIDENTIAL

granular reporting would be useful to provide more insights. This reporting could include the following additional data:

- state level or lower geographical level volume breakdown,
- volume of underperforming FTTN premises ready for migration, as 'proactive migration' of these services are listed as a mitigation strategy to speed up end-user take-up[110], and
- volume of new premises which can potentially connect to fibre, rather than legacy copper, as this is also a described mitigation strategy[110].

NBN Co has described in the document entitled "NBN Co Commentary 19 April" that it tracks metrics at the "SAM" level and regularly reports on the volume of underperforming lines available for migration[111]. This should enable state & regional level reporting, although evidence of such reporting has not been provided and sighted in the preparation of this Report.

The main cost drivers of this initiative are[108]: fibre distances of LFN, proportion of new build required and conditions of the build area.

[110] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL, 'KO Risk Update' worksheet
[111] "NBN Co Commentary 19 April"

FTTN/C to P Connect

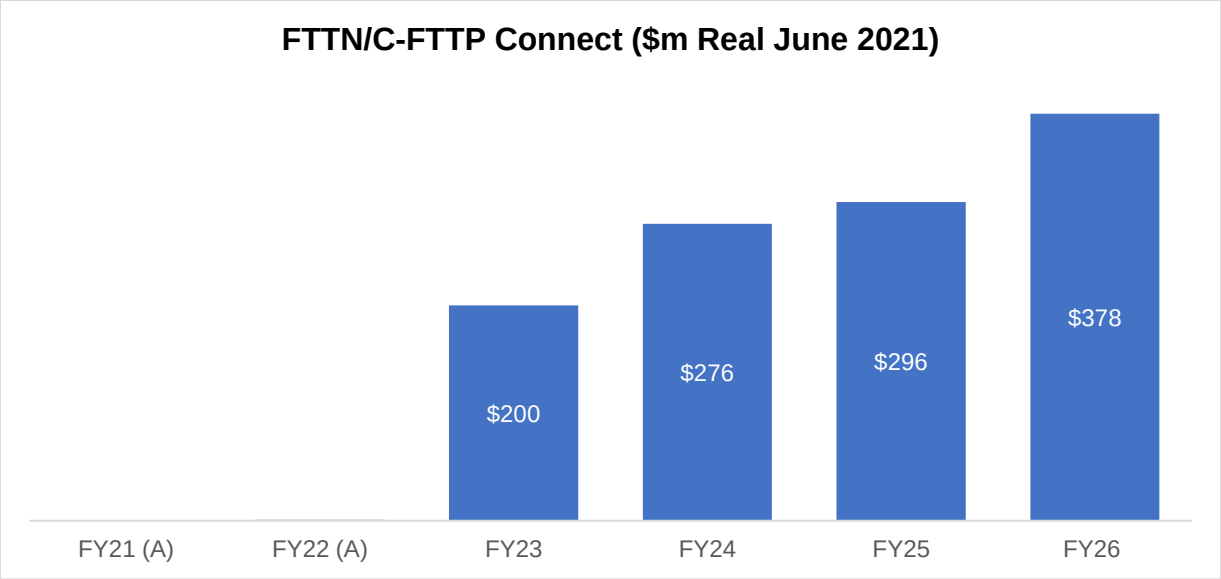

Figure 46 FTTN/C-FTTP Connect ($m Real June 2021)[112]

The FTTN/C to P Connect initiative depends on the network being ready and end-users willing to migrate to higher-tiers (on-demand) [113,114]. It involves replacing the lead-in cable between the Muti-Port Pit and customer premise with fibre; and Installing new NTD device (ONT)[115].

NBN Co's forecasts for end-users to upgrade from FTTN/C to FTTP comprise:

- For FTTN to P upgrade, the forecast is based on end-users willing to take up 100/20 Mbps speed tier or higher, with a target of ~769k premises during FY24-FY26, bring the total forecast of FTTN to P migration to ~890k premises. For FY23, the target is ~125k[109].
- FTTC to P upgrade, the forecast is based on end-users willing to take up 250Mbps or higher speed tier, with a target of ~88k premises. It is expected that by end of 2023, the entire 1.5m premises will be available for the on-demand upgrade[116]. The FY23 target for FTTC to P upgrade is ~37k[109].

For FTTN/C to P Connect, volume metrics being tracked and monitored by NBN Co are[117]: FTTN to P upgrade orders and completed number of lead-ins, FTTC to P completed number of orders and completed number of lead-ins. The main cost drivers are:

- Whether new lead-in conduit is required,
- If not, any remediation work may be required to fix the existing conduit, and
- Any remediation work may be required to enlarge FTTC pit to fit in additional equipment.

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[112] SAU Supporting Submission Part F.
[113] 003 nbn ACCC Briefing - IOP23 - Fixed Line Upgrade – CONFIDENTIAL.
[114] SAU Supporting Submission Part F.
[115] NBN Network Design Rules – June 2022.
[116] SAU Supporting Submission Part F.
[117] 013 ACCC RFI - FY23 Opco Report Jan-23 Final – CONFIDENTIAL.

NBN Co's target unit cost per lead-in is between [redacted] during the FRC, with an average lead-in distance of [redacted], which results in a cost per metre of lead-in cable between [redacted]. Comparing with the initial 2m FTTN premise passed, the next 1.5m premises generally incur higher network build and connect cost as it includes more regional and complex premises with higher build distance. With the network build completed within the FRC, and the relatively slow migration rate, the estimated payback period is approximately 17 years[Error! Bookmark not defined.] (further details and description from NBN Co is set out in this section below).

Initial Expenditure Assessment

This network upgrade is expected to be completed by FY26 with a forecast end-user migration volume of approximately 25%* of homes passed by FY26 (forecast 890k cumulative lead-in connections by FY26 vs. 3.5m homes passed).

It is acknowledged that NBN Co is still in the early phase of the FTTN/C to P Connect program, and there is still the opportunity to implement measures that may accelerate and achieve the required run rate needed to meet the FRC target. However, whilst in the early phases, the slow take up of FTTP services by existing FTTN end-users (below the forecast weekly targets described by NBN Co) introduces several risks:

- Achieving the forecast service assurance expenditure reduction (~72%) and copper remediation expenditure reduction are mostly attributed to N to P migration, and
- Achieving the forecast network assurance and network maintenance cost reduction, as the FTTN network needs to be supported for an extended period of time.

The timing of the proposed network upgrade and end-user take up described by NBN Co is illustrated below, showing a significant lag between network upgrade activity and end-user migration.

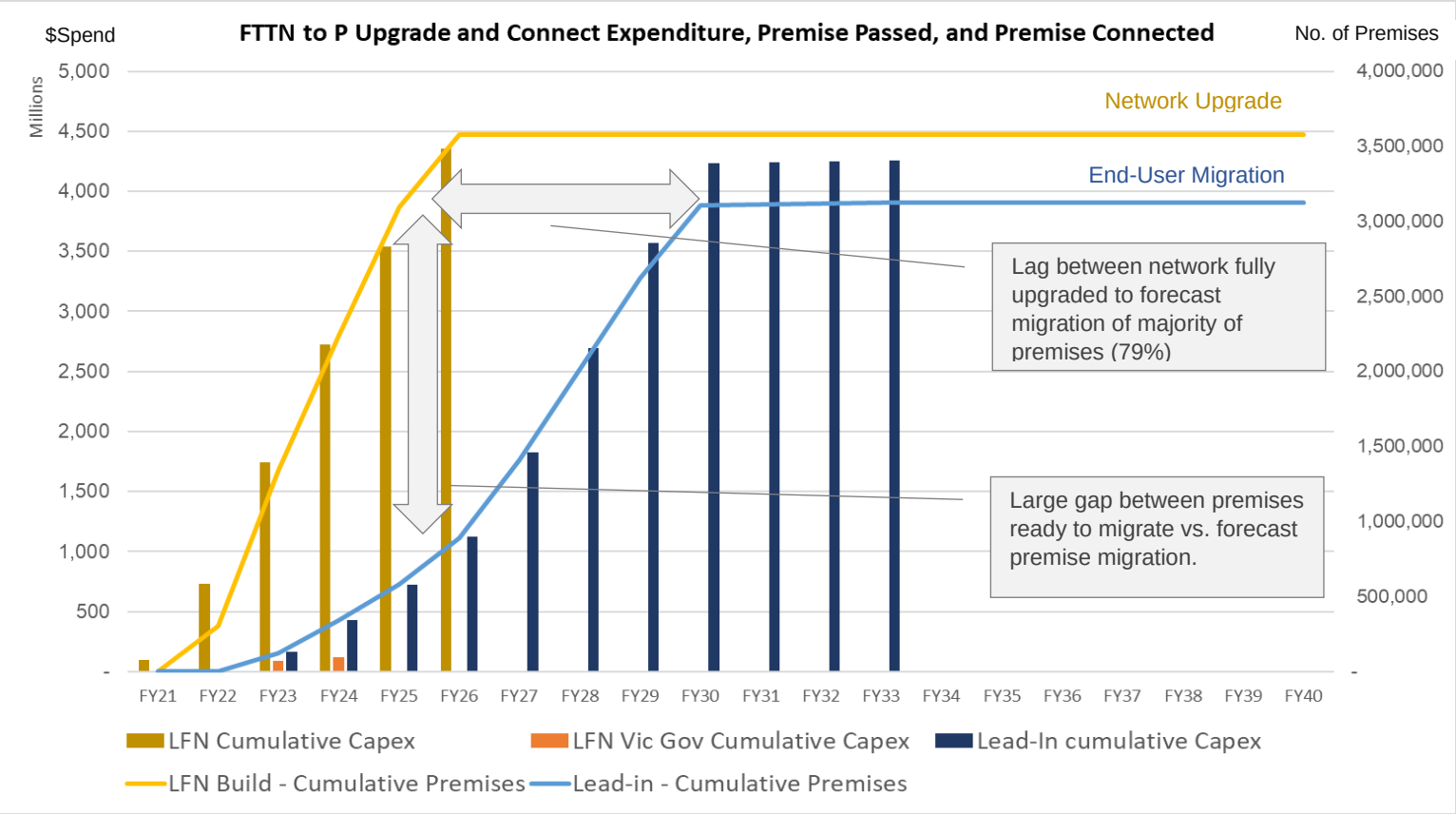

Figure 47: FTTN to P Network Upgrade and Connect: Expenditure and Premise Volume[118]

[118] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 – CONFIDENTIAL.

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Expenditure Assessment – assessment of additional information following release of draft report

Following release of the draft Report, NBN Co has focused on providing further information and clarifications in relation to this expenditure item. This additional section seeks to illustrate the further extensive analysis carried out and information incorporated into this Report.

Following release of the draft Report, further information was provided by NBN Co regarding the following high-level characteristics of the FTTN to P Upgrade and FTTN/C to P Connect:

- The period of the financial model provided by NBN Co for this expenditure item is from FY2021 to FY2040. Payback over this period is reasonable (IRR of [redacted]%), however this is dependent on the nominated Terminal Value ([redacted]x the EBITDA in FY2040).
- The Network Upgrade (Local Fibre Network, LFN) is a short-term 4-year program starting in FY2022 and finishing in FY2026 (planned completion December 2025). It is focused on an initial rollout of local network fibre (LFN) capability which provides and allows end-users to progressively migrate and connect on-demand once the LFN network upgrade is in place (in the related area). Consequently, there is a proposed 4-year lag between completion of LFN network upgrade in FY2026 and forecast completion of the forecast lead-in connections (79%) in FY2030. This lag is illustrated in Figure 47 above (as set out in the draft Report).
- The migration and connection of end-users has been proposed initially by NBN Co as an on-demand upgrade, and commenced in FY2023[119]. Currently rebates are being offered to RSPs ($120 to $165 per end user) and market development funding is being provided to RSP's ($250,000 per RSP) to incentivize user migration.
- Migration and connection of end-users is forecast to be completed in FY2030 with decommissioning of the FTTN network[120] forecast to begin in [redacted]
- NBN Co anticipates that the migration model will evolve from the current on-demand migration to proactive model to [redacted][121].
- The additional financial analysis provided by from NBN Co[122] considers different scenarios for migration approach, with variations of lead-in connection volumes and cost, and ARPU. The LFN CAPEX and timing does not change across any of the 5 scenarios i.e., remain as per the base on-demand case.

[119] There are a small number of lead-in connections planned in FY22 of approximately 3,000 premises but this is not significant in comparison to the 3.1M premises (2.8M active) planned to be migrated by FY30.
[120] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL, Section 2.3, Page 10.
[121] [redacted]
[122] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL

- The market penetration of the newly built FTTP footprint is forecasted to reach 79%, with ~30% end-users on 250Mbps and 1Gbps speed tiers, ~54% on 100 Mbps and remaining on 50Mbps and below.

In addition to its description of the above characteristics, NBN Co has also described the process of scenario planning and option assessment it undertook as part of preparing these expenditure items.

Summarised below is NBN Co's description of the scenarios it analysed:

Scenario	Summary
On-demand	This reflects nbn's current program and involves the upfront build of the LFN and on-demand migration of end users, with decommissioning of the network from [redacted]
Forced	Same as the 'On-demand migration' option, except that after the LFN is built nbn would move as quickly as possible to a forced migration and decommissioning of the FTTN network.
New connect sensitivity	Same as the 'On-demand migration option, except that new connections are forecast to grow at a lower rate.
Capex sensitivity	Same as the 'On-demand migration option, except that capex is modelled higher.
ARPU Drop	Same as the 'On-demand migration option, except that capex ARPU is modelled lower.

Table 6 Summary of FTTN to P Scenarios[123]

Following this description from NBN Co, the cumulative and new net active premise volumes can be plotted across the five scenarios. This is illustrated below. Only scenarios 'On-Demand', 'Forced', and 'New Connect Sensitivity' are shown, as the 'Capex Sensitivity' and 'ARPU Drop'

[123] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL

scenarios follow the same active premise model as the 'On-Demand' scenario. Rather, these omitted two scenarios differentiate through financial estimate sensitivities, not volume estimates.

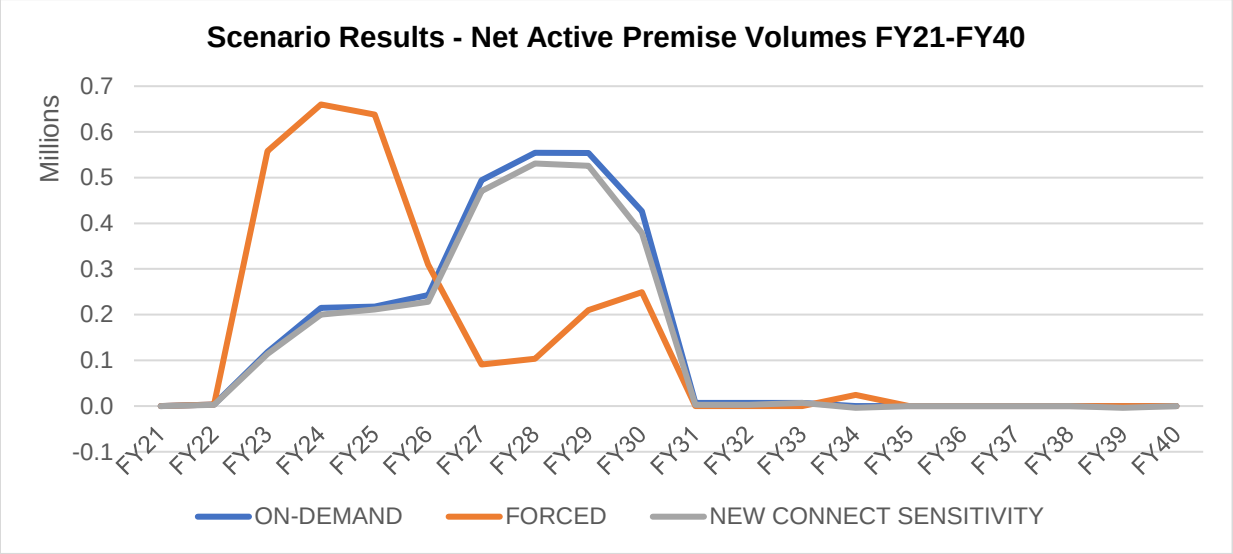

Figure 48 Scenario Results - New Net Active Premise Volumes FY21-FY40[124]

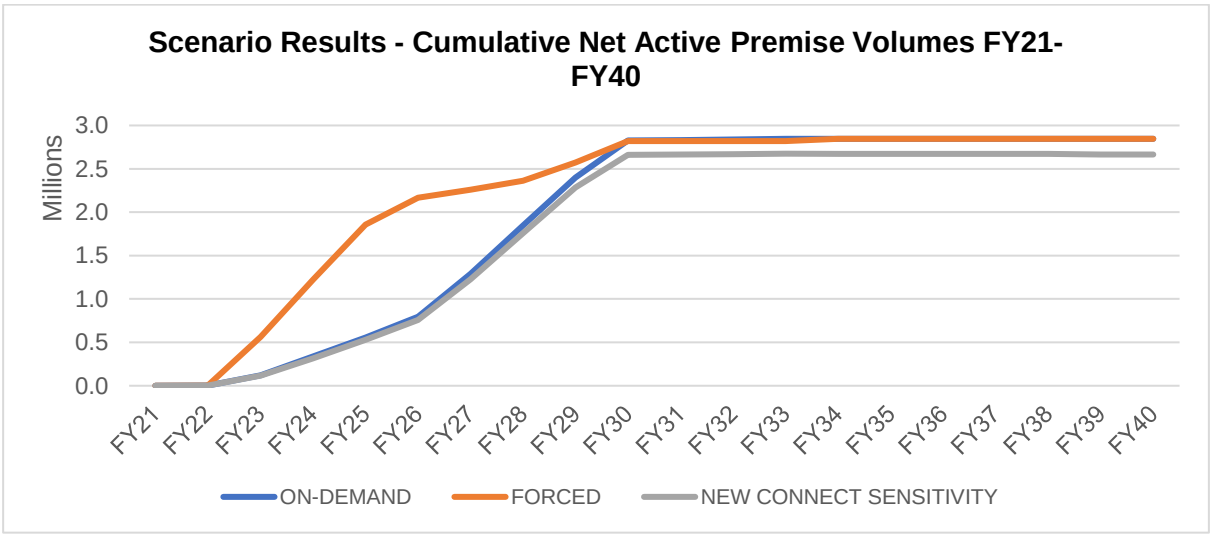

Figure 49 Scenario Results - Cumulative Net Active Premise Volumes FY21-FY40[125]

[124] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL
[125] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL

Following its analysis of the scenarios, NBN Co has described its preferred implementation plan, which would take place across a 4-year period between the completion of the local fibre network build (LFN) and the eventual migration and connection completion of end-users. NBN Co's modelling to support this preferred implementation approach indicates that the uplift in revenue for on-demand connections offsets the delay in the benefits provided by any earlier migration (for example, under a forced migration scenario) and decommissioning of the copper network.

NBN Co has described how its preferred implementation approach allows end-users to progressively migrate on-demand (over 8 years) on the general assumption that a higher proportion of end-users (and RSP's) will opt to upgrade their services to the high-speed capabilities and improved stability of the FTTP network, with a greater acceptance for any disruption (new lead-in and NTD) and/or cost.[126] This upgrade consequently provides improved ARPU for NBN Co as end-users move to higher speed tiers.

Given the unpredictability of on-demand migration, it is recognized that the LFN network upgrade would be required, however the focused full build-out and cost of a national LFN upgrade is likely to result in an initial lower utilization of the local network fibre resources that have been deployed, evidenced by the 4-year time period between between the completion of the local fibre network build (LFN) and the eventual migration and connection completion of end-users.

The on-demand delivery model preferred by and prepared by NBN Co for this expenditure item also estimates lower savings initially for copper remediation and capacity lifecycle savings. This is due to the slower take-up and migration of customers from FTTN to FTTP technology; the parallel support of both FTTN and FTTP networks and full decommissioning of legacy and ageing copper areas are unlikely to start until later, [redacted]. It is assumed that NBN Co would take reasonable measures, e.g., [redacted] in these areas to optimize the process. In FY2026, when the LFN network upgrade is complete, it is forecast/planned that 22.3% of passed premises are connected and active on the upgraded FTTP network.

Fixed Local Network (LFN) Upgrade and Forced Migration

In its more recent documentation, NBN Co has also described the characteristics of the forced migration option it has modelled in comparison to its preferred on-demand model, some characteristics of which include:

- No change to Local Fibre Network (LFN) CAPEX and timing i.e., LFN remains the same for both base case on-demand and forced migration model scenarios described by NBN Co,[127]
- Lead-in CAPEX remains the same for both on-demand and forced migration options,[127]
- CAPEX savings for capacity and lifecycle, copper remediation, reconnect and assurance would be brought forward by 2 years (compared to the on-demand migration model chosen by NBN Co),[127]
- OPEX savings for assurance would be brought forward by 2 years[127], and

[126] 031 nbn follow up material – nbn Special Access Undertaking Variation 2023 – Expenditure Review – Follow-up material.
[127] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL, Section 2.5, Page 11

- There would be lower revenue[127]

The forced migration model described by NBN Co increases the payback period from 17 years for NBN Co's preferred on-demand migration model to 18 years and decreases the IRR from [redacted]. The lead-in connection cost is estimated at [redacted] per premise for the period to FY30 (compared to an average of [redacted] for NBN Co's on-demand migration model). As a result, the NBN Co model indicates an on-demand migration delivers better financial outcomes compared to forced migration.

Irrespective of the above, it remains unclear whether NBN Co considered the possible additional benefits of a more defined and controlled program provided by a forced migration process. Example of benefits might include the unpredictability of on-demand connections versus the opportunity to leverage bulk deployments to reduce the per premise lead-in cost, compared to on-demand migrations.

Decommissioning of the FTTN Network

In its most recent documentation, NBN Co has described that the decommissioning phase of the FTTN network[128] is proposed to begin [redacted]. NBN Co expects the migration model to evolve [redacted]

Under the on-demand migration model in progress during FY2023 and FY2024, NBN Co is offering end-user rebates and funding to RSP's to incentivize user migration and adoption of high-speed tiers. The final decommissioning phase is expected to remove FTTN infrastructure and begin to realize savings in copper remediation, assurance, capacity, and lifecycle. The following characteristics were described by NBN Co:

- By FY2026, when the Network Upgrade (LFN) program concludes, there will be 796,000 Active premises, which is 22.3% of premises passed,
- By FY2027, there will be 1.29M active premises which is 36.1% of premises passed,
- From [redacted], the decommissioning of the FTTN network is planned to begin and will evolve [redacted], and
- By FY2030, 2.825m premises will be active, representing 79% of premises passed. In comparison, for the January 2023 actuals[129], there are approximately 4.1m FTTN Premises ready-to-connect, and 3m Active Premises representing a lower 72.6% penetration. Therefore, the financial model represents an increased penetration (by up to 6% based on January 2023) under increasing market competition.[130]

The base financial model for the on-demand migration includes OPEX for Marketing and Product costs annually up to FY2030. The costs for the decommissioning of the FTTN network beginning

[128] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL, Section 2.3, Page 10
[129] 013 ACCC RFI – FY23 Opco Report Jan-23 Final - CONFIDENTIAL, DATE: 15/02/2023
[130] nbn Special Access Undertaking Variation 2022 - Supporting submission, Part A: Executive Summary and Key Narratives, November 2022, Section 3.2 "nbn faces significant and increasing competition."

in [redacted] may include [redacted] funding, and associated revenue impacts. However, there is limited detail in the financial and modelling information provided by NBN Co and depending on the magnitude of [redacted] funding, timing and revenue impacts, this may have a significant impact on the forecast and financial modelling prepared by NBN Co.

NBN Co's description of its financial model and analysis

Given all of the above information from NBN Co, the following scenarios were modelled in NBN Co's latest analysis, for sensitivity and financial impact for FTTN to P Connect (not LFN build).

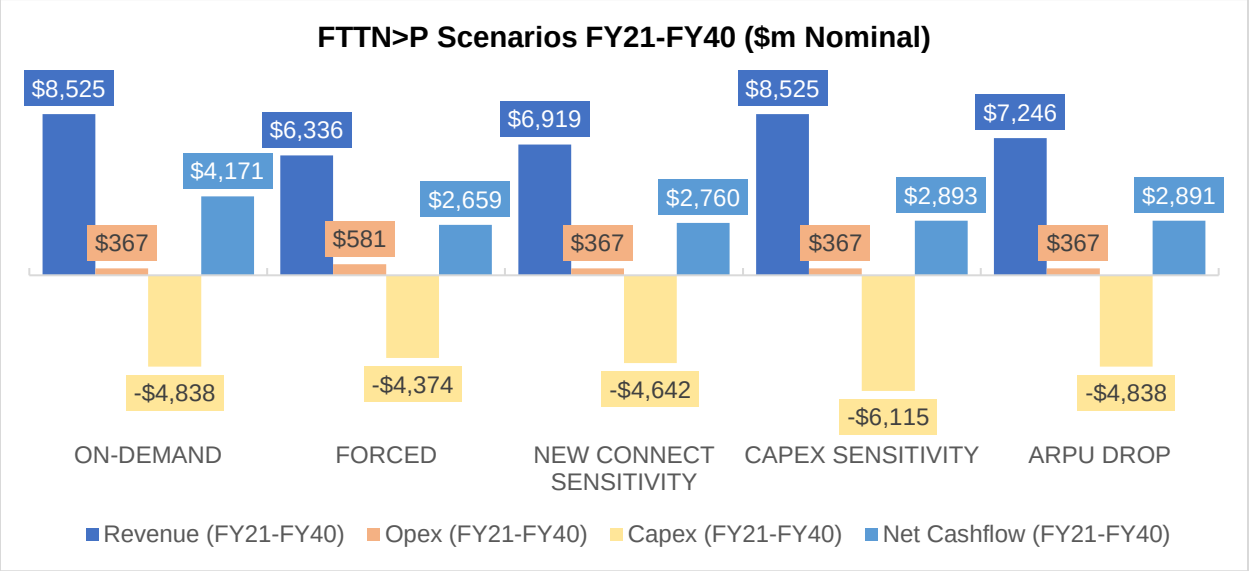

Figure 50 FTTN>P Scenarios FY21-FY40 ($m Nominal)[131]

[131] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m

Figure 51 Cumulative Net Cash Flow FY21-FY40 ($m Nominal)[132]

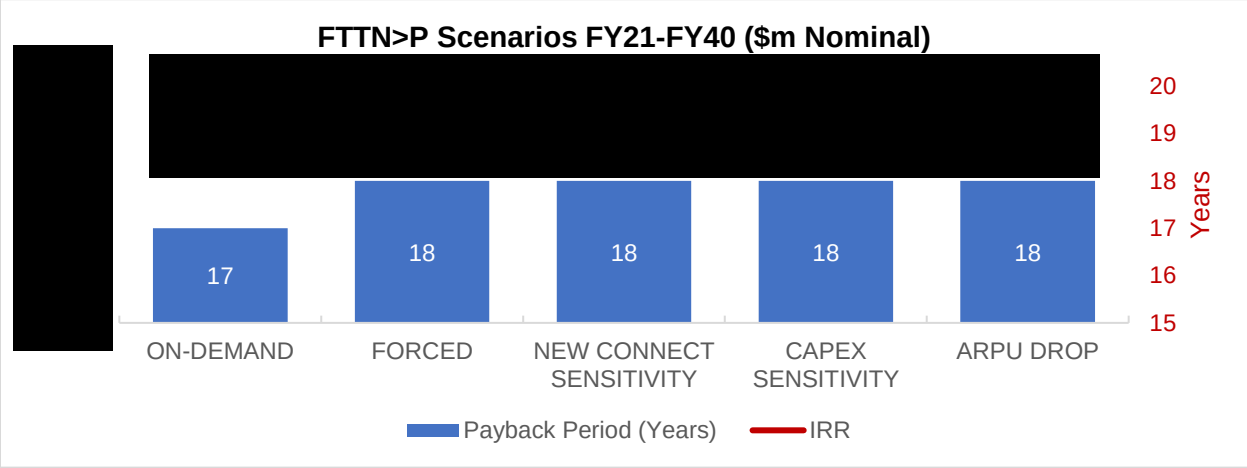

Figure 52 FTTN>P Scenarios FY21-FY40 ($m Nominal)[133]

Table 7: Financial Model Optional Scenarios

Key Scenario Components	Unit	Scenarios				
		Base Case (on-demand)	Forced Migration	New Connect Sensitivity	Capex Sensitivity	ARPU reduced
Revenue (FY21-FY40)	$m	$8,525	$6,336	$6,919	$8,525	$7,246
Opex (FY21-FY40)	$m	$367	$581	$367	$367	$367

[132] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m
[133] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m

Capex (FY21-FY40)	$m	($4,838)	($4,374)	($4,642)	($6,115)	($4,838)
Net Cashflow (FY21-FY40)	$m	$4,171	$2,659	$2,760	$2,893	$2,891
IRR	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Payback Period	Years	17	18	18	18	18
Terminal Value	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
FY40 EBITDA	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
EBITDA to Terminal Value Multiple	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Marketing and Product	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

The different scenarios indicate the base case delivers better financial outcomes.

The financial model presented by NBN Co as its preferred model[134] represents a mixture of base costs for the upgrade (LFN and Lead-in costs), incremental revenue, and incremental savings. The preferred model presented by NBN Co includes a speed tier mix (STM) to model the revenue. Underlying cost model details for many of the proposed benefits were not provided, i.e., savings (particularly for copper remediation, assurance, capacity, and lifecycle savings profile), nor were the rationale and assumptions for the lifecycle events (e.g., capacity and lifecycle, copper remediation).

A Terminal Value of [redacted] the EBITDA in FY2040 has been added to the NBN Co's financial case[135] for all scenarios it analysed. In the base on-demand migration scenario, the Terminal Value adds [redacted] in FY2040, in addition to a total EBIDTA of $9B for the full financial model from FY2021 to FY2040. The base financial model preferred by NBN Co becomes cashflow positive in FY2030 as the migration activities conclude.

Note: The use of [redacted] EBITDA as the Terminal Value factor is in contrast to a lower multiple that NBN Co has used in the past in other contexts[136].

Speed Tier Mix (STM) Forecast

The financial model described by NBN Co[134] includes a Speed Tier Mix (STM) to model the revenue, user demand and the related speed tier mix. For base case, which the current FRC expenditure forecast is based on, the STM up to FY2030 has the following characteristics:

- Up to 25% of total connections are new connects,
- Up to 30% of total connections are higher speed tiers of 250/25 Mbps and 1000/50 Mbps,

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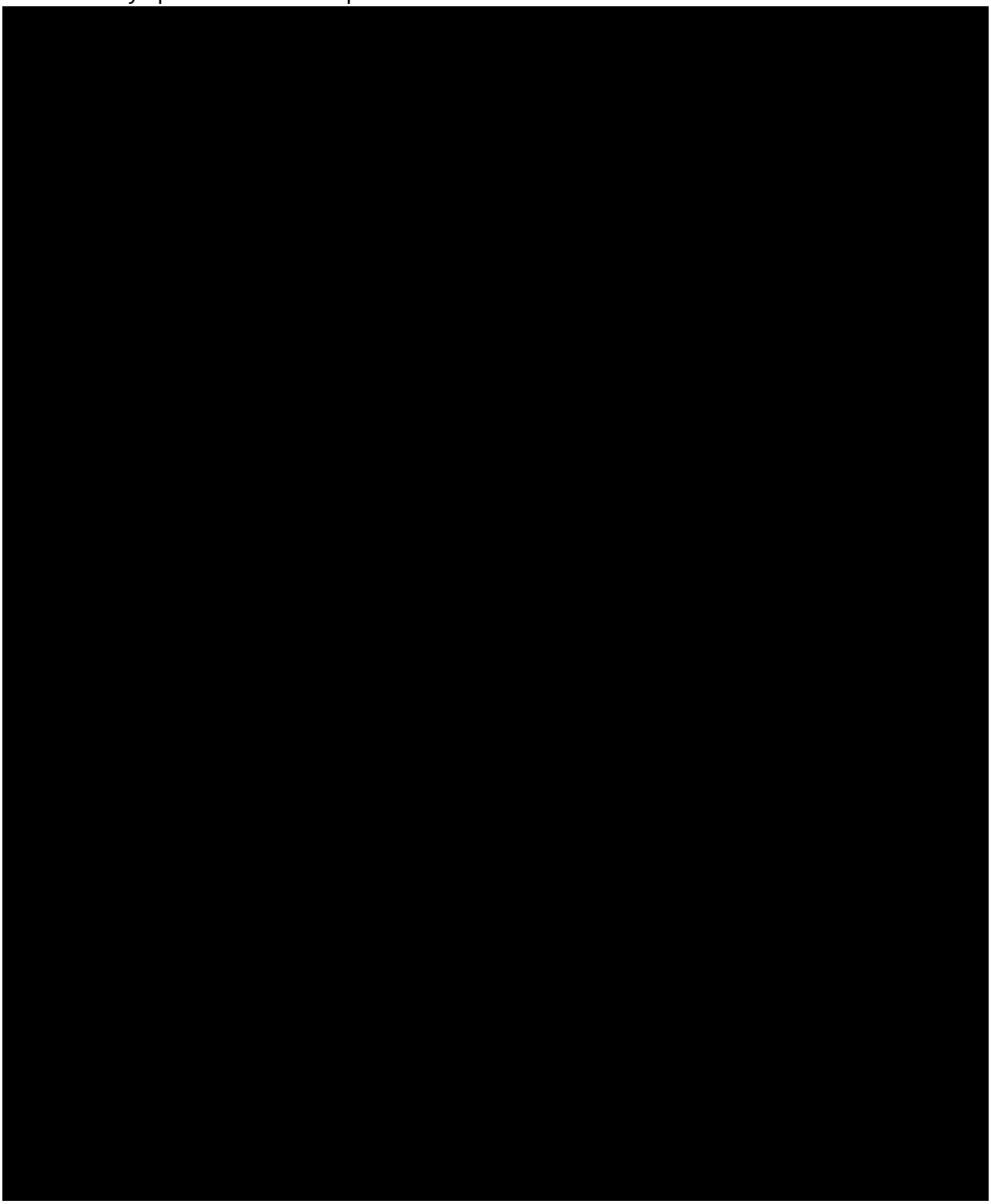
[134] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m
[135] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL, Section 2.5, Page 12
032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL
[136] NBN Co, Long-term Financial Outlook use 6 x EBIDTA, https://www.nbnco.com.au/content/dam/nbnco2/2019/documents/media-centre/corporate-plan-report-2020-2023.pdf

- Up to 54% of total connections are on 100/20Mbps speed tier, and
- The variation in pricing used in the model over the same period remains relatively stable in the key speed tiers where uptake occurs.



[137] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m

Table 8 Speed Tier Mix Summary, On-demand Migration Base Case[138]

NBN Co has described the current promotional activities it is using with RSPs to promote the take-up of FTTP in the network upgrade areas, as highlighted in a presentation to the Government on 16 March 2023[139]. These current initiatives include:

- Scale IT Automation with the RSPs,
- Direct NBN Co Marketing,
- RSP Marketing including a Marketing Development Fund,
- Channel rebates and RSP Enablement (insights, target lists),
- Social Media and local community enablement and engagement, and
- Activity Plan for demand generation into June 2024 (including).

There has been a significant increase in weekly orders to be approximately 4,000 orders a week on the back of the NBN Direct Marketing campaign during March 2023.

CAPEX Savings

From the descriptions and documentation provided by NBN Co, CAPEX savings for its preferred approach are predominantly attributed to “Capacity and Lifecycle” and “Copper Remediation” savings with a total of ~$3.9 B through to FY2040. It is noted that:

- The financial model presents both items as savings, instead of presenting a base case of ‘do nothing’ vs. ‘FTTN to P upgrade’ case, making it challenging to analyse, and
- Total Copper Remediation saving is estimated at ~$2B, until FY40. For the FRC, the total saving is ~$219m.

[138] Summary Calculations from “032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet STM Base”
[139] 029 Fibre Connect, Minister’s Office briefing for 16 March 2023 - CONFIDENTIAL, DATE: 26/4/2023.

The Capacity and Lifecycle saving is estimated at ~$1.9B until FY40, and has a significant change in profile and continues to increase in the post-FY31 period (e.g., 95% increase during FY2032). The rationale and event triggers for these lifecycle events, were not provided. For the FRC, the total saving is ~$31m.

The CAPEX savings are illustrated below:

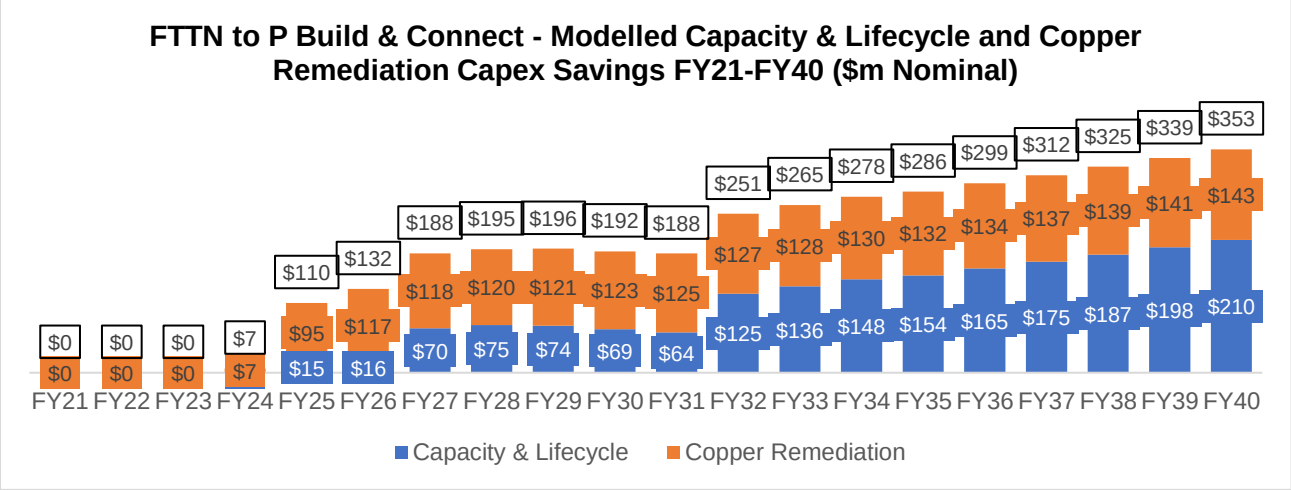


Figure 54 FTTN to P Build & Connect - Modelled Capacity & Lifecycle and Copper Remediation Capex Savings FY21-FY40 ($m Nominal)[140]

Summary and Conclusion

In conclusion, the prudency and efficiency of this expenditure is **inconclusive**, as some of the information provided indicates that the expenditure forecasts are prudent and efficient, including:

- The choice of upgrade technology (for both expenditure items) appears to be prudent because of the described forecast benefits of improved service assurance and reduced assurance costs.
- There is a program level financial model that indicates the implementation plan in terms of LFN build, lead-in connection and benefit realisation.
- The cost per metre of LFN fibre deployed of [redacted] which is within normal industry range, as is the cost per metre of lead-in fibre deployed of [redacted].
- NBN Co has described how it has carried out sensitivity analysis for different end-user migration scenarios as part of its planning for this expenditure item.
- It is recognised that the FTTC to P Connect activity is based on sound rationale (i.e., end-user demand driven expenditure). However, this activity forms part of the broader expenditure item described by NBN Co and so has been assessed as part of the broader initiative for prudency of expenditure.
- NBN Co indicated that, to decommission the FTTN network from [redacted]

[140] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 – CONFIDENTIAL, worksheet IOP.FTTN>P 3.5m

[redacted]. However, it is unclear if this scenario and the impact has been incorporated in the financial model preferred by NBN Co.

- NBN Co has stated that "Over the next few years, nbn will develop more detail in consultation with stakeholders around how the later stages of migration from FTTN to P will work. This may involve [redacted] nbn expects the emphasis to be on promoting the benefits of higher speed tiers [redacted]"[141]

However, Grex has not been able to form a conclusive view on the prudency and efficiency of this expenditure item as there are a number of risks and uncertainties relating to the project that remain and do not appear to have been addressed at this stage:

- A business case has not been received to support this expenditure item. Whilst financial models and other supporting information has been provided in some detail more recently by NBN Co, this information does not constitute a business case (examples of which are described in Part D of this Report). However, wherever possible Grex has included the financial model and supporting data and descriptions in its analysis of this expenditure item as with the other items assessed in this Report.
- There is no clearly articulated mitigation strategy to address the slow take up rate of FTTN to P. Although NBN Co has listed a few mitigation methods through the RFI Process, by their names only, to address the risk of 'underlying consumer interest in upgrades is lower than expected'[142], many of these are related to improving RSP engagement and marketing efforts. Proactive upgrades of under-performing FTTN services is one of the mitigation strategies mentioned. However, as there are about 110k underperforming FTTN services[143], the impact of proactive migration may be limited, to support the realisation of the proposed business benefits. In addition, as no supporting documentations have been provided with any of the mentioned mitigation strategies, it is difficult to assess their reasonableness and effectiveness.
- The forecast completion of a national network upgrade by FY26 is mismatched against a slow migration forecast of ~25% of homes passed in the same period (forecast 890k cumulative lead-in connections by FY26 vs. 3.5m homes passed[144]). This results in a payback period of ~17 years.[144] However, although migration rates had begun to increase recently reaching 4,000 migrations per week[145] aided by marketing activities including RSP collaboration and funding, and user rebates, this was behind the targets

[141] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[142] 019 ACCC RFI - nbn Response - tranche 5 _question 13_ - CONFIDENTIAL.xlsx, 'KO Risk Update' worksheet
[143] 010 nbn ACCC Briefing - IOP23 - Capacity - CONFIDENTIAL.pdf, p11.
[144] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL, 'IOP.FTTN>P 3.5m' worksheet.
[145] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL, Section 2.7, Page 13

identified by NBN Co in its financial model and appears to have reduced more recently prior to the release of this final Report.[146]

- The financial model presented more recently by NBN Co shows that ultimately, FTTP penetration in the newly upgrade footprint will reach 79%, which is higher than the current brownfield FTTP penetration of 74%, based on the On-Demand Base Financial Case[147] and Opco report[148] data NBN Co has provided. Using the STM forecast provided, some of the improvements to market penetration may be attributed to new connects, although there is no overall, clear rationale for the forecasted market penetration improvement presented by NBN Co in its modelling and analysis.
- NBN Co did not provide underlying modelling and calculations to provide more details on the forecasted Capex savings across Copper Remediation and Capacity & Lifecycle which totals to ~$3.9B until FY40.
- Decommissioning costs of FTTN do not appear to be linked to the financial modelling provided for this expenditure item.
- It is not clear if the product and marketing costs in the provided financial model and supporting descriptions includes the costs of Rebates and other RSP funding from FY23 to FY30.
- The assumption on terminal asset value at 2040 described above may overstate actual terminal value.

[146] Jan 2023 OpCo report shows monthly orders range from ~3,041 to ~4810 for N to P and 2,554 to 2,936' for C to P between Nov 2022 to Jan 2023, which represents a combined weekly order volume of approximately 1600-2000. The most recent quarterly published figures from NBN Co are set out here - June quarter 2023 report | ACCC.

[147] 032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL. “IOP.FTTN>P 3.5m” worksheet
[148] 013 ACCC RFI - FY23 Opco Report Jan-23 Final - CONFIDENTIAL, Pages 2-6.

11. Capability – Fixed Wireless Upgrade[149]

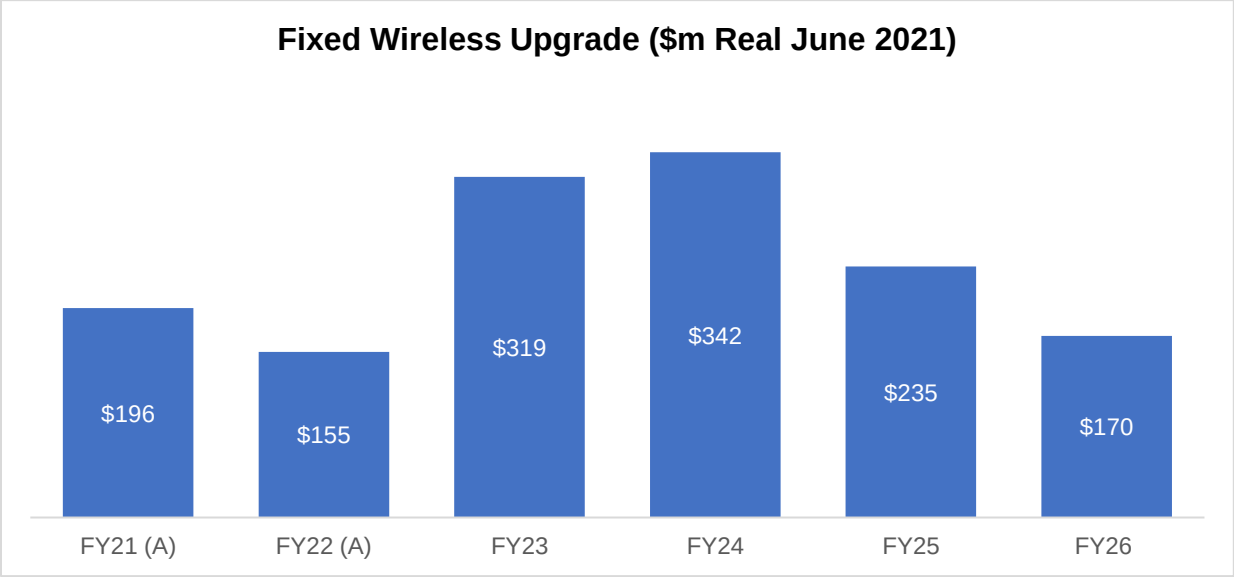


Figure 55 Fixed Wireless Upgrade ($m Real June 2021)[150]

The fixed wireless network upgrade is the third largest capital expenditure initiative described by NBN Co in the ACCC Briefings, and accounts for ~10% of total capital expenditure. NBN Co has proposed that the primary intent is to increase the capacity of the whole fixed wireless network by a multiple of 2.5[153]. NBN Co has described that it aims to uplift busy hour (download) speeds of at least 6 Mbps to at least 50 Mbps[153,151], enabling high speed Fixed Wireless Home Fast with download PIR of 100 - 130 Mbps to all customers, and Fixed Wireless Superfast plans with download PIR of 200 - 325 Mbps to 85% customers[152].

However, Grex understands that, although both 6 Mbps and 50 Mbps metrics refer to end-user download speed, their definitions and calculations are different[152], where 6 Mbps is the minimum average download speed per user in the busy hour period[149], and 50 Mbps is the Typical Wholesale Download Busy Hour Speeds[149,153]. It is Grex's recommendation that NBN Co and ACCC continue to use these baseline and target performance metrics so that both the 6Mbps (which Grex assumes would become redundant once the rollout of this initiative is complete) and 50Mbps are measured and tracked throughout the FRC.

This upgrade will additionally provide an increase in the Fixed Wireless coverage area, by extending the reach of existing coverage areas[151] from 192,000 km^2 to 322,000 km^2, this will also indirectly improve satellite end-user experience by migrating 120k satellite end users to the fixed wireless network[153].

The initiative plans to achieve its objectives by:

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[149] SAU Supporting Submission Part F, Chapter A.1.10, Key changes from the March Variation supporting submission, Page 36-37 with further detailed provided in 007 nbn ACCC Briefing – IOP23 – Regional Upgrades – CONFIDENTIAL.
[150] SAU Supporting Submission Part F
[151] 023 ACCC RFI - BM 154 21 September 2021 - 11 Fixed wireless and satellite upgrades - CONFIDENTIAL
[152] NBN Co Commentary 19 April.
[153] 007 nbn ACCC Briefing - IOP23 - Regional Upgrades - CONFIDENTIAL

- Upgrading all 2,356 cell sites by increasing the number of cells from current 23k to 60k (i.e. increase of 37k cells) using new lens antenna technologies. A lens antenna can deliver multiple, independent, focused high-performance beams from a single antenna. It does so by transmitting tightly focussed RF signals, which target a very precise area without interfering with neighbouring zones,
- Deploying 5G spectrum and associated technology in addition to current 4G spectrum/technology. 5G spectrum can deliver x3 times the capacity of existing 4G spectrum,
- Extending range of mid-band coverage by updating eNodeB software[154],
- Progressively upgrading WNTDs (Wireless NTD) to WNTD4[155], and
- Upgrade select Microwave backhaul links as required.[156]

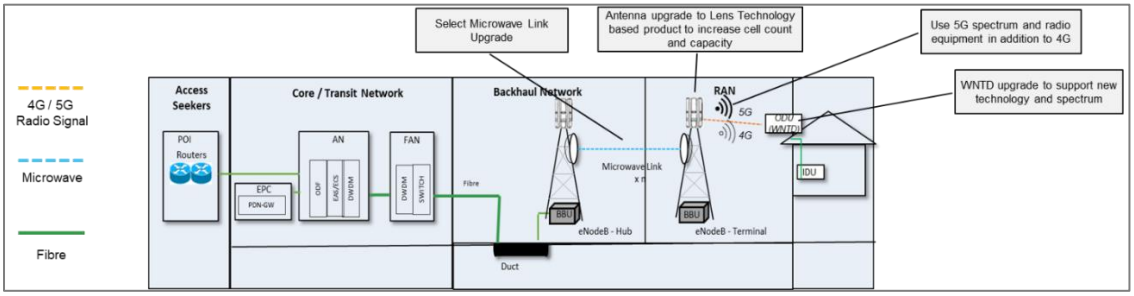


Figure 56: FW Network Upgrade Illustration[157]

NBN Co has described that it plans to upgrade all ~2,350 sites to the new 50 Mbps TWBPS by Dec-2024, with 1,568, 629 and 300 sites upgraded in each of FY24, FY25 and FY26 respectively, with site upgrade post Dec-2024 to maintain committed speeds[158].

The main unit cost metric used by NBN Co to track efficiency is cost per Mbps increase. The target is [redacted] for each of FY24 to FY26. It is understood that this metric is based on the total Capacity Upgrade cost, including Design, SAED, Build (HW and Services) and Core, divided by the increased capacity (Mbps) of the network. The network capacity increase used for calculation is a flat rate or 60Mbps/4G cell (aligning with 3bps/Hz for a 20MHz 4G cell). A similar methodology will be used for the Mbps capacity of 5G cells as they are deployed[158]. The second cost metric being tracked by NBN Co, is the cost per upgrade, which has an average of [redacted] to date.[159]

Potential risks related to this initiative include:

- New Lens based technology:

[154] 026 SMCG nbn HST Program Findings - Final - CONFIDENTIAL
[155] NBN Co has advised that WNTDs will be progressively replaced (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).
[156] NBN Co Initiative Presentation and Discussion Meetings
[157] NBN Network Design Rules – Jun 2022
[158] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[159] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

- Mini lens technology is relatively new, with the original use case deployment in sporting stadiums to support a high density of end users. A lens antenna can deliver multiple, independent, focused high-performance beams from a single antenna. It does so by transmitting tightly focus RF signals, which target a very precise area without interfering with neighbouring zones.
- NBN Co has described that it has conducted trials and testing of the product[160]. Further understanding of the maturity of product/technology for outdoor macro use case would be required to assess the risks and associated mitigations, related to this relatively new technology.

- Increased requirements and expenditure for tower strengthening[158]:
  - More instances of tower structural strengthening are required to cater for additional antenna installation due to wind loading, than originally forecasted – NBN Co has indicated that this has become a significant cost driver.

- 5G mmWave signal limitations:
  - Signal propagation in mmWave band, while offering higher capacity, typically covers short distances only, and is susceptible to atmospheric absorption, reflection, and scattering from obstacles, thereby requiring Line of Sight (LoS) to the End-User premise antenna.
  - NBN Co has described that it is in the process of sourcing improved planning software that takes into account local clutter, terrain and other relevant information for more precise RF planning for the proposed 5G coverage[161].

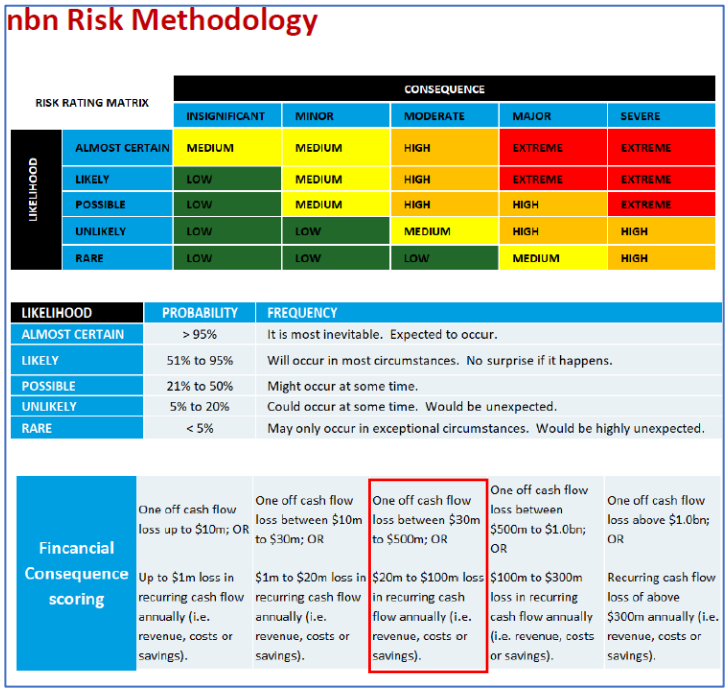
- New WNTD maturity and availability:
  - A new generation of WNTD, WNTD v4 will need to be rolled out progressively[162]. This is a new product that has been recently[161] tendered. The availability, maturity and stability of the product is yet to be proven in the field.
  - NBN Co has described that mid-band 5G spectrum cannot be re-farmed until all WNTD 1/2/3 are upgraded to WNTD v4[163] – although it is not clearly documented what NBN Co's plan is regarding 5G mid-band and mmWave spectrum usage. They also described that (progressive) WNTD replacement from v1/2 to v3/4 is required for high-speed tier orders[163]. With 440k deployed WNTDs, and [redacted] per upgrade[163].

At the end of April 2023, NBN Co provided additional information dated July 2021, in the form of an external review paper of its Fixed Wireless High-Speed Tiers and Extended Range LTE projects. This report sets out reasonably detailed descriptions, impact assessments and mitigation strategies of a number of technology and other risks. The report concluded that the

[160] NBN Co initiative presentation and discussion.
[161] NBN IOP23 initiative presentation/ and discussion
[162] NBN Co has advised that WNTDs will be progressively replaced (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).
[163] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL, including email sent from NBN Co to ACCC on 28 March at 3.31pm with associated documentation entitled "023 ACCC RFI – BM 154 21 September 2021 – 11 Fixed wireless and satellite upgrades – CONFIDENTIAL" and "024 ACCC RFI – CR 12 14 June 2022 – Fixed Wireless and Satellite Upgrade Funding Agreement – CONFIDENTIAL".

two projects would leave NBN Co operating in the 'Moderate Risk Appetite' range, which is defined as "utilise newer, emerging technologies in the early phase of their industry adoption but in a controlled manner that limits any adverse impact or risk to customers".[164] It is noted that:

- Several individual risks are identified as having a 'Moderate' consequence and 'Possible' likelihood. 'Moderate' consequence is defined as having a one-off cashflow loss between $30m and $500m; or recurring loss of $20m to $100m annually.



nbn Risk Methodology

RISK RATING MATRIX		CONSEQUENCE				
		INSIGNIFICANT	MINOR	MODERATE	MAJOR	SEVERE
LIKELIHOOD	ALMOST CERTAIN	MEDIUM	MEDIUM	HIGH	EXTREME	EXTREME
	LIKELY	LOW	MEDIUM	HIGH	EXTREME	EXTREME
	POSSIBLE	LOW	MEDIUM	HIGH	HIGH	EXTREME
	UNLIKELY	LOW	LOW	MEDIUM	HIGH	HIGH
	RARE	LOW	LOW	LOW	MEDIUM	HIGH

LIKELIHOOD	PROBABILITY	FREQUENCY
ALMOST CERTAIN	> 95%	It is most inevitable. Expected to occur.
LIKELY	51% to 95%	Will occur in most circumstances. No surprise if it happens.
POSSIBLE	21% to 50%	Might occur at some time.
UNLIKELY	5% to 20%	Could occur at some time. Would be unexpected.
RARE	< 5%	May only occur in exceptional circumstances. Would be highly unexpected.

Fincancial Consequence scoring	One off cash flow loss up to $10m; OR Up to $1m loss in recurring cash flow annually (i.e. revenue, costs or savings).	One off cash flow loss between $10m to $30m; OR $1m to $20m loss in recurring cash flow annually (i.e. revenue, costs or savings).	One off cash flow loss between $30m to $500m; OR $20m to $100m loss in recurring cash flow annually (i.e. revenue, costs or savings).	One off cash flow loss between $500m to $1.0bn; OR $100m to $300m loss in recurring cash flow annually (i.e. revenue, costs or savings).	One off cash flow loss above $1.0bn; OR Recurring cash flow loss of above $300m annually (i.e. revenue, costs or savings).

Figure 57: NBN Co Risk Ratings[164]

- The identified 'Moderate' and 'Possible' risks with a 'High' risk rating are listed in the table below. The main technology risks identified align with the ones identified by Grex through its assessment of this expenditure item.

Risk Description	Scenario	Consequence	Likelihood	Rating
Cost and timing of availability of WNTDv4	HST & Extended Rant	Moderate	Possible	High
5G mmWave service qualification may not reach range or prediction	HST & Extended Range	Moderate	Possible	High
mmWave offload not sufficient to achieve long term capacity requirements	HST, HST & Extended Range	Moderate	Possible	High

[164] 026 SMCG nbn HST Program Findings - Final - CONFIDENTIAL

Risk Description	Scenario	Consequence	Likelihood	Rating
High speed take-up maybe lower than planned	HST, HST & Extended Range	Moderate	Possible	High
Mini-lens does not deliver the capacity required.	HST, HST & Extended Range	Moderate	Possible	High
Uplift of new customers within new or extended footprint may differ from planned	HST & Extended Range	Moderate	Possible	High

Table 9 Fixed Wireless Risk Descriptions[164]

- Although mitigation strategies / methods are proposed for each identified risk, the effectiveness of these strategies are not clear at this stage, and the residual risks are not quantified[165].

NBN Co also provided a short description of the upgrade proposals considered in early 2020. However, the very brief information provided raised several questions:

1 It is not clear why 6Mbps and 50Mbps appear to be compared directly, given NBN Co has indicated they are not the same metric,

2 There are no underlying calculations and models supporting the detailed numbers, and

3 There is no clearly documented rationale on why Option 3 is chosen over the other two options, e.g., it has the worst NPV of the three[166].

[165] NBN Co has advised that a residual risk was carried into the nbn business case rolling the mitigation costs and likelihoods together to form a blended risk cost (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).
[166] NBN Co has advised that option 3 was its preference to achieve its outcomes. (Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023).

Figure 58 NBN Co FW Upgrade Proposals / Options[167]

NBN Co provided additional written supporting information on 7 July 2023. With respect to the Fixed Wireless upgrade, NBN Co's written submission highlighted the following[168]:

- Options analysis has taken place progressively over several years, to provide 'fixed line-like' speeds. It largely included three steps, i.e.,
    - **Step 1:** Setting the direction for a new minimum speed that is 'fixed line like'. Among the three high level options considered in April 2023 (described above), no option was chosen due to no option being considered financially viable,[169]
    - **Step 2:** Engineering decisions to drive down cost of achieving desired speed. This includes seeking new RAN technology, utilising 5G mmWave spectrum, new WNTD and capacity planning insourcing, and
    - **Step 3:** Lower the cost of preferred option and seeking Government funding.
- Sensitivity analysis of 'preferred option' base case was conducted.
- More information on risk management was provided, including a Risk Management Plan from June 2022, and most recent Program Risk Register from June 2023.
- A breakdown of project costs for site upgrades was provided.

In conclusion, prudency and efficiency of this expenditure is **Inconclusive**, as:

- NBN Co appears to have considered different options in the early stages of the decision-making process including a 'Do Nothing' scenario as the base case, network wide upgrade to 25 Mbps and network wide upgrade to 50 Mbps.
- Different technology options appear to have been considered to meet the target capacity using a combination of advanced antenna technology, additional spectrum, and other engineering enhancements.

[167] 027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
[168] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[169] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 – CONFIDENTIAL, page 18 – "step 1".

- High level financial numbers have been provided for the preferred option, with a payback period of 7 years, and IRR of [redacted]. These favourable results include a $480m government grant, an unspecified EBITDA multiple for terminal value calculation (assumed [redacted]) and appears to be calculated from FY22.[170]
- Sensitivity analysis has been performed to simulate different scenarios based on the preferred option. Five scenarios were tested, the output of which was a net present value to FY34 that excluded grant funding and used a 7% discount rate. Results are as follows:

Table 10 Fixed Wireless Sensitivity Analysis[171]

- FRC expenditure cost breakdown has been provided by site upgrade volume and unit cost, as well as by cost categories including equipment, services, labour and other.

In conclusion, the prudency and efficiency of this expenditure is **inconclusive**, as some of the information provided indicates that the expenditure forecasts are prudent and efficient, including:

- Technology upgrade and adding spectrum will naturally bring significant capacity increases.
- There is an estimated cost of [redacted] per WNTD upgrade, to support capability upgrade or lifecycle replacement (which NBN Co has acknowledged does not factor into the cost per Mbps[172]).

[170] 019 ACCC RFI - nbn Response - Tranche 5 Question 13 - CONFIDENTIAL
[171] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[172] It remains unclear whether this cost is included in the forecast expenditure for this initiative as of 28 March 2023.

- Cost per site upgrade at [redacted] appears to be reasonable.
- Program level risks appear to have been captured and tracked, with corresponding mitigation strategies. Key risks include the utilisation of mini-lens technology, WNTD v4, and 5G mmWave spectrum as described above.

However, Grex has not been able to form a conclusive view on the prudency and efficiency of this expenditure item as there are a number of risks and uncertainties relating to the project that remain and do not appear to have been addressed at this stage:

- While the approach to calculating the unit cost target of $ per Mbps is understood, it is not clear how this can be used to perform an effective efficiency assessment,
- It is not clear the amount of risk contingency that has been factored into the financial model provided by NBN Co, the residual risks, and if the allocation is sufficient to address the residual risks, based on various artefacts provided.
- The effectiveness of proposed mitigation strategies and residual risks are unclear at this stage.
- Whilst the cost per site appears reasonable, it is unclear how this cost factors in the possible site structural upgrades due to the wind loading effect of upgraded antennas and equipment on the relevant sites.[173]
- While understanding the decision-making process was progressive over the last few years, the rationale to reach the preferred option of network-wide upgrade to 50 Mbps TWBPS by end of 2025 is not clearly articulated, for example, no detailed optionality analysis and corresponding cost-benefit analysis has been provided.
- The capacity upgrade baseline of 6 Mbps busy-hour throughput and target metric of 50 Mbps TWBPS are not directly comparable, making it very difficult to understand and assess the actual capacity uplift achieved by the program. Several explanations have been offered by NBN Co during the RFI and ACCC Briefings process, but it remains difficult to clearly articulate the capacity uplift in terms of % of current capacity and improvement in end-user experience. In addition, several artefacts provided by NBN Co make direct comparison of the two metrics as if they're the same, confusing the subject even further.

12. Capability - SMB Enablement (on-demand)[174]

[redacted]

[173] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[174] SAU Supporting Submission Part F, Chapter A.2.3, Capability, pages 49 – 50, with more detail provided in 011 nbn ACCC Briefing – IOP23 – Business Upgrades – CONFIDENTIAL and through the RFI Process.

SMB Enablement Initiative (on demand) is an ongoing business as usual activity and involves building direct fibre connections to business premises on demand once an order is placed for NBN Co Enterprise Ethernet. It provides NBN Co's customers with the flexibility to meet end user requirements for higher speed services than would otherwise be available on NBN Co's multi technology mix. NBN Co deals directly with its RSP customers to understand end user needs and requirements. The capex for SMB Enablement includes direct fibre connections to meet growing demand from end users for access to higher speed business grade services and includes all build and connection costs for business fibre orders. The business grade services have symmetrical speeds and an option of additional service level support with a dedicated Business Operations Centre.

Volumes for SMB enablement activity is driven by end-user demand, with monitoring described by NBN Co to ACCC of number of premises and costs per premise. The cost drivers include build, design, activation, materials, NBN Co internal labour and delivery partner costs.

SMB Enablement capex is classed as a Competitive Service and is excluded from the Core Services ABBRR and the Core Services RAB and will not form part of the cost base relevant to the application of price controls[176]. Therefore, the key expenditure data is the competitive percentage of shared network and service infrastructure costs. The customer specific costs for SMB Enablement capex and opex (e.g., for the direct fibre connections) were not assessed for the purposes of this Report due to the classification of SMB Enablement as a Competitive Service.

[175] SAU Supporting Submission Part F

[176] "[CIC] NBN Co – SAU supporting submission – Efficiency of NBN's expenditure and demand forecasts – 16 December 2022 ("SAU Supporting Submission Part F"), Section A.2.5 Capability, Page 49-50"

As the (large) majority of the SMB Enablement is a Competitive Service, no assessment has been made in this report of this component of forecast expenditure.

13. Capability - Regional Co-Investment[177]

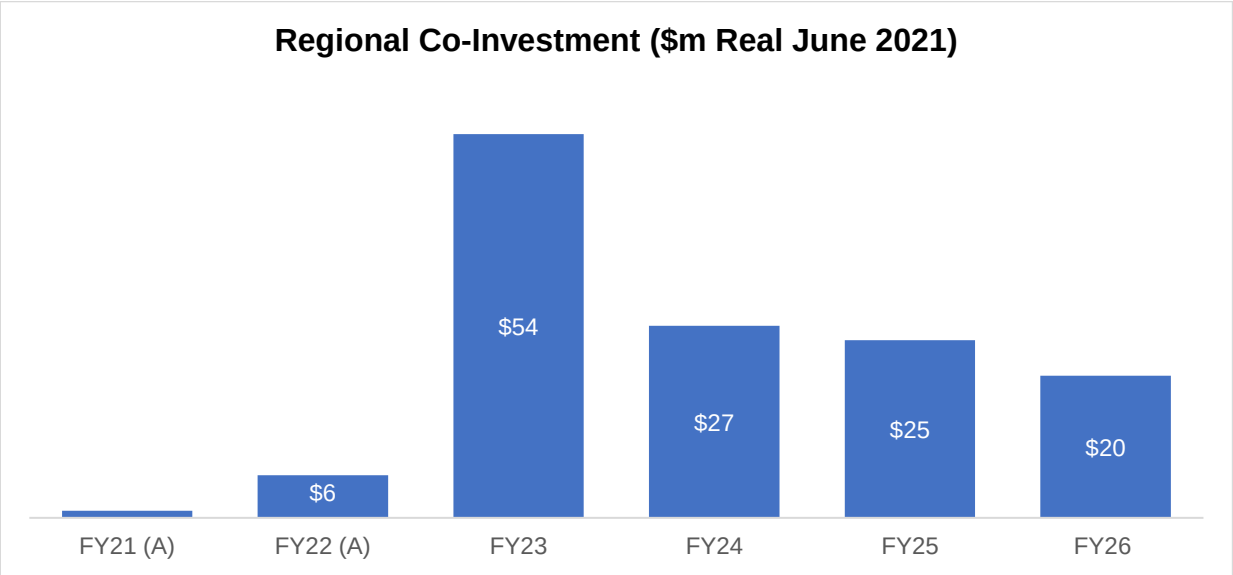


Figure 60 Regional Co-Investment ($m Real June 2021)[178]

NBN Co's Regional Co-Investment Initiative complements the Network Upgrade Initiative and SMB Enablement Initiative through the creation of a $300 million fund to co-invest with federal, state, territory and local governments in programs designed to shift regional premises to more capable technologies. The upgraded capability of the fixed wireless network enables premises to access higher speeds. The forecast level of migration from fixed wireless to FTTP technology in regional areas is lower, resulting in the forecast level of capex on fibre upgrades in regional areas being lower.

The forecast is $72m over the First Regulatory Cycle (versus $61m for FY21-FY23).

Further detailed information on the unit costs of this initiative to qualify the assessment further was not available but this is understood as volumes for the Regional Co-Investment are driven by a number of external factors, such as:

- **Contracted upgrade programs**: where NBN Co has a signed contract/grant agreement to upgrade a specific site/area to new technology, the total capex required in contract is planned in RCIF,
- **To be contracted nbn co-contribution**: allowance placed in plan for expected co-contribution programs run by federal/state/local authorities, and

[177] Refer to "007 nbn ACCC Briefing – IOP23 – Regional Upgrades - CONFIDENTIAL" and SAU Supporting Submission Part F, Chapter A.2, Capital Expenditure, Page 37, 38, 40, Chapter A.2.5, Capability Page 44-45, 50-51
[178] SAU Supporting Submission Part F

- Demand for speeds higher than available technology in regional areas, coupled with federal/state/local government view for co-investment nationwide.

The key cost metrics for Regional Co-Investment initiative include:

- Network design,
- Construction,
- Transit network,
- Subscriber (fixed network only), and
- Connection cost (lead in and WNTDs).

The key monitoring metrics for Regional Co-Investment initiative include:

- All contracted programs are monitored against plan across technology and contract categories, and
- The cost per Mbps.

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes** as:

- There is a lack of unit cost detail.
- Governments are co-investing with NBN Co to upgrade regional technology, meaning NBN Co's exposure to the costs is much more limited than the other upgrade and expansion projects identified throughout this expenditure review.
- The expenditure is handled as contracted programs that are planned as part of the RCIF process.

14. Capability – Other - Capability (incl. Tech Choice Program & Business Satellite Service)

[redacted]

There is a relatively small amount of capex allocated for two other initiatives[180]:

- Tech choice program: Ongoing Tech Choice program to upgrade specific premises to the next most capable technology and is funded via an up-front contribution from the relevant end-user(s). The program is expected to have lower demand over time due to network upgrade initiatives such as FTTN to FTTP upgrade.
- Business satellite service (BSS): proposed capex to enable the BSS product via beam expansion, Telemetry Tracking and Control, platform and network build, and transit readiness.

There is [redacted] allocated over the FRC for these initiatives.

- Tech Choice Program: Volume driven by demand for technology upgrades from end users,
- BSS: Volume driven by demand for business services.

The cost driver and monitoring metrics for these are related to the initiative characteristics: -

- Tech Choice Program: Cost per upgrade (depending on technology type).

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes**, as:

- This is ongoing BAU activity. Further detailed information on the activity to qualify the assessment further was not made available.
- The expenditure is customer led and predominantly funded by the end-user in most cases, and likely to be variable depending on the end-user requirements. Where there is

[179] SAU Supporting Submission Part F
[180] SAU Supporting Submission Part F.

upfront customer funding, this is expected to offset the capital expenditure included in the RAB.

- This represents a relatively small expenditure for NBN Co and is funded up-front (for Tech Choice). Further detailed information on the activity to qualify the assessment further was not made available.

15. Other - IT (Systems Engineering incl. Enterprise Simplicity)[181]

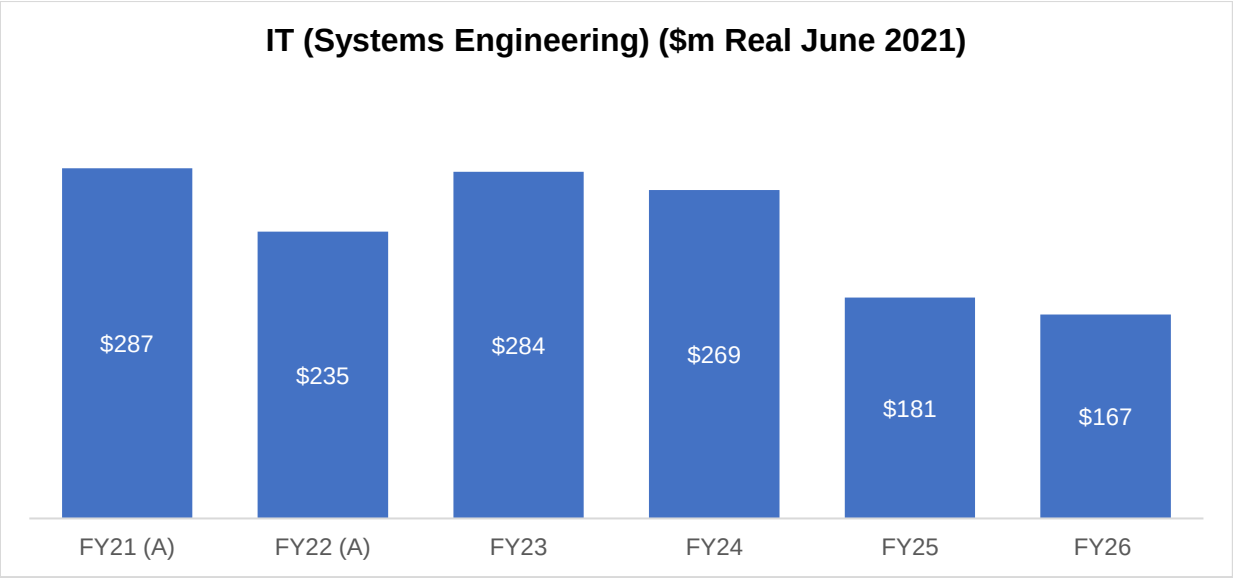


Figure 62 IT (Systems Engineering) ($m Real June 2021)[182]

This initiative covers the IT Capex spend across the organisation (including effective management of vendors on key cost drivers). This is managed centrally through the Systems Engineering and Operations Business Unit (SEO) and includes capex (IT Systems Engineering) and operating expenditure costs (IT and software opex).

The Enterprise Simplicity program is the key initiative that underpins the cost savings across capex for IT (Systems Engineering) and opex for IT and software. This program represents a technologically prudent initiative to address the proliferation of multiple/duplicated applications that impact the cost base and the customer experience (including improved RSP availability, automation, APIs, and integration) and assurance processes. Some of the reduction in IT (Systems Engineering) capex is assumed to be attributed to the end of the Enterprise Simplicity program in FY25. Capex is forecast to be $45M in FY24-FY26.

Key volume drivers and monitoring metrics include number of applications, licenses, environments, incidents, devices, and labour (FTEs/TSAs and EWs). The cost drivers include labour costs, managed services (number of incidents), software licensing and maintenance,

[181] SAU Supporting Submission Part F, Chapter A.2.3, Capability, pages 49 – 50, with more detail provided in 004 nbn ACCC Briefing – IOP23 – SEO – CONFIDENTIAL and RFI Process (including nbn response to RFI dated 24 March 2023).
[182] SAU Supporting Submission Part F

cloud managed services, application support and maintenance, IT hardware maintenance, telephony, and facilities.

The decommissioning of 166 applications highlights a technical debt with inefficient IT costs in the previous SAU period, with possible considerations for enterprise architecture and strategy, and/or technology governance in the operating model to monitor costs, allowing the multiple/duplicated applications across the IT platforms.

The main outcome of the initiative from a capex perspective is a [redacted] cost saving which represents both a prudent and efficient investment. Further savings are described from an opex perspective in section 22 below. However, there are no additional benefit/value metrics for improved service levels (such as customer experience and assurance).

This prudency and efficiency of this expenditure is assessed to be **Qualified Yes**, as:

- It delivers costs savings across capex for IT (Systems Engineering) and opex for IT & Software Costs and represents a technologically prudent initiative to optimise, rationalise and modernise the existing applications that impact the cost base.
- Majority of capex investment for this initiative is in FY21-FY23, so this is not expected to be a significant initiative in the FRC in FY24-FY26.
- However, there is insufficient clarity on the extent of the overall net benefits delivered that consequently assist with the prioritisation of the expenditure on this program. There are no benefit/value metrics targeted including improved end-user experience and customer service assurance activities (e.g., service performance, willingness to pay, and possible revenue benefits for NBN Co).
- However, there are no benefit/value metrics targeted for improved service levels or committed due to an enhanced end-user experience (i.e., cost savings and benefits due to improved customer experience and customer service assurance).
- The break-even point (spend on program versus expected enterprise level savings) is likely to be beyond FY26 (6+ years).

Whilst the assumption in qualifying the findings around prudency and efficiency of this expenditure is that improvements in service levels will be delivered as part of the Enterprise Simplicity program, there has been no commitment to or transparent/discrete measures provided to achieve these outcomes, particularly in the areas of operational and customer experience. It is recommended that there are further measures implemented to track and measure IT costs related to business-as-usual activities so that they deliver (and preferably exceed) against the relevant industry service level metrics. IT Initiatives such as Enterprise Simplicity should improve on current service metrics baselines (e.g., improve delivery, assurance, customer experience). These service metrics, in the immediate term should align to the WBA4 and/or Module 4 of the SAU Variation, and it is expected that IT business as usual and expenditure for new initiatives should be reviewed, measured and tracked against these new metrics, as well as the WBA5, RKR or equivalent reporting that is introduced.

Reporting of IT capex and opex should be transparent with the detailed activities within Systems Engineering and Labour Costs made available to assess their prudency and efficiency of the programs they enable. For example, the Enterprise Simplicity initiative touched on System Engineering, IT & Software Costs and likely some Labour Costs which have not been fully transparent.

16. Other - Other Network[183]

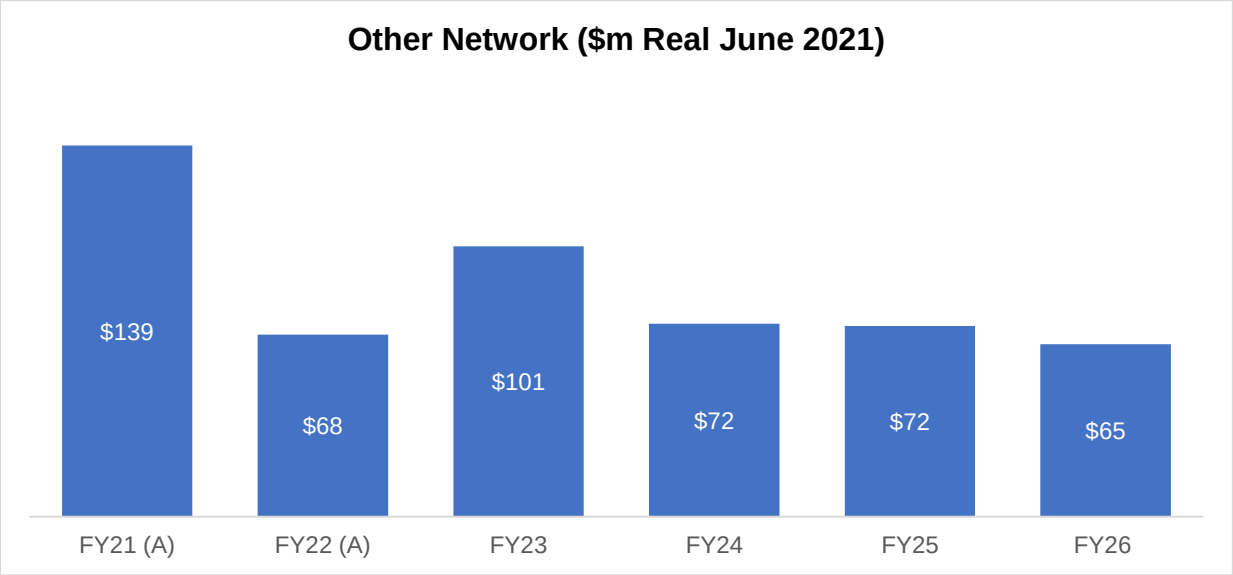


Figure 63 Other Network ($m Real June 2021)[184]

Other Network within NBN Co's description of "Other" capex comprises capex proposed expenditure across network engineering & security (incl. the Aggregation Evolution program), Innovation Lab (testing equipment and new initiatives prior to implementation), manage ongoing cyber-sec risks, develop network efficiency improvements, undertake automation initiatives, internal field workforce tools capex.

There is $209m allocated over the FRC (2.8% of total capex).

The prudency and efficiency of this expenditure is assessed to be **Qualified Yes**, as:

- This is an ongoing BAU activity. However, this is qualified as further detailed information on the activity to qualify the assessment further was not made available.
- Although this initiative addresses efficiency, automation and tools, there are no benefit/value metrics targeted including the overall benefits to the business and/or the end-user service experience (e.g., assurance, service performance, willingness to pay, and possible revenue benefits for NBN Co). This can assist with prioritisation of the program and its initiatives, and where relevant such as network efficiency introduce additional metrics for monitoring and tracking outcomes.
- Expenditure breakdown assessed as high-level breakdown only. Further detailed information on the cost breakdown of this BAU activity to qualify the assessment further was not made available.
- Although this initiative addresses efficiency there are no benefit/value metrics targeted including the overall business benefits such as cost savings.

[183] SAU Supporting Submission Part F.
[184] SAU Supporting Submission Part F

17. Other – Facilities & Other[185]

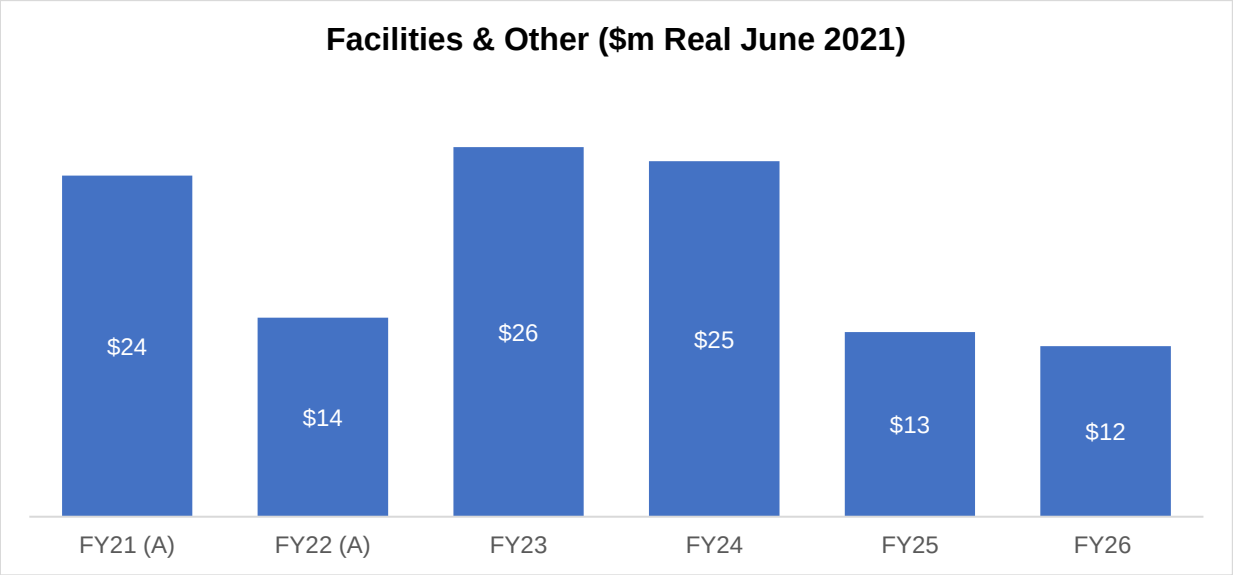


Figure 64 Other - Facilities & Other ($m Real June 2021)[186]

This includes capitalised labour costs for business unit subject matter experts for time required to support various initiatives.

There is $50m allocated over the FRC (0.7% of total capex).

The prudency and efficiency of the expenditure assessed to be **Yes**, as:

- Ongoing BAU activity.
- It is assumed that an appropriate process is followed to determine where and when this type of resources (appropriate expertise) is utilised within the business. Expenditure is related to upgrade/fit out works by third parties[187].

[185] SAU Supporting Submission Part F.
[186] SAU Supporting Submission Part F
[187] 017 ACCC RFI - nbn Response - Tranche 4 - CONFIDENTIAL, Q5.2.6a

18. Other - Commercial Works[188]

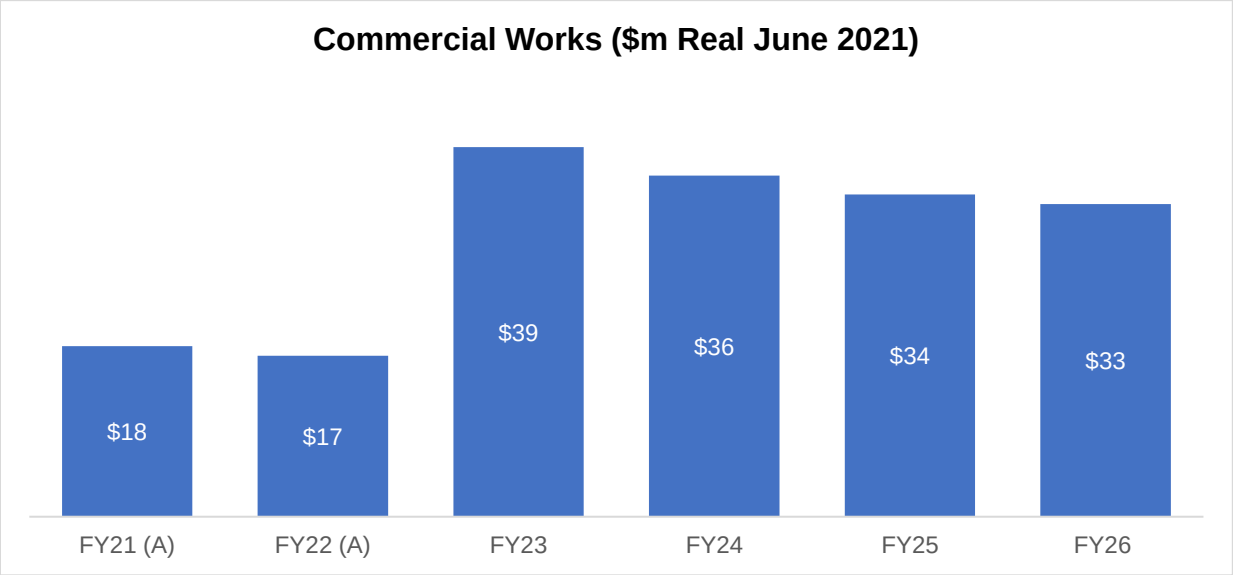


Figure 65 Commercial Works ($m Real June 2021)[189]

These works are undertaken on a cost recovery basis. This is often at the request of third parties and may involve activities such as moving NBN Co infrastructure to allow for construction.

There is $103m allocated over the FRC (1.4% of total capex).

The prudency and efficiency of the expenditure is assessed to be **Yes**, as:

- Ongoing business as usual activity.
- Delivered on a cost recovery basis.

[188] SAU Supporting Submission Part F.
[189] SAU Supporting Submission Part F

OPERATIONAL EXPENDITURES

19. OPEX - Infrastructure Payments[190]

[redacted]

Expenditure Item ($m)	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Infrastructure Payments	794	851	[redacted]			

Table 11 Infrastructure Payments FY21-FY26 ($m Real June 2021)[192]

The Infrastructure Payments is the largest operational expenditure [redacted] related to expense that provides for the use (under Telstra Arrangements) of ducts, exchanges and dark fibre that form part of the NBN Co network. Rates are set out under long-term contracts with Telstra. Expenditure is driven by network size, and volume of infrastructure to be leased.

Under the Telstra Arrangements, the amounts paid for each unit and type of infrastructure are CPI indexed so, in real terms, changes in the opex for Infrastructure Payments is related only to changes in the volume of relevant infrastructure used by NBN Co. Due to small additional volume of infrastructure in the near term, this cost is forecast to have a small increase. It represents a large component of the overall forecast operating expenditure.

[190] SAU Supporting Submission Part F, Chapter A 3.1, A3.2, pages 53 – 55.
[191] SAU Supporting Submission Part F
[192] SAU Supporting Submission Part F

The prudency and efficiency of this expense is related to NBN Co's enterprise function, i.e., procurement and financial management. As a long-term contract already negotiated with Telstra, this expense is not further considered in the context of the cost base for the FRC. Its prudency and efficiency is assessed as **Yes,** as:

- Telstra infrastructure rental including ducts, fibres, and racks are required for BAU Activity.
- As a long-term contract already negotiated for Telstra infrastructure, there is no change regarding the FRC period. The cost is predictable, based on demand forecasts and contractual terms.
- The prudency and efficiency of this expense is related to NBN Co's enterprise function, i.e., procurement and financial management.
- It is assumed that NBN Co would be assessing the viability of the use of Telstra infrastructure under the agreement vs. other alternatives.
- The cost is predictable, based on demand forecasts and contractual terms.
- This is a long-term agreement already in place between Telstra and NBN Co.

20. OPEX - Direct OPEX[193]

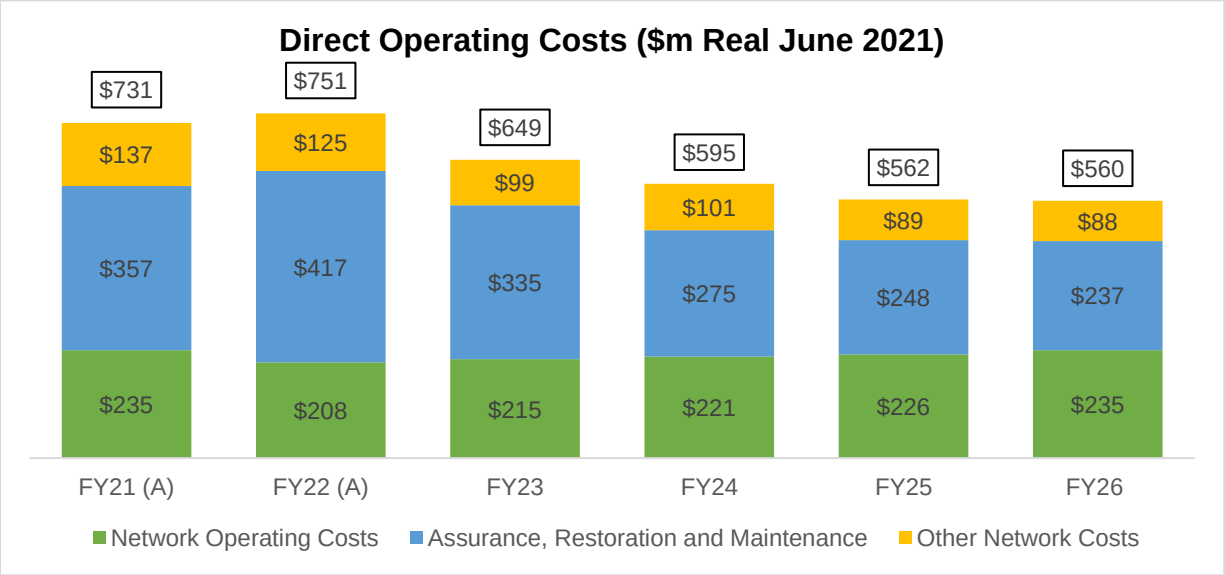


Figure 67 Direct Operating Costs ($m Real June 2021)[194]

Direct Operating Expenditure relates to the opex required to physically operate and maintain the NBN network. It is the second largest opex expenditure, after Infrastructure Payments, accounts for ~23% of the total opex expenditure. It includes the following components:

- Network Opex: power, spectrum, site, and managed services (backhaul) costs.

[193] SAU Supporting Submission Part F, Chapter A 3.1, A3.3, pages 55 – 58.
[194] SAU Supporting Submission Part F

- Assurance, Restoration and Maintenance: service assurance, network assurance and network maintenance
- Other Network Costs: freight and supply chain, vendor support contracts and more

Overall, the direct operating costs are forecast to reduce by 25.4% from FY22 to FY26, mostly due to forecast reduction in 'Assurance, Restoration and Maintenance' and 'Other Network Costs'.

Network Operating Costs:

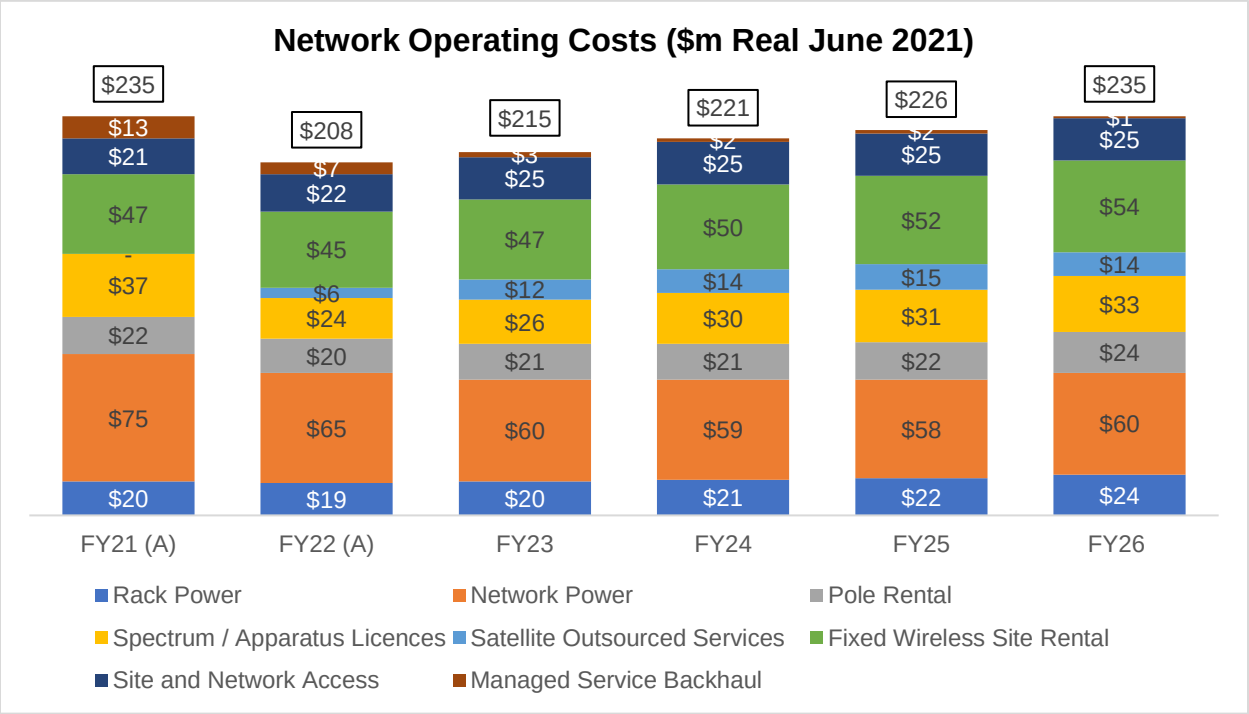


Figure 68 Network Operating Costs ($m Real June 2021)[195]

Forecast total increase of 13% from FY22 to FY26 mainly due to forecasted rack power increase (23%). Due to lack of detailed supporting information through the ACCC Briefings and RFI Process, the impact of planned HFC outside plant modernisation and DAA roll out on network power consumption is unclear, as DAA nodes and amplifiers are both powered devices (i.e., active devices). Additionally, it is unclear if the impact of the newly built FTTP network, as part of the FTTN to P upgrade program, has been factored into this expenditure category.

Prudency and efficiency of this expenditure is **Qualified Yes**, as

- All the expenditure is required for BAU operation of the NBN network.
- Further detailed information on the activity to qualify the assessment further was not made available.

[195] SAU Supporting Submission Part F

- The provided unit costs across various items appear to be reasonable.
- It is assumed that the impact of major network upgrade programs such as FTTN to P upgrade and HFC upgrade are already included in the forecast.

Assurance, Restoration & Maintenance

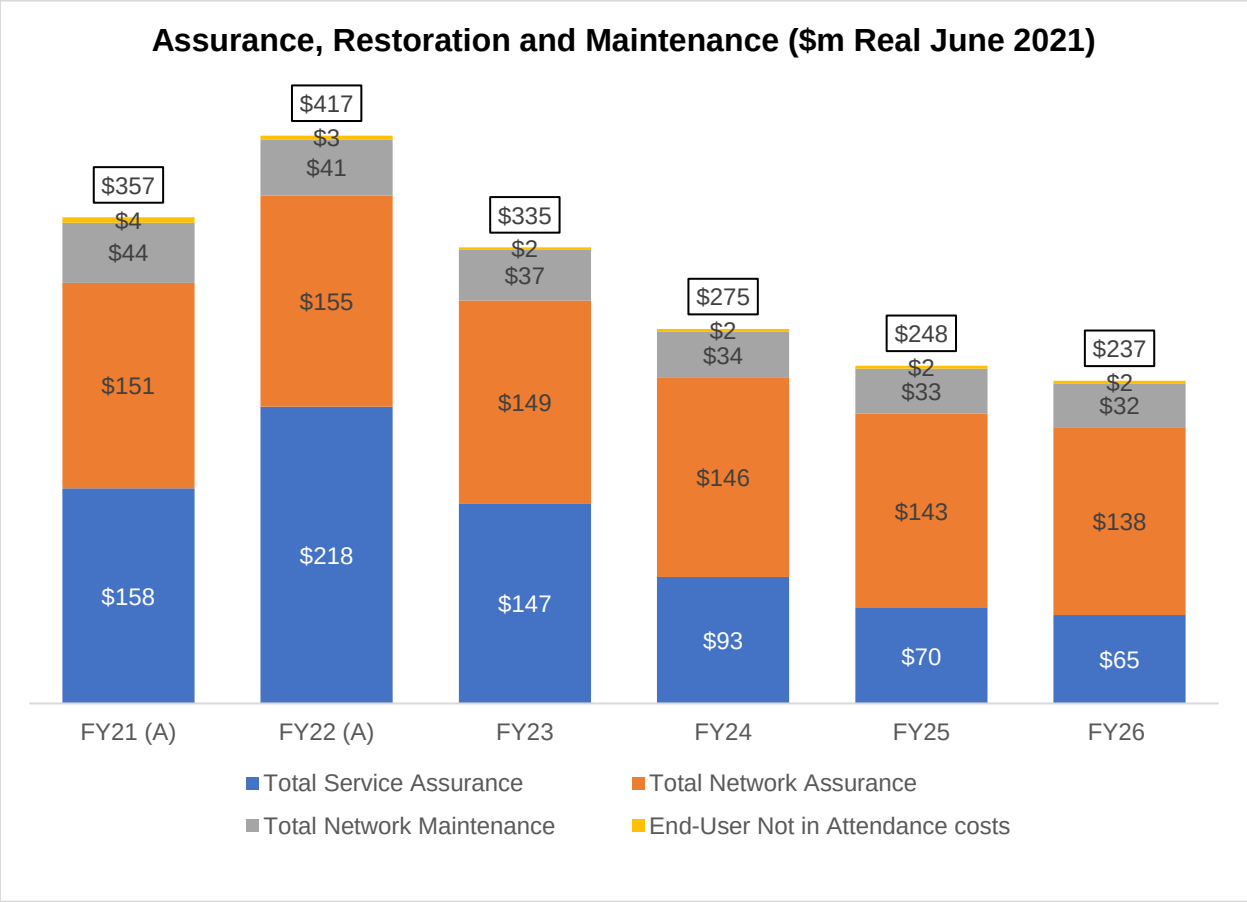


Figure 69 Assurance, Restoration and Maintenance ($m Real June 2021)[196]

Forecast significant decrease of 43% from FY22 to FY26 due to forecast service assurance reduction (72%), network assurance reduction (11%) and network maintenance reduction (23%). It is described by NBN Co that, Truck Roll Efficiency Program and FTTN to P migration are the main contributing factors to the reduction in all three categories especially service assurance[197], which seems to misalign with the relatively slow migration forecast to FTTP from existing FTTN and FTTC end-users.

[196] SAU Supporting Submission Part F
[197] SAU Supporting Submission Part F

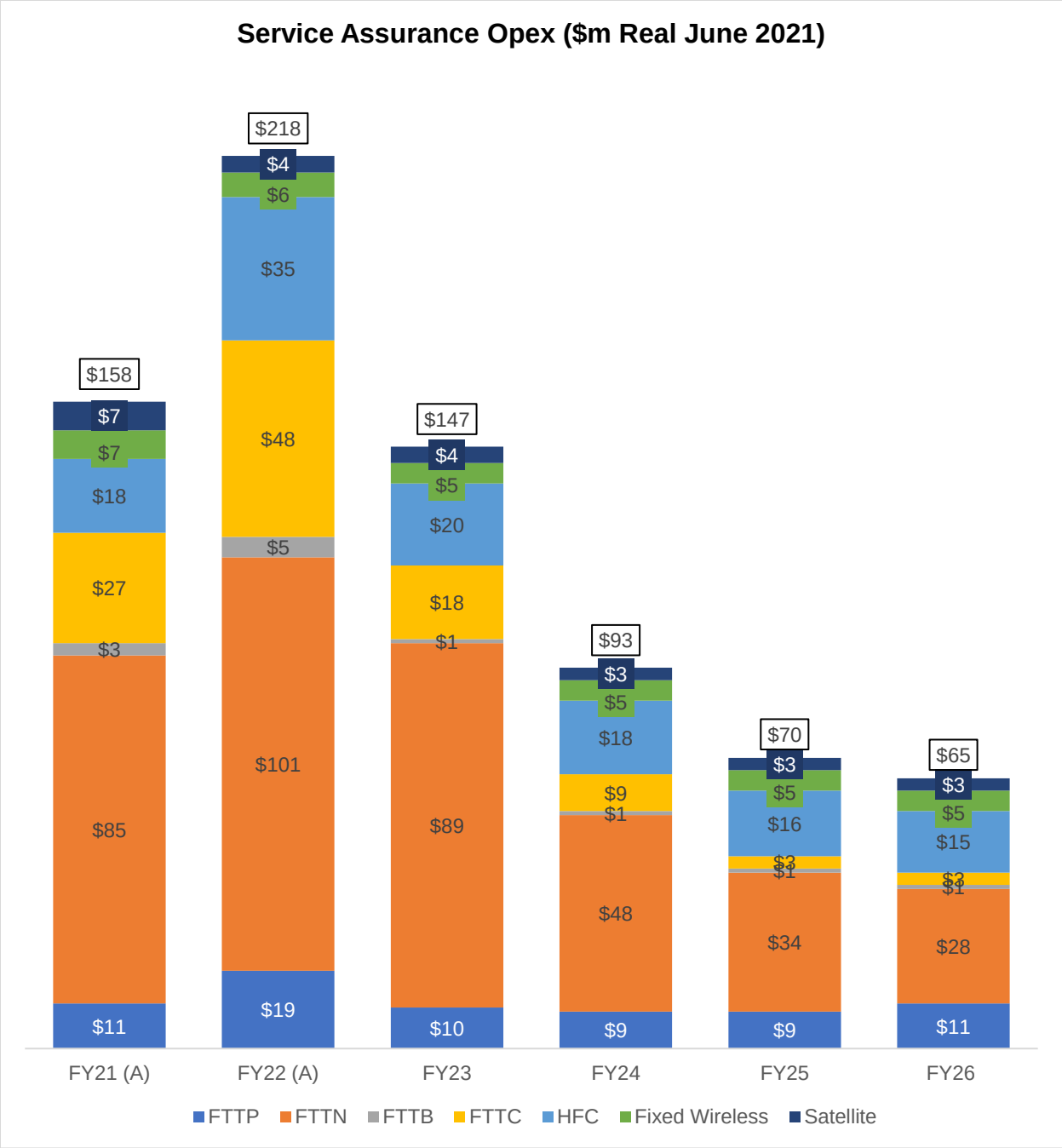


Figure 70 Service Assurance Opex ($m Real June 2021)[198]

Furthermore, NBN Co has forecasted a substantial reduction in service faults per 100 active premises across all the technologies[199]. NBN Co described that the key reasons for these reductions are[200]:

[198] NBN Co SAU Submission
[199] 017 ACCC RFI - nbn Response - Tranche 4 - CONFIDENTIAL
[200] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

- For FTTN & FTTC specifically, better long-term weather conditions, compared with FY21 and particularly FY22 had more extreme weather incidents.
- A comprehensive and detailed Truck Roll reduction program which is focussed on reducing the volume of truck rolls as associated expenditure by: exploring opportunities to reduce the level of incidents by improving the performance of the network (i.e., upgrading equipment that may have been more weather prone with more robust equipment) and the efficiency of the truck rolls (i.e., reduced repeat truck rolls, not in attendance truck rolls etc). Based on information provided by NBN in July 2023, this program is forecasted to provide benefit of 768k truck roll reductions between FY23 and FY26[201].
- FTTN to P migration and FTTC to P migration result in ~120k truck roll reduction in total during FY23-FY26 due to reduced premises and therefore faults on the FTTN network[201].

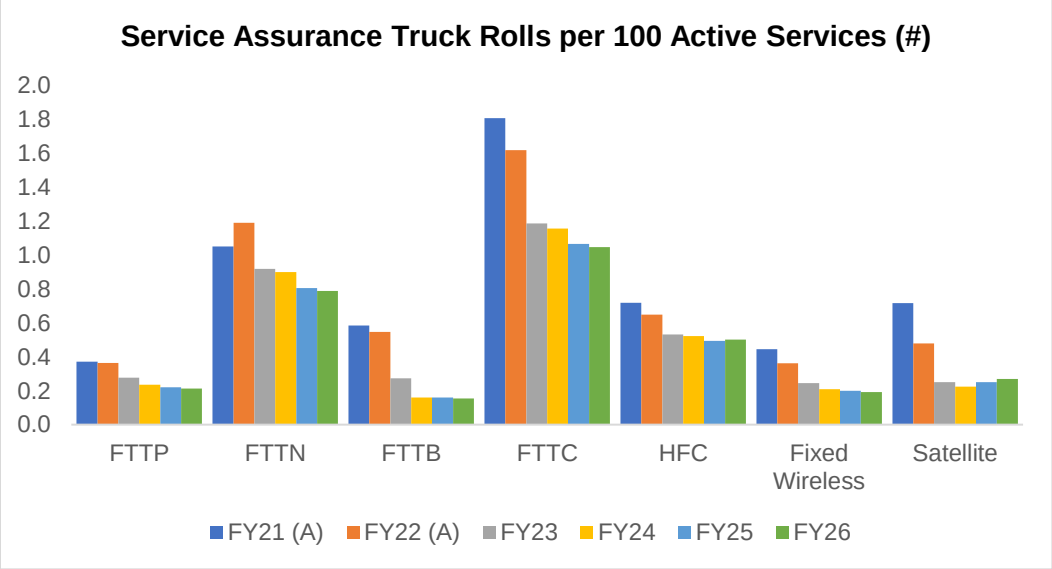


Figure 71 Service Assurance Truck Rolls per 100 Active Services (#)[202]

It can be deduced that the other contributing factors would be completion of the Initial Build and the reduction in new connects and network build program that results in a level of network stability (and reduction in fault rates) due to the reduced network change.

NBN Co is also undertaking a higher level of pro-active assurance, where NBN Co and its customer RSPs work together to identify faults and undertake activity to remediate before an incident occurs. Reduction in fault rates as a result of proactive assurance is not expected to accommodate the full-service assurance reduction forecast.

It is worth noting that NBN Co's RFI provided volumes and unit costs for Service Assurance did not match the allocations in NBN Co's SAU Supporting Submission Part F. Significant differences appear in FY21-FY23. Whilst the differences are comparatively less significant in the FRC period,

[201] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[202] 017 ACCC RFI - nbn Response - Tranche 4 - CONFIDENTIAL

the calculated volumes and unit costs exceed the allocated amounts in NBN Co's SAU Supporting Submission Part F, shown in the below figure.

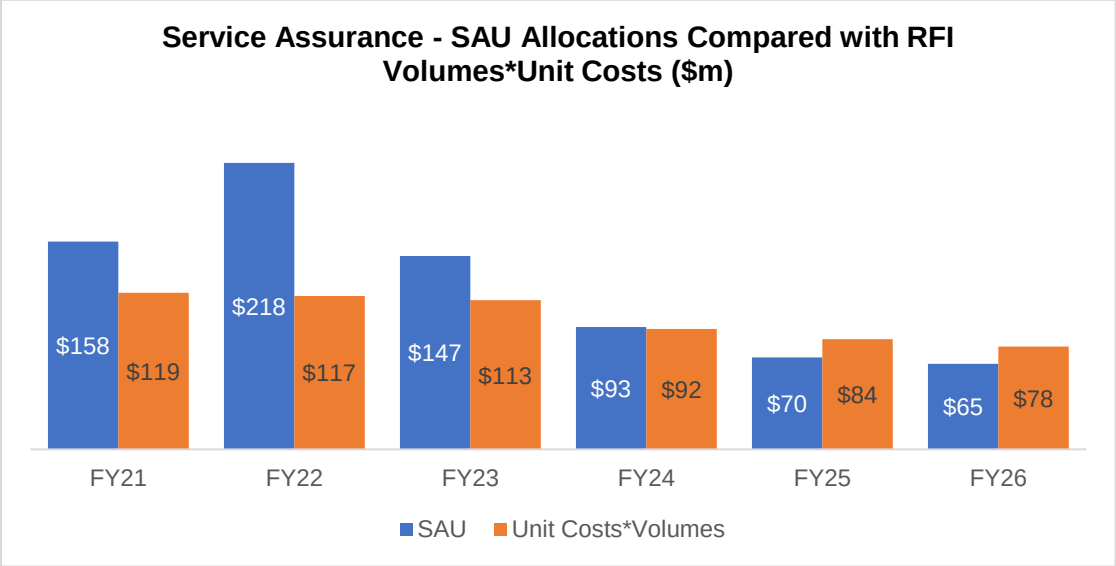


Figure 72 SAU Allocations Compared with RFI Volumes*Unit Costs ($m) [203],[204],[205]

For network assurance (11% cost reduction from FY22 to FY26), NBN Co described in its submission dated July 2023 that the main drivers behind the forecasted reduction are[206]:

- Slight increase in FTTP incidents, offset by reduction in FTTN incidents as end users migrate to FTTP,
- General reduction of incidents due to improved weather conditions, compared with FY21 and FY22,
- Static delivery partner (DP) labor rates through efficiencies via annual price reviews, and
- Several DP focused initiatives to drive down volume and high-cost tickets.

[203] SAU Supporting Submission Part F
[204] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[205] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL
[206] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL

Figure 73 Network Assurance Volume and Average ToW Cost Forecast

It is worth noting that NBN Co's RFI provided volumes and unit costs for Network Assurance did not match the allocations in NBN Co's SAU Supporting Submission Part F. Significant differences appear in FY21-FY26, as shown in the figure below.

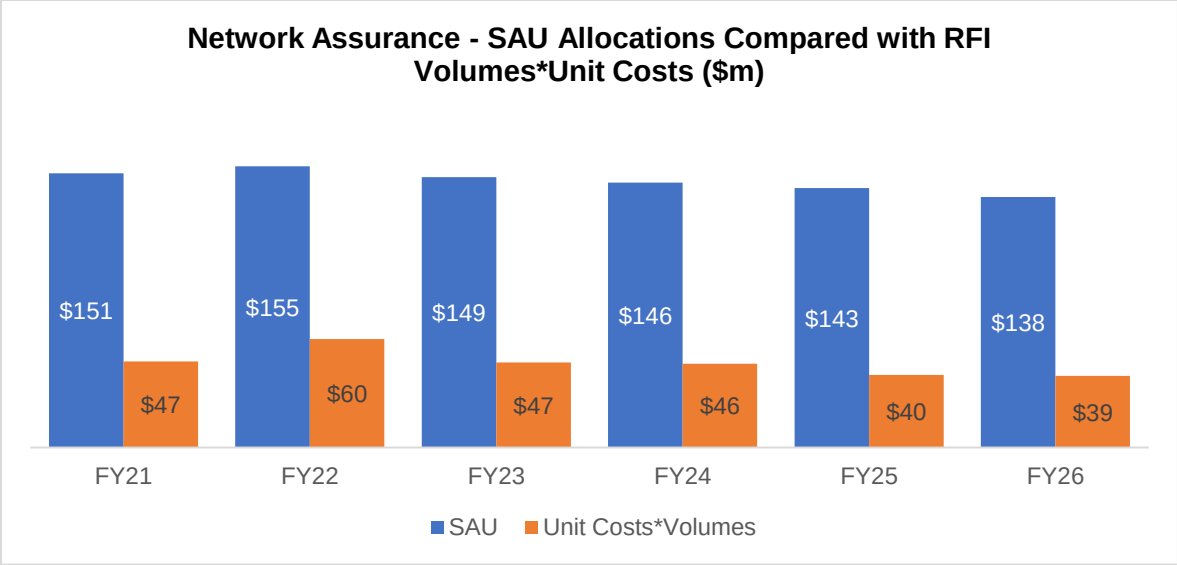


Figure 74 Network Assurance - SAU Allocations Compared with RFI Volumes*Unit Costs ($m)[207],[208],[209]

[207] SAU Supporting Submission Part F
[208] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[209] 020 ACCC RFI - Grex consolidated - nbn Response 24 March - CONFIDENTIAL

For network maintenance (23% cost reduction from FY22 to FY26), further information provided by NBN Co in July 2023 describes the main drivers behind the forecasted reductions as[206]:

- 25% reduction of Distribution Network (Pole network across fixed line technologies) maintenance cost due to much lower cost through a new contract with a new DP, although at slightly higher volume due to additional proactive inspections, and
- 30% reduction of HFC network maintenance cost, due to static DP cost through annual pricing reviews, reduced downstream incidents due to cleaner spectrum used, and reduced volume of recuring incidents through improved technician work quality.

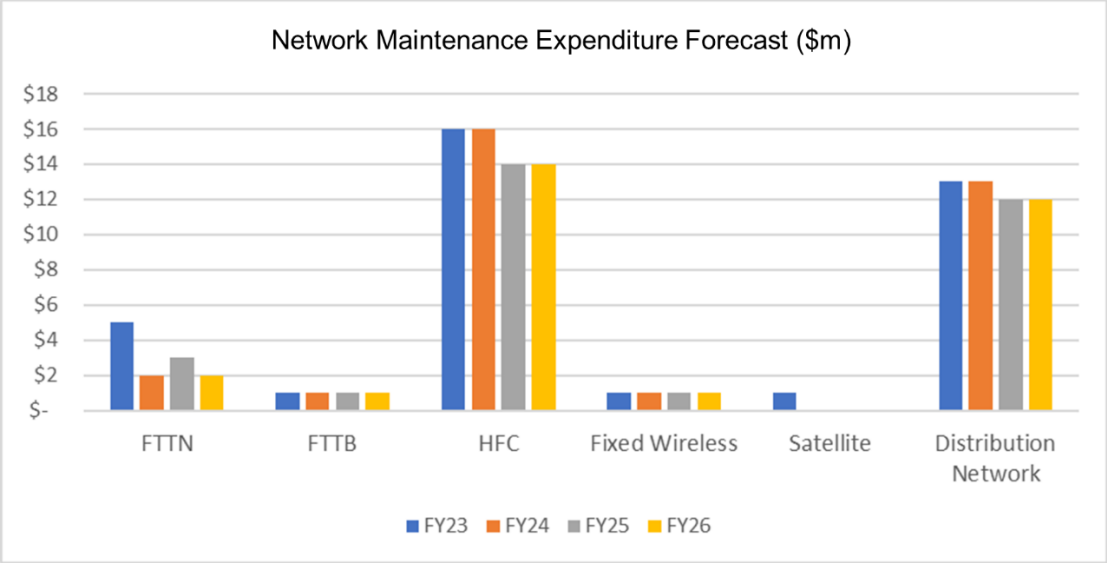


Figure 75 Network Maintenance Expenditure Forecast ($m)

In conclusion, the prudency and efficiency of this expenditure is **inconclusive**, as some of the information provided indicates that the expenditure forecasts are prudent and efficient, including:

- All the expenditure is required for BAU operation of the NBN network and maintenance of service levels & performance.
- Service assurance incident volume per 100 active premise is proposed by NBN Co to gradually decrease from FY24 to FY26, predicated on a significant reduction from current year to the start of the period.
- Further documentation provided by NBN Co[210] shows that the majority of the truck roll reduction is forecasted to be a result of the Truck Roll Efficiency program, which is responsible for 835k fewer truck rolls in the FRC (980k between FY23 and FY26)[211]. This compares with 121k truck roll reduction as a result of FTTN/C to P migration in the FRC (127k between FY23 and FY26).
- FTTN to P migration is the other major contributor to the overall volume and expenditure reduction.[212] Along with FTTC to P migration, migration activity is responsible for ~121k

[210] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[211] 031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
[212] SAU Supporting Submission Part F

reduction in truck rolls (96k truck roll reduction from FTTN to P migration, and 25k truck roll reduction from FTTC to P migration) based on current forecast of migration volume. This is largely calculated based on the FTTN service fault rate.

However, Grex has not been able to form a conclusive view on the prudency and efficiency of this expenditure item as there are a number of risks and uncertainties relating to the project that remain and do not appear to have been addressed at this stage:

- The full effectiveness of the Truck Roll Efficiency program is not clear, due to lack of performance data, especially how it is tracking against the significant service fault rate reduction target in the current period (FY23 to FY24),
- The impact of slower than forecast FTTN to P migration may have an impact on the forecasted truck roll reduction volume. It is also not clear if the completed FTTN/C to P migration are effectively reducing overall FTTN/C service faults according to NBN Co's forecast (due to lack of performance data),
- The network assurance expenditure forecast differs significantly from the provided volume and unit cost of tickets of work across different technologies, and
- For network assurance, there is inherent reliance on improved weather conditions.

Other Network:

This includes miscellaneous direct network related costs such as: freight distribution & supply, vendor support contract and others such as fleet vehicle and security.

Prudency and efficiency of this expenditure is **Yes**, as

- All the expenditure is required for BAU operation of the NBN network, and
- It is assumed that NBN Co is adhering to its procurement & governance framework (as described in the SAU Variation).
- Although no volume and unit cost information is provided, it is assumed there would be large degree of logical variation in both due to the type of activity included in this expenditure.

21. OPEX – Labour Costs[213]

[redacted]

[213] SAU Supporting Submission Part F, Chapter A 3.4, pages 59 – 60, with additional information from 006 nbn ACCC Briefing - IOP23 - Labour Costs - CONFIDENTIAL

[redacted]

Expenditure Item ($m)	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Total Labour Costs (Opex Only)	831	665				

Table 12 Labour Costs FY21-FY26 ($m Real June 2021)[215]

Labour refers to the opex required for NBN Co's internal workforce, which is comprised of a mixture of Full Time Equivalents (FTEs) and Temporary Staff Arrangements (TSAs) across Ops (incl. internal field workforce), network engineering & security, regional development & engagement, SEO (incl. IT), customer products & marketing, corporate (incl. finance, people and culture, and other corporate teams).

There has been a steady decline in Labour operating expenditure since 2019's peak initial build period. Labour opex is reducing annually over the FRC, related to the tapering down of customer connect volumes following the completion of the initial build, partially offset by the headcount required to facilitate the delivery of the forecast volumes of work under the Network Upgrade Initiative, SMB Enablement Initiative and Regional Co-Investment Initiative, particularly with respect to the expanded scope of the FTTN to FTTP and fixed wireless upgrades.

Capitalisation is reflected against various capex programs based on Labour activity, and the Labour forecast is net of capitalisation. The real forecast includes nominal growth of 2.5% over the FRC for salaries for the whole internal workforce.

[214] SAU Supporting Submission Part F
[215] SAU Supporting Submission Part F

NBN Co has a number of initiatives to deliver headcount reductions within the range of [redacted] progressively to FY26. Capex efficiencies are expected through NBN Co's "Mega Processes", which are expected to reduce total headcount by [redacted] through:

- Process Simplicity Programme [redacted]
- Enterprise Simplicity Programme [redacted]
- Reduction in capex investment and build activity [redacted], and
- Op model optimisation [redacted]

The workforce plan includes recruitment in FY23 and FY24 for planned initiatives which include the FTTN to FTTP Network Upgrade and the Internal Field Workforce. [redacted] The IWF details have not been made available, except that in FY26 this will reach a Delivery Partner (DP)/IWF mix for Service Assurance Truck Rolls of 89% for FTTP, 60% for FTTN, 78% for FTTB, and 96% for HFC.

During FY24-26, Opex Labour costs are forecast to decrease [redacted] and appear to be driven by optimisation and planned reduction in the overall headcount. As such, the Labour cost reductions represent a **Qualified Yes** for both prudency and efficiency, as

- Labour cost reduction is a consequence of reduced headcount and maintaining average TFR flat across the FRC period.
- It is assumed the optimisation of the workforce will support the initiatives and on-going business activities of NBN Co, however, this would require further detailed analysis and additional breakdown of labour resources to confirm without any qualification. Further detailed information on the breakdown of this activity to qualify the assessment further was not made available.

22. OPEX - Other Operating Costs

[redacted]

[redacted]

Other Operating Costs Expenditure Items	FY21 (A)	FY22 (A)	FY23	FY24	FY25	FY26
Outsourced Services	118	97	[redacted]			
Advisory and Corporate Costs	24	22	20	13	13	13
IT and Software Costs	205	184	177	153	145	138
Marketing and Product Costs	88	44	44	42	40	39
Facilities Costs	88	73	63	57	52	47
TUSMA Levy	31	34	35	36	38	39
Insurance	15	24	27	33	36	38
Other Internal Expenses	36	24	31	31	28	27

[216] SAU Supporting Submission Part F

Total Other Operating Costs	606	503	[redacted]

Table 13 Other Operating Costs ($m Real June 2021)[217]

This component refers to the support of all other aspects of NBN Co's operations – including non-network facilities, IT and software costs, outsourced functions, and insurance. The individual line items comprise the following:

1. Outsourced services: Outsourced services e.g., IT helpdesk, extended workforce arrangements,
2. Advisory & corporate costs: Legal, consulting, etc.,
3. IT & software costs: BAU (reductions expected through Enterprise Simplicity Initiative, this is already described in section 6 of this appendix.
4. Marketing & product costs: Advertising & media, customer marketing program, direct marketing & partnerships, other marketing, product costs,
5. Facilities costs: Office accommodation & other non-network facilities. Expected to reduce in line with internal workforce reduction,
6. TUSMA levy: Telecommunications Universal Service Management Agency: as NBN Co's share of industry eligible revenue increases, the amount NBN Co needs to pay towards the TUSMA Levy will increase,
7. Insurance: This covers insurance to protect NBN Co and its assets (excluding satellite insurance, which is included under Network Assurance), including professional indemnity, directors' and officers' insurance, general and public liability, and cyber liability, and
8. Other internal expenses which include accounting, tax and audit fees, recruitment costs, training and development, corporate communications, office supplies and subscriptions, travel and entertainment, and other.

The main outcome of NBN Co's IT Enterprise Simplicity initiative (described under the capex initiative in section 15 above) is a [redacted] cost saving of *opex* for IT & Software Costs for the FRC, i.e., comparison of IT and Software Costs (Opex) between FY21-23 and FY24-26. This justifies the business case for Enterprise Simplicity and is an efficient improvement.

These are driven by a range of factors, including ongoing transformation and the level of required support for capital works.

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes**, as:

- Ongoing BAU Activity
- Expenditure breakdown assessed as high-level breakdown only.

[217] SAU Supporting Submission Part F

23. OPEX - Service Level Rebates

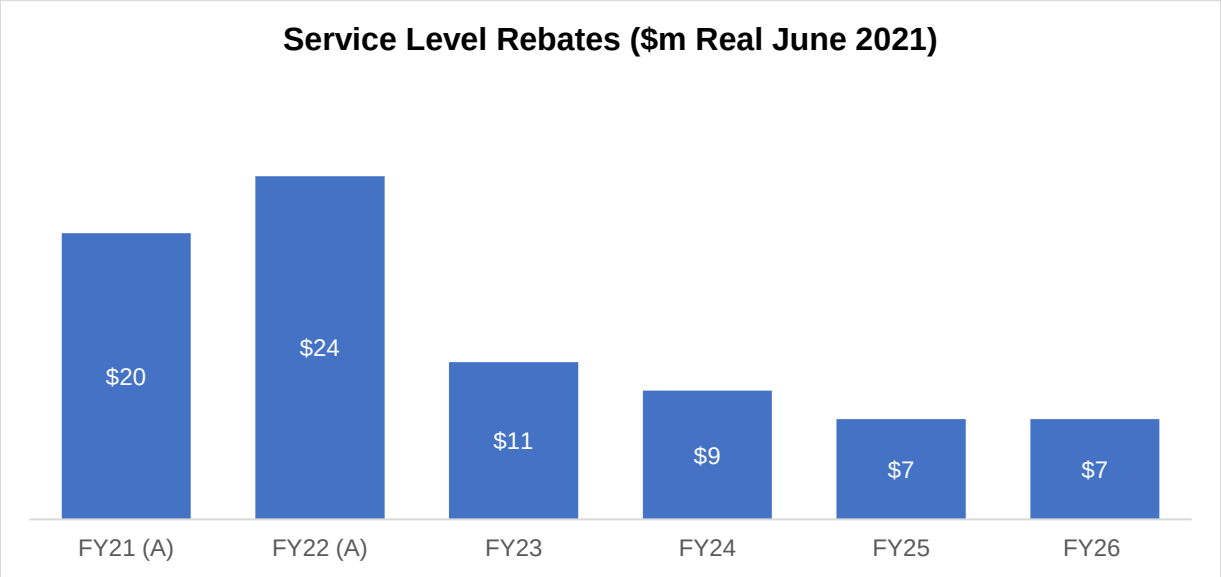


Figure 78 Service Level Rebates ($m Real June 2021)[218]

NBN Co provides RSPs with rebates where NBN CO fails to meet the applicable Service Level. NBN Co has forecasted a significant reduction in the service rebate expenditure in the FRC.

The prudency and efficiency of the expenditure is assessed to be **Qualified Yes**, as:

- This is related to the penalties regime included in the WBA and is forecast against NBN Co's perceived inability to meet the contracted service performance target(s).
- Further detailed information on the drivers and metrics that improve the end-user experience and service levels (including related current and roadmap IOP performance and assurance initiatives and activities) to qualify the assessment further was not made available. The introduction of new customer service metrics and reporting to monitor and enhance decision-making related to the end-user experience is assumed to play a key role in the improvements.
- This is forecast to decrease during the FRC relates to the continued stability and maturity of the network, and the proposed improvement in performance and capability provided by the current IOP23 initiatives, as well as future IOP initiatives.
- Further detailed information on the drivers and metrics for the improved service performance that reduces the rebates costs (including related current and roadmap IOP performance and assurance initiatives and activities) to qualify the assessment further was not made available.

[218] SAU Supporting Submission Part F

24. OPEX - Subscriber Payments

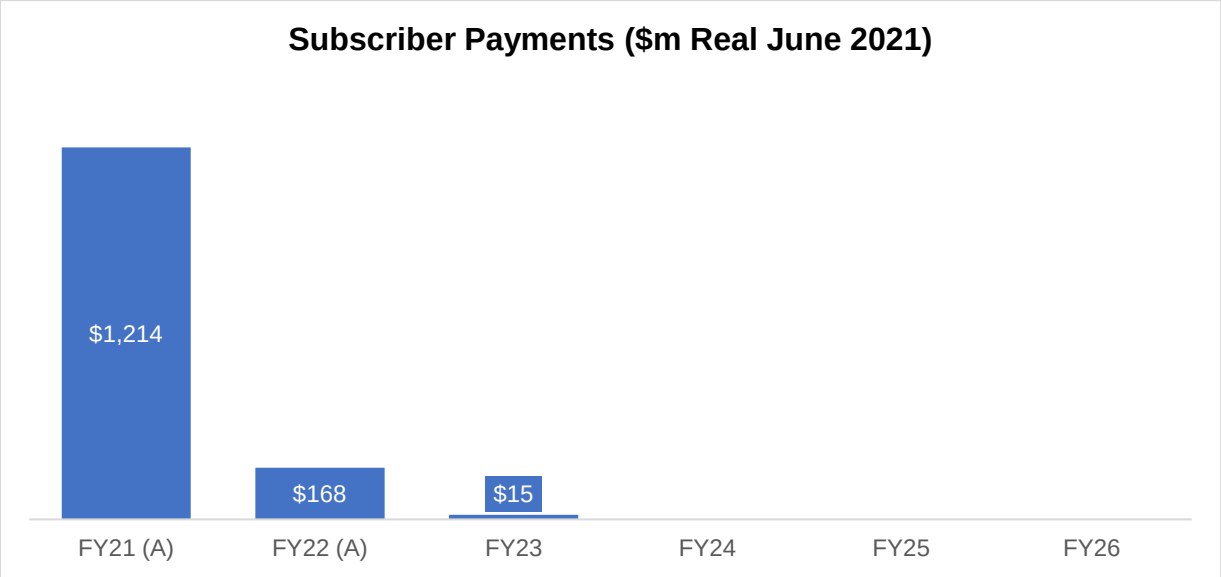


Figure 79 Subscriber Payments ($m Real June 2021)[219]

This refers to the opex required to pay for disconnections from legacy networks under the Telstra Arrangements and migrations from legacy networks under the Optus Arrangements. NBN Co has forecasted no such expenditure in the FRC.

The prudency and efficiency of the expenditure is assessed to be **Not Applicable**, as there is no expenditure forecast.

[219] SAU Supporting Submission Part F

GREX CONSULTING

Appendix C – Detailed description of process undertaken in preparing draft and final Report

List of documents provided to Grex and used in preparing this Report (outside of RFI process)

Document received from	Date received	Document title (with reference used in this Report where relevant)
DLA Piper	22/12/2022	[CIC] NBN Co – SAU supporting submission – Efficiency of NBN's expenditure and demand forecasts – 16 December 2022 (***"SAU Supporting Submission Part F"***)
DLA Piper	22/12/2022	[CIC] NBN Co – SAU – Forecasts in support of SAU Variation November - 16 December 2022 (***"Supporting Forecasts – Confidential Version"***)
DLA Piper	22/12/2022	[Confidential] – 2009 – 2023 Building Block Model 2 December 2022 (***"BBM 2009 - 2023"***)
DLA Piper	22/12/2022	[Confidential] – 2009 – 2023 Building Block Model 2 December 2022 (***"BBM 2024 - 2040"***)
NBN Co	15/12/2022	001 nbn ACCC Briefing – IOP23 Expenditure Overview – CONFIDENTIAL
NBN Co	17/01/2023	002 nbn ACCC Briefing – IOP23 – Network Roadmap - CONFIDENTIAL
NBN Co	17/01/2023	003 nbn ACCC Briefing – IOP23 – Fixed Line Upgrade - CONFIDENTIAL
NBN Co	13/01/2023	004 nbn ACCC Briefing – IOP23 – SEO - CONFIDENTIAL
NBN Co	13/01/2023	005 nbn ACCC Briefing – IOP23 – Demand Forecast Methodology - CONFIDENTIAL
NBN Co	18/01/2023	006 nbn ACCC Briefing – IOP23 – Labour Costs - CONFIDENTIAL
NBN Co	18/01/2023	007 nbn ACCC Briefing – IOP23 – Regional Upgrades - CONFIDENTIAL
NBN Co	19/01/2023	008 nbn ACCC Briefing – IOP23 – Truck Rolls - CONFIDENTIAL
NBN Co	19/01/2023	009 nbn ACCC Briefing – IOP23 – New Developments - CONFIDENTIAL
NBN Co	19/01/2023	010 nbn ACCC Briefing – IOP23 – Capacity - CONFIDENTIAL
NBN Co	19/01/2023	011 nbn ACCC Briefing – IOP23 – Business Upgrades - CONFIDENTIAL
NBN Co	15/02/2023	012 ACCC RFI – FY23 Opco Report Dec-22 Final - CONFIDENTIAL
NBN Co	15/02/2023	013 ACCC RFI – FY23 Opco Report Jan-23 Final - CONFIDENTIAL
NBN Co	6/3/2023	018 nbn ACCC Briefing – IOP23 – Risk Management Framework – CONFIDENTIAL

Document received from	Date received	Document title (with reference used in this Report where relevant)
NBN Co	24/3/2023	021 ACCC RFI – IT Investment Business Case – CONFIDENTIAL
NBN Co	24/3/2023	022 ACCC RFI – Project Risk Guidelines – CONFIDENTIAL
NBN Co	28/3/2023	023 ACCC RFI – BM 154 21 September 2021 – 11 Fixed wireless and satellite upgrades – CONFIDENTIAL
NBN Co	28/3/2023	024 ACCC RFI – CR 12 14 June 2022 – Fixed Wireless and Satellite Upgrade Funding Agreement - CONFIDENTIAL
NBN Co	24/4/2023	025 Additional information 21 April 2023 - CONFIDENTIAL
NBN Co	24/4/2023	026 SMCG nbn HST Program Findings - Final - CONFIDENTIAL
NBN Co	26/4/2023	027 Additional information UPDATED 26 April 2023 - CONFIDENTIAL
NBN Co	26/4/2023	028 Board Paper 20th March 2023 DAA - CONFIDENTIAL
NBN Co	26/4/2023	029 Fibre Connect, Minister's Office briefing for 16 March 2023 - CONFIDENTIAL
NBN Co	26/4/2023	030 ACCC RFI - Grex consolidated - nbn Response 26 April - CONFIDENTIAL
NBN Co	7/7/2023	031 nbn Special Access Undertaking Variation 2023 - Expenditure Review – follow-up material, 7 July 2023 - CONFIDENTIAL
NBN Co	7/7/2023	032 Annexure 1 - N2P On-demand and Forced migration scenarios 230630 - CONFIDENTIAL
NBN Co	7/7/2023	033 Annexure 2 - Fixed Wireless High Speed Tiers, TechCo Presentation - CONFIDENTIAL
NBN Co	7/7/2023	034 Annexure 3 - FW Extended TD-LTE Range - CONFIDENTIAL
NBN Co	7/7/2023	035 Annexure 4 - nbn HST Program Followup SMCG Final Report - CONFIDENTIAL
NBN Co	7/7/2023	036 Annexure 5 - Extract of risk summary tables June 2022 from Exco pack - CONFIDENTIAL
NBN Co	7/7/2023	037 Annexure 6 - Extract of risk summary tables from 20230622 FWSUP Program Review - CONFIDENTIAL
NBN Co	14/8/2023 (updated 22 August 2023	nbn Special Access Undertaking Variation 2023 – Supporting submission (Section 3.3 only has been reviewed for the purposes of preparing this final Report) (***"SAU Supporting Submission 14 August 2023"***)
ACCC	13/1/2023	IOP23 – Exco documents – for ACCC – CONFIDENTIAL
ACCC	13/1/2023	Folder of documents provided: • IOP23 Exco Overview Strategic and Operational Guidance – Exco – 20220119 • IOP23 Top Down Financial Guidance – Exco - 220202 • IOP23 IAP Build Profile - Exco – 220209 • IOP23 Business Products - Exco – 220209 • IOP23 New Developments - Exco – 220209

Document received from	Date received	Document title (with reference used in this Report where relevant)
		• IOP23 Usage & Demand Profile - Exco – 220209 (Date: 23/02/2022) • IOP23 Network Capacity Management - Exco – 220223
ACCC	13/1/2023	Folder of documents provided: 1. IOP23 TC4 Base Management and IAP Take Up – Exco 220302 2. IOP23 WFP Initial Submission – Exco – 220302 3. IOP23 Network Lifecycle Planning - Exco – 220309 4. IOP23 WFP [Final Submission] - Exco – 220323 5. IOP23 TC4 Base Management and IAP Take Up - Exco – 220323 6. IOP23 C&A Optimisation (Trucks Rolls Reduction Initiatives) - Exco – 220330 7. Update on Initial FY23 Financial Position – ExCo – 220413
ACCC	13/1/2023	Folder of documents provided: 8. IOP23 IER Prioritisation – Exco 220413 9. RTC & Activations Changes – Exco - 220413 10. IOP23 CX Update - Exco – 220427 11. IOP23 Finance Overview & Kick Off - Exco – 220510 12. IOP23 Key nbn strategic priorities + metrics - Exco – 220510 13. IOP23 Customer Products & Marketing- Exco – 220510 14. IOP23 Operations- Exco – 220510
ACCC	13/1/2023	Folder of documents provided: 15. IOP23 Regional Development & Engagement [RDE] – Exco 220511 16. IOP23 Network Engineering & Security [NES] – Exco 220511 17. IOP23 Systems Engineering & Operations [SEO] – Exco 220511 18. IOP23 Risk Profile – Exco - 220511 19. Corporate Business Units - Exco – 220511 [For Reading – not presented at meeting]

Document received from	Date received	Document title (with reference used in this Report where relevant)
		20. Integrated Operating Plan FY22-26 Draft 10 – ExCo - 220518 21. Future Workforce update – ExCo 220518
ACCC	19/04/2023	Expenditure review – draft report – nbn comments on confidentiality and factual accuracy (***"NBN Commentary 19 April"***)
ACCC	10/10/2023	Expenditure review – final report – nbn comments on confidentiality and factual accuracy – 9 October 2023

RFI Process

The RFI process (referred to throughout this document as “RFI Process”) was an important step within the overall process of the expenditure review and assessment. Following the review of the initial information and workshops provided by NBN Co, the ACCC submitted a RFI Excel spreadsheet containing 41 individual questions on 30 January 2023.

Questions 1-12 related to capital and operating expenditure and sought information such as purpose of expenditure, metrics (volume and unit costs), and risks and governance information. Question 13 requested detailed business cases for the expenditure items deemed significant by NBN Co. Questions 14-41 covered a range of topics across IOP expenditure items as well as BBM and RAB items.

The questions were answered over a ~6-week period across 5 ‘tranches’ of responses. The tranches of information were provided by NBN Co to ACCC and then through DLA Piper to Grex on the following dates:

- Tranche 1: 16th February 2023,
- Tranches 2 and 3: 21st February 2023,
- Tranche 4: 3rd March 2023, and
- Tranche 5: 15th March 2023.

Examples of the information received from NBN Co for each Tranche are shown below.

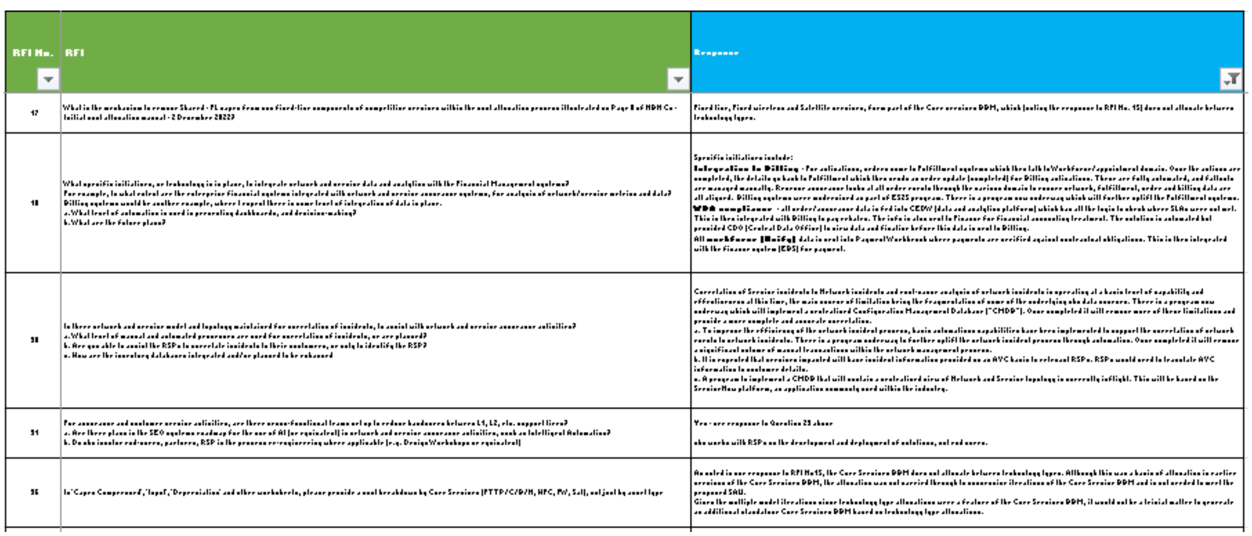


Figure 80 NBN Co Tranche 1 Response

RFI No.	RFI	Response
22	As FTTB upgrade path (to FTTP) is still being investigated, are all the Capex costs associated with FTTB BAU costs using current technology (VDSL/VDSL2)?	nbn does not intend to install new FTTB cabinets into new MDUs, however capacity management of existing FTTB brownfield sites will be through augmentation of additional VDSL2 cards where required
23	Can nbn please provide documentation detailing the process of approving and undertaking upgrades that are pre-EOL and not due to EOL/EOS considerations?	
24	Given its dynamic nature, how does nbn propose to monitor changes to the Network Roadmap and report in a clear manner changes to past KADs and other Roadmap components?	nbn has an established process on making long term technology decisions as outlined in slide 5 of the pack. This is a yearly process of ensuring key architecture decisions and associated high level business cases are kept up to date and we are using the most cost-efficient technologies in the nbn network, and an approval mechanism is in place to ensure plan of record is kept.
25	Similar to the content on slide 8, please provide equivalent network performance metrics (such as Speed, Latency, MBHT, total capacity) for upstream traffic.	With reference to the long-term technology plan, the key network performance metrics for upstream traffic are MBHT, total traffic and network latency. Traffic & MBHT - June 2022: Traffic 1.5Tbps, MBHT 0.17Mbps - June 2032 - 1.7Tbps, 0.22Mbps Latency reference provided on slide 8 is a round trip measurement so already includes upstream.
26	Have the systems impact and costs been estimated for FTTP upgrade? - Please confirm if costs presented include any systems costs (i.e. only related infrastructure build costs) - If systems costs have been included, please provide assumptions, details and breakdown	The system costs of the Fixed Line upgrade to FTTP were considered. The costs presented in the Fixed Line upgrade briefing material were only the build and connect costs. System costs are included within the SEO financials. In IOP, $67m* was allocated to support the fixed line upgrade program SEO requirements ($40m* in FY24-26 period). This is to support product classification, build and connection fulfillment requirements etc. (*) Assumes Real $ (June 21)
27	The build costs have been estimated for FTTP upgrade in the Fixed Line Upgrade document. Systems savings are also included in the SEO document. a. Have there been any systems connect/assurance/support savings estimated as a result of the FTTP upgrade? If so, are they covered by the SOE document, or any other document such as Truck Rolls? b. It is expected that FTTN to FTTP will provide some improvements in connect, assurance, etc. which together with the enterprise simplicity program may see a significant improvement. It would be helpful to understand the breakdown in percentages across these programs, and cross-impacts if any.	The (on-demand) migration of premises from FTTN to FTTP under the Network Upgrade is forecast to result in structural reductions in opex costs that are expected to become more significant once all customers have fully migrated from the FTTN network. Minimal cost savings are forecast in the first regulatory Cycle and primarily relate to the reduced assurance costs because of the lower fault rates of the FTTP technology compared to FTTN. These cost reductions were embedded in the figures presented in the Truck Roll briefing. There were no SEO cost savings assumed because of the upgrade The assurance cost reductions are predicated on the migration profile. In FY24 the assumed savings equate to 4% of assurance costs and grow to 12% by FY26.
28	The SEO document includes costs associated with the Roadmap, especially the ES25 program. It is not clear how this high level roadmap (e.g. SaaS, Data & Analytics) maps to the BBM data/costs and how it is represented in the BBM. a. Is there further breakdown as to how this roadmap maps to the BBM data, i.e. item and percentage breakdown of the costs included - if so please provide further details and documentation b. Related to the roadmap, what is the current baseline of the key technology items and metrics you are looking to improve on? (This will help with understanding the amount of change that is required, and value delivered over time to meet the target state and savings (e.g., a data platform is often a multi-year program, with significant costs and change management requirements).	
29	Moving to industry standards/directions around modern architectures is a key part of the system evolution, such as moving to a loosely coupled, data driven, intelligent automation, self-serve architecture. a. It appears that this is governed by the Enterprise Architecture capability in nbn, please confirm. Is this organisational capability handled as a centralised capability? Are there any communities implemented across the organisation, e.g. CoP (Practice), CoE (Excellence)? b. Have any key weaknesses in current systems architecture been identified? Please provide details. Apart from decommissioning and shutdown, are there any expected efficiency and/or process improvement savings from the initiatives. For example: i. data & analytics, ii. moving tightly coupled (P2P) to modular API-driven architecture using integration platforms, and iii. automation. c. What are the key data & analytics and integration platforms in place, and their relative maturity with regard to the system processes currently implemented? What is the target state likely to look like, especially with regard to data/analytics and automation?	a. This capability is both centralised and distributed depending on the timeframe. The CTO sets the 2 to 10-year systems strategy and executes via KADs (Key Architectural Decisions). Enterprise Architecture then incorporates these decisions into the nbn-wide reference architecture in discussion with domain-based Architecture communities (data and analytics, security, infra, digital integration). The Solution Architecture domain teams build target domain architectures, that transform and reduce costs as we deliver business outcomes and take the reference architecture into account when designing solutions. b.i. Data simplicity will deliver a 50% reduction in reports (~12k) and reduce applications from 67 to 37. For example, SharePoint migration is now complete moving from 3 different versions of SharePoint to one strategic solution. SharePoint Online (SPO) with decommissioning of infrastructure saving $3.5m OPEX p.a. by FY24, uplifting user experience and capability by integrating MS Teams and Planner. b.ii. Moving to an API enabled architecture will reduce costs for both partners and nbn. Partner simplicity will deliver seamless integration into nbn processes allowing for direct pass through of requests from partner systems using APIs. This is complemented by a simplified and common portal framework that allows partners to use bots if desired, while reducing cost of change for nbn and increasing speed to market. Similarly, using APIs internally allows reuse of data patterns and reduces the need for custom integrations and bespoke development. b.iii. Automation is enabled by the simplification of systems and processes delivered by ES25. This programme enables self-serve automation capabilities for many processes when complete. Consolidated and simplified business processes, accurate and reliable centralised data, business self-service as well as deploying AI/Machine Learning capability onto real time data streams. c. Consolidating to a single data warehouse and data lake will remove 3 data warehouses, 4 data lakes and 30 Data Discovery Environments. This simplified architecture, along with data visualisation tools and data virtualization capability, as well as proactive monitoring to reduce inconsistencies and errors, allows self-service configuration of reporting. This capability will also allow data to be accessible to other systems more easily. The long-term strategy for autonomous networking that aligns to the Open Digital Architecture TMForum standards with reusable

Figure 81 NBN Co Tranche 2 Response

RFI No.	RFI	Response
14	Please describe and provide information on how the capacity model (e.g. Network Engineering Capacity Model) is utilised and implemented across the organisation (e.g. design processes) and technology (e.g. activation, assurance and operations) particularly to assist with planning purposes, e.g. a. How does the capacity model correlate and/or map to network assurance metrics on usage, etc.? b. How does the capacity model correlate and/or map to network & service model/inventory for service management?	Network Engineering Capacity Modelling develops an associated capacity upgrade path and augment plan for right time implementation by leveraging inputs from various nbn business units. The Network Engineering Capacity model ingests inputs from organisation wide data to determine capacity requirements. This data includes: a) Current network usage, b) Forecasted usage growth, c) residential and business service activations forecast, d) new product introductions, e) network assurance considerations on availability, resiliency etc. f) service assurance considerations on performance etc. g) network roadmap, including lifecycle plan. Network Engineering Capacity Model generates Augmentation Plan, which sets out the design, build, augmentation, and migration works required to ensure the network continues to have sufficient capacity to meet end user needs into the future. This then helps develop a Deployment Plan factoring labour, material and design and build process requirements. Key leading and lagging metrics also support the monitoring & maintenance of network capacity and course correct deployment plan as required. Capacity process regularly monitors network usage and forecasted growth, comparing against capacity thresholds, nbn design guidelines resulting in capacity upgrade trigger flowing to design and build teams for implementation. Regular governance forums track deployment and spend actuals compared to forecasted budget, as well as network metrics on usage, utilisation and performance.
19	The handling of EOL/EOS of product lifecycle is a typical process for all technology organisations and individuals. a. Does nbn face a specific challenge with the handling of EOL/EOS of the infrastructure and systems? b. Does nbn need to put in place any specific measures to manage the EOS/EOL products, or is this a financial consideration? c. Due to maturity of the nbn business and platforms, is the EOS/EOL only now impacting the business and operational costs? d. How is EOS/EOL handled in nbn's Operational Model, i.e. governance forums, roadmaps, metrics used, tools?	a.The main challenge has centred around global shortages that have resulted in unplanned EOL notifications. The most notable was the global chip set shortages which affect our HFC Modems and FTTC DPU's. As nbn holds strong relationships with each of our equipment suppliers, notifications of this type are address with suppliers to operationalise suitable replacements. b.Both are relevant and considered as part of the nbn Lifecycle management and Transition Planning process, considers the risk appetite of the network, cost to upgrade and maintain, assets to sweat, management of technical debt, and requirements of long-term product & technology strategy to determine the network upgrade plan. c.nbn has been managing EOL/EOS on platforms from the beginning, noting that we have always included appropriate EOL/EOS arrangements as part of our contracts with vendors. In the past few years, larger Network Evolution programs have been initiated to mitigate EOL/EOS on the ageing Network. d.As part of the overall Network Roadmap - Lifecycle management is delivered through processes, systems (and databases), transition planning, governance, IOP funding and capability delivery as outline in Network Roadmap briefing document
20	Slide 10 "Network simplification: simplify and secure our network for customers" provides an excellent overview of the network simplification program. a. This program is assumed to have been incorporated into the BBM (Building Block Modelling) and the costing. Can you confirm? b. It would be helpful to understand the next level of detail and how it maps to the data in the BBM. For example: the percentage each program/initiative contributes to the costs and data presented in the BBM. c. As programs can change over a 10 year cycle, due to many valid factors, what robustness is there in the roadmap, operating model, and BBM model to absorb the changes, and stay aligned on the value outcomes for the end-customers, RSPs and stakeholder.	a. The network simplification programs, based on current IOP planning are included in our overall capex expenditures use for the calculation of BBM forecast capex expenditure. However, any further FTTP upgrade opportunities of the Copper network are not specifically included. b. Minimal cost are forecast in the first regulatory cycle and primarily relate to the building of capability. The costs are expected to become more significant as deployment scales into FY26+ c. nbn typically plans its long-term technology roadmap over a 10 year period combined across access, aggregation, transit and associated systems. The input to this model is the traffic and speed forecasts, corporate plan, and user capability needs and operational needs of nbn to maintain an efficient network that meets the digital capabilities for all Australia. Over that 10 year period there can be many technology shifts, changes and innovations that change that roadmap and associated costs to deliver; these costs are managed as an overall capex profile.
21	The information presented is specifically on the strategy and planning aspects. A key risk is understanding the organisational ability to deliver on the Network Roadmap, and putting in place any mitigation. a. Does nbn have any specific plans to enhance the overall enterprise agility in the area of delivery, to meet the end user experience, and achieve the customer experience and business KPIs/targets/outcomes. b. If there are specific plans to enhance delivery, can nbn elaborate further on what those plans are?	
23	Can nbn please provide documentation detailing the process of approving and undertaking upgrades that are pre-EOL and not due to EOL/EOS considerations?	nbn applies the same Technology Strategy Management process for upgrades driven by capacity and performance. Slide 5 (Technology Strategy Management) of the Network Roadmap briefing document (as presented to the ACCC/Grex on 17 January 2023) sets out the process for any capacity and performance upgrade considerations.

Figure 82 NBN Co Tranche 3 Response

NBN Co responded to RFIs 1-12 in Tranche 4 and as such the questions were responded to in an additional sheet by NBN Co. This is due the large number of questions within each question, which NBN Co responded to by using a matrix format with the initiative/spend item across the column headings and the individual questions across the row headings. This was repeated for each RFI question. Snapshots are pictured below.

RFI No.	RFI No. 7 Descriptions	A.3.7 Subscriber Payments
12	a. Please provide details and description of the key drivers and unit cost assumptions used to forecast and plan the allocation (e.g. events, quantities, location) - historic and forecast	Payments for disconnections from legacy networks under the Telstra Arrangements and migrations from legacy networks under the Optus Arrangements not forecast beyond FY22 following the completion of the initial build. Relatively minor opex is forecast in FY23 related to the Medical Alarm Subsidy Scheme and Unconnected Families.
	b. Please provide details and description of the key metric(s) used to track and measure performance and/or service delivery (targets and actual) - historic and forecast	Subscriber Payments are not forecast to be incurred in the First Regulatory Cycle. IOP Real $ FY21 (A) FY22 (A) FY23 FY24 FY25 FY26 Subscriber Payments ($'m) 1,226 165 15 - - -
	c. Please outline the any critical dependencies and assumptions for the ongoing delivery, management and performance of the area (e.g. other projects, capabilities, 3rd parties, other)	Not applicable, refer item b above
	d. Please confirm cost allocation outlined in documentation (see reference) - opex (historic / forecast). Please confirm progressive spend for FY23 forecast budget and updated forecast if changed	Not applicable, refer item b above
	e. Please provide details and description of cost allocation contingency (historic / Forecast)	Not applicable, refer item b above
	f. Please provide governance and risk framework used to manage and ensure program/project delivery, performance and cost management	**nbn** applies the same governance process across all expenditures. Slide 10 (Expenditure Governance Progress) of the IOP23 Expenditure Overview briefing document (as presented to the ACCC/Grex on 16 December 2022) sets out the process.
	g. Please provide all governance and/or programme reporting documents /presentation for the past 12 months.	Provided the **nbn** Operating Committee (OpCo) Reports for January 2023 and December 2022 on 15 February 2023
	h. Please provide Risk Register(s) (if not already provided in g.) - key risks (risk description / status / rating / date - current and historic past 12 months)	Not applicable, refer item b above

Figure 83 NBN Co Tranche 4 Response

NBN Co responded to RFI 13 in Tranche 5, which requested business case information across 7 initiatives. NBN Co responded to this question using a matrix that consisted of column headings for financial information, risk management activities, performance management metrics, and references to other RFI responses. Row headings comprised the initiatives of which business case information was sought. The information shown in the summary matrix was provided in the form of further sheets within the Excel workbook. A snapshot of the summary matrix is pictured below.

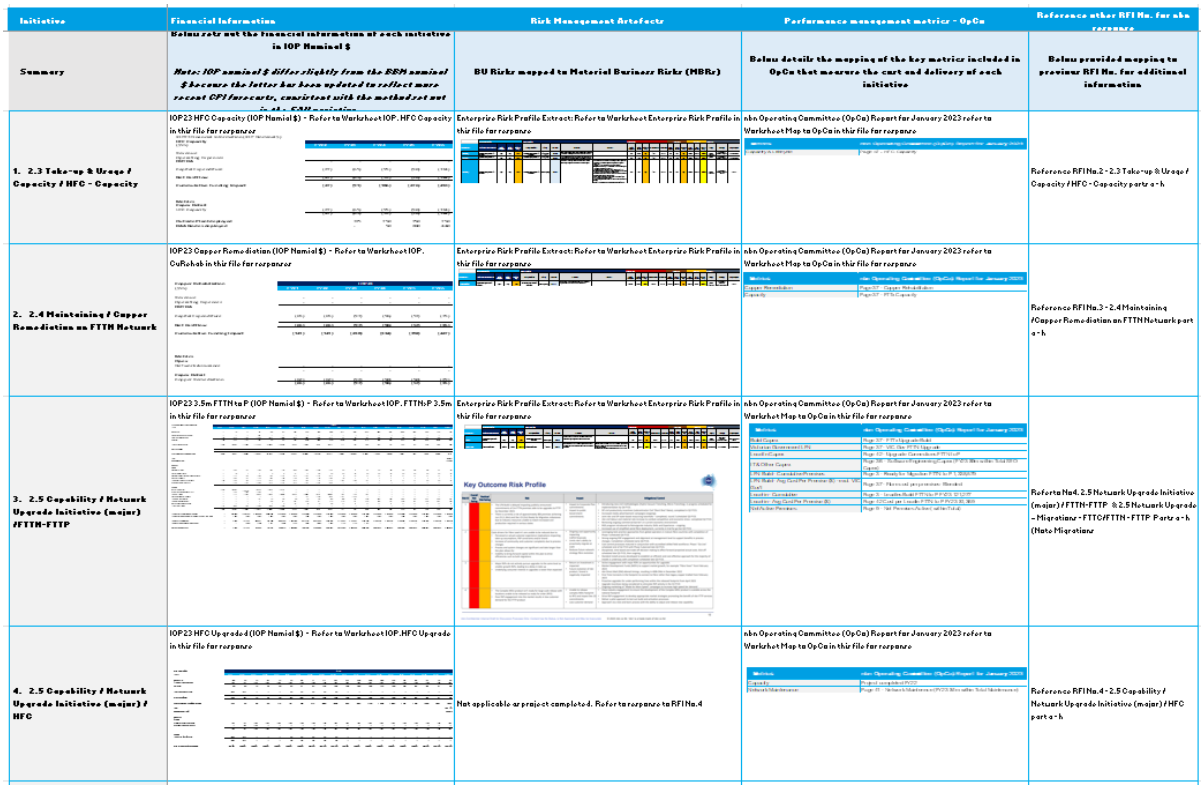


Figure 84 NBN Co Tranche 5 Response

The process also involved 3 meetings to discuss components of the RFIs, as follows:

- Meeting 1, 8th February 2023, 1:30-2:30pm: meeting subject “ACCC – request for information discussion (Ben/David only for first half hour)”: No presentation or other materials were provided by NBN Co,
- Meeting 2, 28th February 2023, 4-5pm: meeting subject “CONFIRMED - SAU Variation – nbn/ACCC meeting – discussion on network prioritisation”: No presentation or other materials were provided by NBN Co,
- Meeting 3, 8th March 2023, 2-3pm: meeting subject “CONFIRMED – SAU Variation – nbn briefing to ACCC on corporate risk framework”: Presentation pack entitled “018 nbn ACCC Briefing - IOP23 - Risk Management Framework” was provided on the 7th March 2023.

Following receipt of responses to all RFIs, further clarifications were sought where it was determined that the initial questions were not answered sufficiently. These clarifications were present throughout the various component questions of questions 1-13, as well 8 of the remaining questions 14-41. 20 questions were answered to a sufficient level of detail.

The RFI Process was completed with the receipt of clarification responses from NBN Co on 24 March 2023 (with a further response sent on 28 March 2023 and reviewed for the purpose of preparing this final Report. The information received is discussed further in the following section.

Results of RFI Process – data and information to be incorporated into recommended process under Part D of this Report

As described in Part B - NBN Co Expenditure Process, NBN Co has conducted an IOP process for FY23 led by NBN Co's Finance & Strategy teams, from a bottom-up perspective to develop a detailed operational and financial plan for the coming four financial years (i.e., FY23 to FY26), in a manner that has been described as best meeting NBN Co 's corporate objectives and stakeholder needs.

This process was presented by NBN Co in the ACCC Briefings and sought to provide detail on the various capital expenditure initiatives (and programs) and operational expenditure items and their relevant drivers, risks, objectives, and governance frameworks.

NBN Co advised ACCC that each initiative or spend item is monitored closely using a range of metrics such as volumes, unit costs, and overall cost.

As part of the RFI process, further information was requested, including internal metrics, business cases, and further detail regarding spend for all capital expenditure and operating expenditure items, as already categorised by NBN Co within SAU Supporting Submission Part F. *The extent to which documentary evidence and answers have been provided by NBN Co through the RFI Process is incorporated into the assessment of prudency and efficiency of the expenditure items in this Part C.*

Moving forward, it is clear from an initial review of the PowerPoint presentations provided by NBN Co to the ACCC in the ACCC Briefings together with the various snapshots and links to other documents such as OpCo reports provided by NBN Co as an attempt to answer the questions under the RFI Process that there is an abundance of information and data that could be used to track the progress of expenditure.

As an example of the detailed internal processes NBN Co undertakes, for the most recent IOP the ExCo Kickoff presentation makes clear reference to the extensive process carried out to collect submissions from the business units for proposed initiatives. It appears as if a consolidation exercise was commenced as part of IOP23's ExCo Kickoff presentation to the NBN Co ExCo as there are references throughout the presentation to the business case preparation for the "Top 50 Initiatives by end Feb" (which was early in the process). ExCo support was required for all of the Top 50 "Initiative Plans" and whilst some initiatives may have only needed "1 – 2 pages", detailed business cases (using a simplified business case template) were required for those initiatives that were "most material for the IOP".

These processes then appear to have culminated in a proposed set of key outcomes, initiatives and metrics for IOP23, as set out in Exco presentation "Key nbn outcomes for FY23 and metrics – 10/5/2022".[220]

[220] Document 19 in folder 3 of Exco documentation provided to ACCC by NBN Co.

Exco presentation "Key nbn outcomes for FY23 and metrics – 10/5/2022"

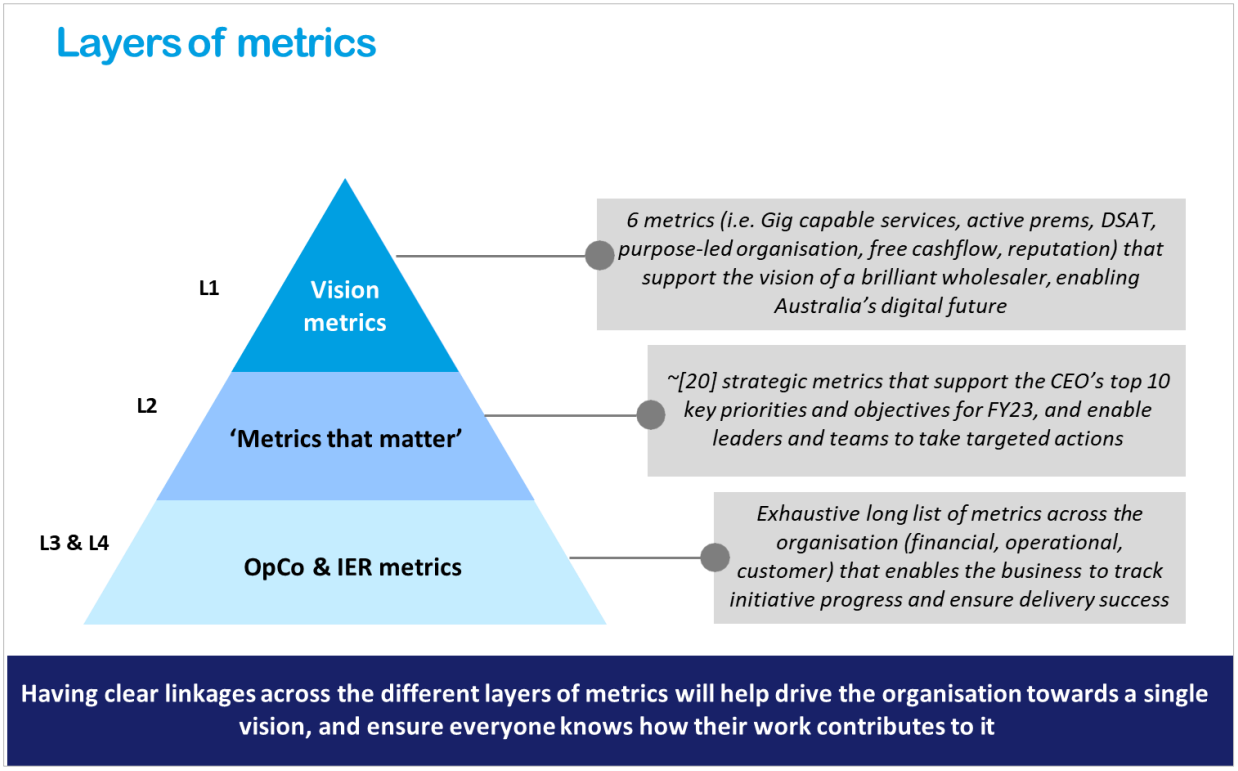


Figure 85: Key outcomes for FY23 and metrics from IOP23 process[221]

This approach to detailed metrics and the extrapolation of drivers for expenditure also appears to form a significant portion of the regular monthly reporting NBN Co's finance area undertakes.

Regular management reports – for example OpCo (monthly)

In its briefings to ACCC and the Request for Information (RFI) process carried out in late February/early March 2023 NBN Co has provided examples of the operational reporting provided to NBN Co's Exco through what is referred to as the "OpCo reports", copies of which have been provided for December 2022 and January 2023.[222]

Metrics used include items such as:

- Capex – Key Upgrade and Capacity Capex Driver Metrics,
- Fixed Wireless Driver Metrics (Jan-23 Opco report), and
- Upgrade Connection Driver Metrics.[223]

[221] 001 nbn ACCC Briefing – IOP23 Expenditure Overview – CONFIDENTIAL, slide 8 and used for further ACCC briefings.
[222] 012 ACCC RFI – FY23 Opco Report Dec-22 Final – CONFIDENTIAL and 013 ACCC RFI – FY23 Opco Report Jan-23 Final - CONFIDENTIAL
[223] 013 ACCC RFI – FY23 Opco Report Jan-23 Final – CONFIDENTIAL.

It is these overall key outcomes, initiatives, and metrics for IOP23 that were presented to ACCC for this expenditure assessment, as opposed to any underlying documents outside of a copy of the original business case for IT Investment[224] and a collation of the documents supporting the grant application for the Fixed Wireless Upgrades.

The expenditure assessment should include detailed data and information to the ACCC, acquired through a transparent reporting process – Part D sets out some recommendations for broad steps that could be taken moving forward to achieve this.

For the most recent process of expenditure review, described in this Part C, a formal business analysis, reporting and monitoring process was not established:

- The documents prepared by NBN Co describe IOP initiatives and activities but do not link clearly to the process of prudent and efficient expenditure assessment that needs to be carried out by the ACCC under the statutory criteria.
- Multiple individual (mutually exclusive) reports exist and are used for internal purposes by NBN Co (detail of these mainly internal documents is set out in Part C). Whilst these reports contain some pertinent and useful data and information (particularly for reporting on capital expenditure progress), there do not appear to be clear mechanisms in place for an external party such as ACCC to track changes and developments from the previous years, and/or to inform the ACCC of any significant changes to existing or existing initiatives.
- Additionally, a formal, documented process has not been described to ACCC whereby NBN Co has undertaken a detailed business case process to establish why the expenditure item was the best option and to enable ACCC to assess that each item of expenditure results in the lowest cost to consumers over the long term.

The recommended process in Part D of this Report seeks to leverage this information and data so that it can be combined with the other elements described to support ACCC's decision-making for prudent and efficient expenditure moving forward beyond this current assessment.

Further information received and reviewed since release of draft Report

As NBN Co has described in its latest SAU Supporting Submission 14 August 2023, further information has been provided to ACCC and meetings conducted by NBN Co with ACCC and Grex between the release of the draft Report and finalization of this Report. This latest process is illustrated as part of the broader process carried out prior to release of the draft Report:

[224] 021 ACCC RFI – IT Investment Business Case (provided Friday 24 March 2023).

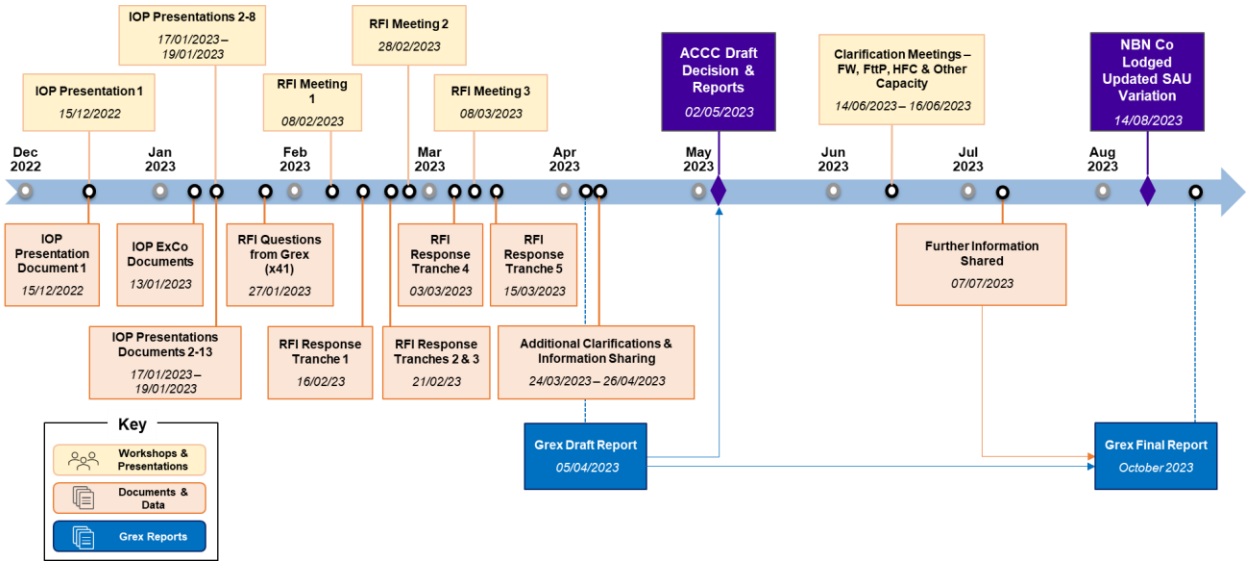


Figure 86: Timeline of information shared and meetings conducted with NBN Co and ACCC in preparing both the draft and final Report

As NBN Co has described,[225] the focus of the process carried out by NBN Co with ACCC since the release of the draft Report has been on the expenditure items with either a 'Qualified No' or 'Inconclusive' rating.

Wherever possible, this final Report reflects the data incorporated (including amendments to previous analysis where relevant) to illustrate the further evidence provided by NBN Co. Clear documentary evidence is footnoted throughout the Report to show where this information has been incorporated, including but not limited to changes to any draft ratings for the expenditure items focused on by NBN Co since the release of the draft Report.

[225] SAU Supporting Submission 14 August 2023 – section 3.3, page 31.

Further documents relied upon in preparing this Report

Document published by:	Date	Document title (with reference used in this Report where relevant)
ACCC	13 January 2023	Proposed variation to the NBN Co Special Access Undertaking – Consultation paper (**"ACCC January 2023 Consultation paper"**)
Ofcom	© 2023	1. https://www.ofcom.org.uk/ 2. https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/telecoms-competition-regulation/the-openreach-monitoring-unit 3. https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/costs-and-billing/automatic-compensation-need-know ; https://www.ofcom.org.uk/__data/assets/pdf_file/0026/107693/Statement-automatic-compensation.pdf 4. https://www.ofcom.org.uk/__data/assets/pdf_file/0018/216090/wftmr-statement-volume-6-bt-rfr.pdf
OpenReach	© 2023	1. https://www.openreach.co.uk/cpportal/services/product-services/service-level-commitments 2. https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/costs-and-billing/automatic-compensation-need-know
Commission for Complaints for Telecom-Television Service (CCTS)	© 2023	1. https://www.ccts-cprst.ca/for-consumers/resources/government-and-regulatory/
Canadian Radio-television and Telecommunications Commission (CRTC)	© 2023	1. https://crtc.gc.ca/eng/archive/2021/2021-181.htm 2. https://crtc.gc.ca/eng/internet/role.htm#:~:text=The%20CRTC%20regulates%20the%20wholesale,providers%20to%20their%20retail%20customers 3. https://crtc.gc.ca/eng/ce/actions.htm 4. https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/
AER	© 2023	1. https://www.aer.gov.au/about-us/our-role 2. https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/efficiency-benefit-sharing-scheme-ebss-—-november-2013

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Justice Laws Website	© 2023	1. https://laws-lois.justice.gc.ca/eng/acts/t-3.4/
Chorus	© 2023	1. Chorus Annual Report 2022
Commerce Commission	© 2023	https://comcom.govt.nz/regulated-industries/fibre/projects/fibre-price-quality-path-and-information-disclosure