



Grid Comms Data Centre Ethernet Replacements Ergon Justification Statement

20/ 10/ 2024



Part of Energy Queensland

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DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
1.0	Approved Version	15/11/2024	General Manager Grid Technology

1. SUMMARY

Title	Grid Comms Data Centre Ethernet Replacements							
DNSP	Ergon Energy							
Expenditure category	<input checked="" type="checkbox"/> Replacement <input type="checkbox"/> Augmentation <input type="checkbox"/> Connections <input type="checkbox"/> Non-network							
Identified need <i>(select all applicable)</i>	<input type="checkbox"/> Legislation <input type="checkbox"/> Regulatory compliance <input checked="" type="checkbox"/> Reliability <input type="checkbox"/> CECV <input checked="" type="checkbox"/> Safety <input type="checkbox"/> Environment <input checked="" type="checkbox"/> Financial <input type="checkbox"/> Other <i>An ongoing program to proactively manage Data Centre telecommunications assets through a multi-faceted approach that involves:</i> <ul style="list-style-type: none"> • <i>Replacing obsolete business critical assets prior to their end-of-life dates.</i> • <i>Maintain equipment software and firmware versions to resolve bugs, improve stability, patch security vulnerabilities, maintain vendor support and to overall extend the life of the asset.</i> • <i>Develop and integrate new hardware revisions into the existing platform to ensure longevity in hardware investment.</i> <i>Proactive replacement ensures a reduction of time and costs of failures as the assets age and experience an increased failure rate.</i>							
Expenditure		Year	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
		\$m, direct 2022-23	\$0.21M	\$0.21M	\$0.44M	\$1.75M	\$1.75M	\$4.36M
Benefits	<i>Proactive program has a range of advantages compared to a fail fix asset strategy. It ensures a reduction of time and costs associated with both hardware and software failures as the assets age and experience an increased failure rate.</i> <i>The program will reduce risks associated with potential network wide disruptions to business-critical functions involving the operation and control of the distribution network.</i>							

2. PURPOSE AND SCOPE

This document recommends the optimal capital investment necessary for replacement of obsolete Operational Technology Data Centre telecommunications assets. This is a preliminary business case document has been developed for the purposes of seeking funding for the required investment in coordination with the Ergon Regulatory Proposal to the Australian Energy Regulator (AER) for the 2025-30 regulatory control period. Prior to investment, further detail will be assessed in accordance with the established Energy Queensland investment governance processes. The costs presented (\$4,368,469) are in (2022/23) direct dollars.

3. BACKGROUND

3.1. Asset Population / Site Summary / Capability

The operational technology data centres host multiple mission critical systems for the operation and control of the distribution network, real-time voice, automation, and data acquisition services to co-ordinate safe and efficient work activities. These data centres house many telecommunications network assets that underpin these systems as common infrastructure that is vital to support these operational requirements.

This is an ongoing program that is divided into multiple projects to address differing needs, priorities and completion timings. This program is consistent with the Telecommunication Network Asset Management Plan.

3.2. Asset Management Overview

The table below lists the total asset population quantities for each asset type within the Data Centre network, the quantity that has exceeded vendor end of life support dates, the driver for replacement and the asset criticality to the business.

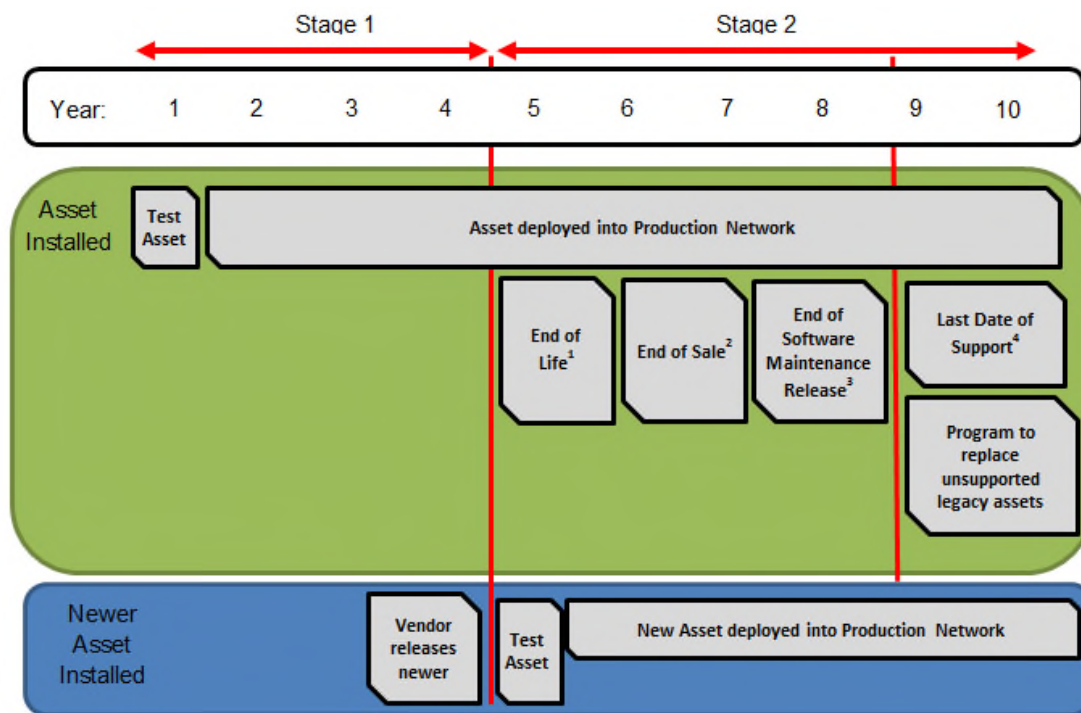
Asset Class / Technology Type	Total Quantity	2025-30 End of Life Quantity	Replacement Strategy
Core Routers & Switches	16	16	Vendor support removal
High-Capacity Switches	24	24	
Low-Capacity Switches	52	*0	

Ergon Energy has a total of 92 OT Data Centre routers and switches deployed across 4 x sites. The majority of this equipment was installed in 2021 and has a typical asset life in the order of 6 to 7 years.

Although the existing deployed Low Capacity assets have not yet had the manufacturer announce end of life, it's forecasted by 2030 the vendor would have announced these as of End of Sale with End of Software Support and End of Hardware Support expected to occur early in the 2030 RCP. Should the manufacturer accelerate these dates this program will need to re-evaluate its replacement strategy with view to potentially include small quantity of these assets for proactive replacements.

The following diagram depicts the optimal asset lifecycle timeframes associated with Data Centre Telecommunications network equipment. The optimal asset life is typically 10 years for active telecommunications equipment. This assumes Ergon adopted the product early in the vendor's

product lifecycle. Typically, Ergon Energy are not always early adopters to the vendor's latest products, hence the Stage 1 timeframe typically vary between 1 to 4 years depending on when the product was acquired after the vendor released the product. Therefore, actual asset life on average is more likely to be 6 to 7 years.



1. EoL - This is just a notification that the vendor will eventually stop supporting a particular product. Feature freeze goes into effect on the platform and no new features or expansion modules will be added to the product line.
2. EoS - Typically one year after EoL is announced, the product can no longer be ordered through normal channels. The asset however, is still eligible for vendor support and is still receiving maintenance updates and bug fixes.
3. EoSMR – The vendor stops issuing any additional updates for the asset.
4. LDoS –The vendor stops all support for the product, thus making it obsolete.

Figure 1 Asset Support and Lifecycle

4. IDENTIFIED NEED

4.1. Summary

This program seeks to manage costs and risks associated with provision of comms equipment by replacing equipment ahead of asset obsolescence, in service failure and the need to perform expensive reactive replacement should issues with performance or functionality emerge.

Data Centre Ethernet switches are critical components that underpin the Operational Technology Environment, ensuring secure and reliable communication for a wide range of critical dependant systems. Ergon's strategy is to ensure these assets remain current for manufacturers support by monitoring supplier support cycles and replace infrastructure proactively before support lapses based on several key needs:

- **Manufacturer End of Life issues:** After the end-of-support date, the manufacturer will no longer provide range of essential services such as configuration support, hardware replacements, software updates (including essential bug fixes and security patches), field notices, configuration guides, technical manuals, bug tracking, vulnerability tracking etc. This introduces a range of issues that can compromise network reliability.
- **Hardware Failures and Lack of Like for Like replacements:** Once support is discontinued, obtaining replacement like for like switches will become increasingly difficult due to how this equipment integrates into the broader data centre network. Any hardware failure could result in prolonged downtime, negatively impacting operational efficiency and causing costly delays.
- **Performance and Capacity Limitations:** As network demands grow, older switches may no longer provide the necessary features, capacity or performance to meet current operational requirements. Replacing aging equipment ensures that the network is scalable and capable of supporting future needs.

The increased likelihood of failure of this equipment if not replaced via this program increases the likelihood of failure of the control and voice systems which will cause extra costs associated with delays, cancellation and rescheduling of planned and unplanned work to the power network.

4.1.1. Asset Performance Considerations

Cyber Security Considerations

Data Centre comms equipment has been identified as critical systems which require alignment to meet these new strategic directions including:

- Alignment to the “Security Legislation Amendment (Critical Infrastructure Protection) Act 2022 (SLACIP Act)”
- Target state maturity level of Security Profile SP2 as defined in the Australian Energy Sector Cyber Security Framework (AESCSF)

The Data Centre assets in scope of this program has had in the order of 19 x Vulnerabilities and Exposures rated with High/Medium impact that have been identified and disclosed in the manufacturers products as listed below. Ergon needs to continuously monitor these and apply the relevant software patches and remediations inline with manufacturer recommendations which requires equipment to be in support.

CVE	Published Date	Impact
	2024 Jul 01	Medium
	2024 Aug 28	Medium
	2024 Aug 28	Medium
	2024 Aug 28	Medium
	2024 Feb 28	Medium
	2024 Feb 28	High
	2024 Feb 28	High
	2023 Aug 23	Medium
	2023 Aug 23	High
	2023 Feb 22	Medium
	2021 Aug 25	High

	2022 Aug 24	High
	2022 Aug 24	High
	2022 Feb 23	High
	2022 Feb 23	Medium
	2022 Feb 23	High
	2022 Feb 23	High
	2021 Aug 25	Medium
	2021 Aug 25	High

Firmware Bugs

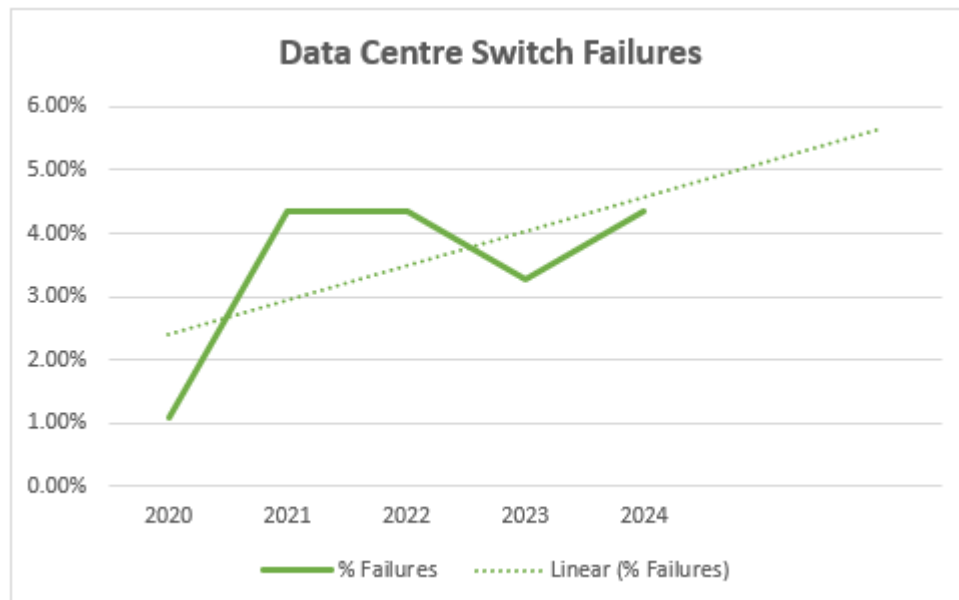
From the period between 2021 to 2024 the manufacturer has published 279 x software bugs that impact operation of the specific make/model of Data Centre routing and switching infrastructure deployed in the network.

The manufacturer firmware release policy generally offers in the order of 12-18 months of full updates and bug fixes after the initial release, then in the order of 24-36 months where only critical bug fixes and security patches are provided.

It is required to maintain vendor support firmware on critical data centre equipment in order to obtain vendor support and patch known issues.

Failure Rates

Current failure rate is forecasted at approx. 5.6% per annum that will experience either hardware/software defects or performance degradation issues.



4.2. Options Analysis

Ergon Energy evaluated multiple options as follows to determine the most prudent asset management approach the Data Centre assets. These options are summarised in the table below and detailed further in each subsequent section.

Option	Qty Replaced	Total Cost	NPV
Option 1 (Proposed) - Multi-faceted proactive approach	40	\$4.36M	\$14,349
Option 2 – Accept the AER proposed 37% reduction	25	\$2.75M	-\$113,753
Option 3 – Counterfactual - Reactive replacement approach	24	\$2.83M	-\$2,393,617

4.2.1. Option 1 (Proposed) – Multi-faceted proactive approach.

Ergon Energy is aware of the need to effectively manage these assets and this project proposes a multi-faceted approach as follows to ensure enhanced performance, improved stability, and increased reliability within our data centre network infrastructure:

- **Maintain software currency.** Once every 2-3 years its required to update firmware across the fleet of data-centre telecommunications hardware to resolve bugs, improve stability, patch security vulnerabilities, maintain vender support and to extend the life of the asset. This project includes **one** major software update across the fleet during the term.
- **Develop and integrate latest equipment.** As the manufacturers release new revisions of hardware it is required to conduct a range of development tasks to validate compatibility and integrate these into the network to ensure assets being purchased have the longest asset life. If Ergon continue to deploy the older models of equipment (once the vendor has released the newer revisions) then the value for money is significantly decreased with a much shorter asset life. This project includes development activities required to integrate **3 x models** of equipment during the term.
- **Replace obsolete assets prior to their end-of-life dates.** End-of-life dates indicate that the manufacturer will no longer provide official support, bug fixes, or firmware updates for the discontinued switches. As a result, if any issues arise, Ergon may experience prolonged downtime and difficulty in troubleshooting and resolving network-related problems. By proactively replacing these switches, Ergon can maintain access to vendor support, leverage their expertise, and benefit from ongoing maintenance services. This helps ensure smoother operations, faster issue resolution, and optimal network performance. This project includes proactive replacement of **40 network assets** during the term.

Total cost of this program \$4,368,469

4.2.2. Option 2 - Accept the AER proposed 37% reduction for the proactive replacement program

This option is accepting the AERs 37% reduction in the program which would result in total program expenditure in the order of \$2.75M. This expenditure would only enable in the order of ~15 units (of 92) for proactive replacement in addition to an anticipated reactive replacement of 1 x failure per-annum which would require a minimum of 2 units (HA pairs) to be replaced.

Due to the nature of where this equipment is installed and the regular volume of configuration changes that occur to this asset class, it is almost certain that firmware issues will be encountered on the remaining units that are beyond vendor software support (EoS_{MR}) and will require reactive action. Typically, such issues impact the entire fleet running that software revision. Often workarounds can be implemented that result in increased O&M costs and higher business impacts with increased outages (eg. to power cycle equipment) due to equipment criticality to business operations.

This option would require maintaining and operating duplicated infrastructure for the new installed units and the existing obsolete units in parallel to each other leading to higher O&M costs.

4.2.3. Option 3 - Counterfactual – Reactive replacement

This option is intended to be purely reactive in nature. The counterfactual considers the continued use of the current infrastructure platform beyond its useful asset life. This means that only remedial/restoration of services will be funded through operating costs, with only capital investment in minor and major upgrade for replacement of failed infrastructure.

The absence of proactive capital investment in the 2025-30 regulatory period would mean that over time the current infrastructure would no longer be fit-for-purpose and may become incompatible with new and emerging systems and technologies used by Ergon and third parties.

Replacement of Data Centre equipment results in twice the cost to replace reactively in an unplanned manner for a range of reasons including:

- **Inefficient integration and deployment costs:** Equipment in this category has vendor proprietary protocols and management systems which when a single asset fails would require broader network integration issues and/or installing duplicated parallel infrastructure. Assets in this category are implemented in high-availability pairs and the failure of a single asset additionally requires replacement of its direct adjacent equipment to maintain compatibility and equivalent functionality.
- **Broad business impacts:** An outage to the underlying telecommunications data centre infrastructure can lead to a failure of critical voice and control systems causing delays, cancellation and rescheduling of planned and unplanned work to the power network; Additionally it can impact several hundreds of staff from accessing OT systems and data required to do their work.
- **Higher labour costs:** Replacing these assets reactively requires specialised technicians to work on short notice or during off-hours (nights, weekends, or holidays) to minimise the impact on operations. This leads to increased labour costs or the need to bring in external contractors for emergency repairs. In addition, unplanned failures result in broader disruption to planned works as resources are diverted to emergency replacements.

Proactive program helps avoid these costs and ensures minimal business disruption ultimately reducing risks and cost.

The total estimated cost of the counterfactual case over the period is \$1,510,048.

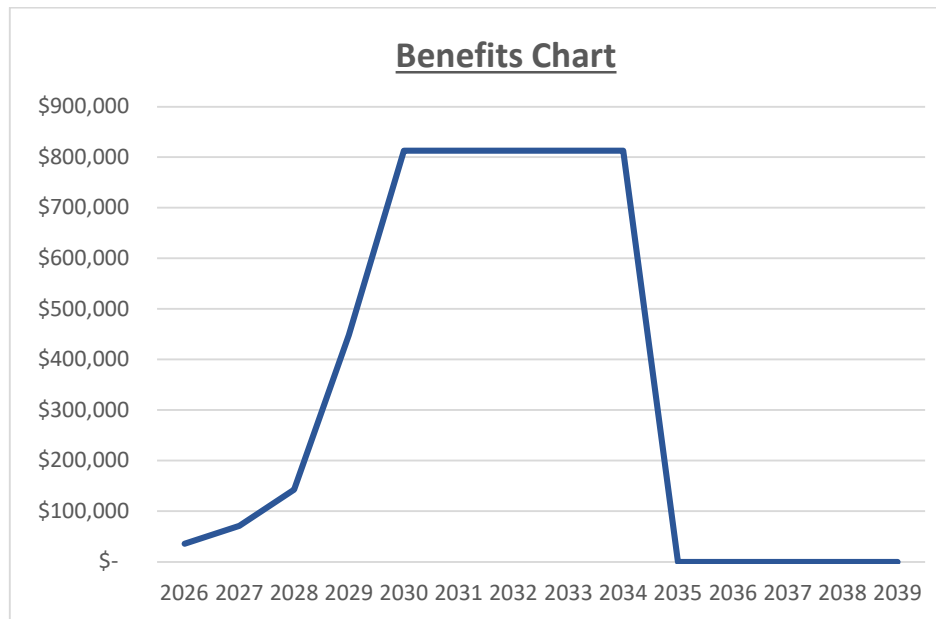
4.3. Risks

Table below outlines the risk assessment for the counterfactual scenario with no proactive program in place to address conditional and age issues (i.e. all work is done as reactive).

Table 1 Risks Associated with the Counterfactual

Risk	Description of Risk
Increased risk of system failure or degradation of system performance costing significantly more compared to a planned replacement program	Aging infrastructure and the associated systems are past the end of their useful asset life and fails or reduces significantly in performance directly impacting business operations. There is an estimated likelihood that on a yearly basis 5.6% of the at-risk assets will experience either hardware or software defects that will result in extended network outages that require an emergency response costing twice as much to fix compared to resolving as part of planned proactive work.
Vendor support removal results in prolonged downtime and difficulty in troubleshooting and resolving network-related problems.	<p>Asset obsolescence results in inability to obtain vendor support patches which is vital for these assets because it offers technical expertise, bug fixes, compatibility updates, resolves known cyber security and performance problems.</p> <p>Inability to support and patch these assets will leave Ergon exposed to such issues with anticipated increase of FTE and labour costs of \$0.21M over the period.</p>
Sub-optimal investment in aging technology costing significantly more compared to a planned replacement program	<p>Without a proactive program to develop, test and integrate new equipment, as manufacturers release newer revisions of hardware, Ergon would continue to deploy the older existing standards, thereby reducing overall asset life by up to 60% and increased risk of the infrastructure not meeting the evolving business demands and needs over time.</p> <p>When equipment inevitably goes End of Sale, Ergon would reactively need to quickly test new alternative solutions resulting in solutions that are not cost efficient, fit for purpose, or integrated into existing operational systems and practices resulting in additional cost increases of \$0.41M.</p>
Failure of data centre asset can result in loss of control to large portions of the power network resulting in major business impacts on executing planned and unplanned control system work resulting in extra costs and extended customer power outages.	<p>An outage to the underlying telecommunications data centre infrastructure can lead to a failure of critical voice and control systems causing delays, cancellation and rescheduling of planned and unplanned work to the power network.</p> <p>Probability of Failure (PoF): We have taken a minimalistic approach to estimating the impact to Customer Reliability, by limiting the exposure to 1 instance of a small 2000kWh impact.</p> <p>Likelihood of Consequence (LoC) - Reliability: 100% likely that an outage would occur should no active remediation be conducted.</p> <p>Estimated to have an impact of approximately \$104k per annum of VCR costs and the rescheduling of planned work.</p>

The table below outlines the cost benefits for the preferred option which has only been modelled over the estimated asset life of ~7 years.



5. ECONOMIC ANALYSIS

5.1. Cost summary 2025-30

Table 2 Cost summary 2025-30

Option	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Option 1 – Proactive Replacement	\$218,423	\$218,423	\$436,847	\$1,747,387	\$1,747,387	\$4,368,469
Option 2 – 37% program reduction	\$137,607	\$137,607	\$275,214	\$1,100,854	\$1,100,854	\$2,752,135
Option 3 – Counterfactual	\$567,901	\$567,901	\$567,901	\$567,901	\$567,901	\$2,839,505

5.2. NPV analysis

The NPV calculations have been modelled as a complete program, with benefits realised through proactive program delivery calculated.

The resulting NPV value calculated for the proposed program was \$14,349.

Table 3 NPV analysis

Option	NPV	Discount rate		Benefits	
		2.5%	4.5%	125%	75%
Option 1 – Proactive Replacement	\$14,349	\$102,861	-\$61,304	\$1,186,974	-\$1,008,135
Option 2 – 37% program reduction	-\$113,753	-\$48,581	-\$134,293	\$544,478	-\$679,041
Option 3 – Counterfactual	-\$2,393,617	-\$2,511,239	-\$2,282,981	-\$2,393,617	-\$2,393,617

APPENDICES

Appendix 1: Alignment with the National Electricity Rules

Table 4 Recommended Option’s Alignment with the National Electricity Rules

NER capital expenditure objectives	Rationale
A building block proposal must include the total forecast capital expenditure which the DNSP considers is required in order to achieve each of the following (the capital expenditure objectives):	
6.5.7 (a) (1) meet or manage the expected demand for standard control services over that period	
6.5.7 (a) (2) comply with all applicable regulatory obligations or requirements associated with the provision of standard control services;	As indicated in section 4, this proposal ensures that safety obligations, reliability obligations and protection requirements are met by providing an appropriate, economically efficient program of works to prevent in-service failure of data centre ethernet infrastructure. Without this program, these obligations would be at significant risk of being breached.
6.5.7 (a) (3) to the extent that there is no applicable regulatory obligation or requirement in relation to: <ul style="list-style-type: none"> (i) the quality, reliability or security of supply of standard control services; or (ii) the reliability or security of the distribution system through the supply of standard control services, to the relevant extent: <ul style="list-style-type: none"> (iii) maintain the quality, reliability and security of supply of standard control services; and (iv) maintain the reliability and security of the distribution system through the supply of standard control services 	This program of work ensures the integrity of communications functions that support SCADA, protection, voice and data communications systems. They are critical in the provision of network reliability in support of MSS and safety net security and reliability targets.
6.5.7 (a) (4) maintain the safety of the distribution system through the supply of standard control services.	This program of work ensures the integrity of communications functions that support SCADA, protection, voice, and data communications systems. They are critical in ensuring safety through correct protection

NER capital expenditure objectives	Rationale
	operation, and through the availability of voice and data communications.
NER capital expenditure criteria	Rationale
The AER must be satisfied that the forecast capital expenditure reflects each of the following:	
<p>6.5.7 (c) (1) (i) the efficient costs of achieving the capital expenditure objectives</p>	<p>The options considered in this proposal take into account the need for efficiency in delivery. The preferred option has utilised a delivery approach that provides for bundling of work in terms of both timing and geography to enable a lower cost delivery compared to other options. It generally avoids emergency replacements that incur higher costs by enabling efficient use of labour resources in the delivery of the work programs.</p> <p>Specialised contractors are utilised as appropriate to ensure that costs are efficiently managed through market testing.</p> <p>Cost performance of the program will be monitored to ensure that cost efficiency is maintained.</p> <p>The unit costs that underpin our forecast have also been independently reviewed to ensure that they are efficient (Attachments 7.004 and 7.005 of our initial Regulatory Proposal).</p>
<p>6.5.7 (c) (1) (ii) the costs that a prudent operator would require to achieve the capital expenditure objectives</p>	<p>The prudence of this proposal is demonstrated through the options analysis conducted.</p> <p>The prudence of our CAPEX forecast is demonstrated through the application of our common frameworks put in place to effectively manage investment, risk, optimisation and governance of the Network Program of Work. An overview of these frameworks is set out in our Asset Management Overview, Risk and Optimisation Strategy (Attachment 7.026 of our initial Regulatory Proposal).</p>
<p>6.5.7 (c) (1) (iii) a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives</p>	NA

Appendix 2: Reconciliation Table

Table 5 Reconciliation

Expenditure	DNSP	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
GRID COMMS Data Centre Ethernet Aged REPEX (\$ Direct)	Ergon	\$0.21M	\$0.21M	\$0.44M	\$1.75M	\$1.75M	\$4.3M