Grid Comms Core IP MPLS Ethernet Replacements

Justification Statement

20/ 10/ 2024

ERGON ENERGY NETWORK
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 Core IP MPLS Ethernet Replacements
DNSP	Ergon Energy
Expenditure category	☒ Replacement ☐ Augmentation ☐ Connections ☐ Non-network
Identified need *(select all applicable)*	☐ Legislation ☐ Regulatory compliance ☒ Reliability ☐ CECV ☒ Safety ☐ Environment ☒ Financial ☐ Other *An ongoing program to proactively manage Core IP/MPLS telecommunications assets through a multi-faceted approach that involves:* • *Replacing obsolete business critical assets prior to their end-of-life dates.* • *Maintain equipment software and firmware versions to resolve bugs, improve stability, patch security vulnerabilities, maintain vender support and to overall extend the life of the asset.* • *Develop and integrate new hardware revisions into the existing platform to ensure longevity in hardware investment.* *Proactive replacement ensures a reduction of time and costs of failures as the assets age and experience an increased failure rate.*
Expenditure	**Year** / **2025-26** / **2026-27** / **2027-28** / **2028-29** / **2029-30** / **2025-30** $m, direct 2022-23 / $0 / $0 / $136K / $543K / $679K / **$1.35M**
Benefits	*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.*

2. PURPOSE AND SCOPE

This document recommends the optimal capital investment necessary for replacement of obsolete Ethernet, IP/MPLS network 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 ($1,358,073) are in (2022/23) direct dollars.

3. BACKGROUND

3.1. Asset Population / Site Summary / Capability

Ergon Energy's telecommunications network (CoreNet) is vital to support operational requirements. Operational services across the distribution network support critical voice and data services to co-ordinate safe and efficient work activities, access medical or emergency services, monitoring and control.

The majority of CoreNet was established between 2009 and 2013 under a project called UbiNet. CoreNet operates over a combination of sites and infrastructure that is either directly owned by Ergon Energy or leased from third parties. CoreNet telecommunications sites are separated into a four layered architectural framework:

- Core Layer - Highest transport and major WAN capacity between major cities and aggregates distribution layer sites. Provides high-speed, high-capacity and carriage for very large volumes of telecommunications services.
- Distribution / Aggregation Layer - This layer aggregates sites from the access layer onto common WAN capacity. Provides medium WAN capacity between smaller towns and locations as well as add/drop capacity along major WAN backbone routes.
- Access Layer - Aggregates services and connections to common capacity provided by the distribution layer. Typically provides capacity within a township.
- Edge Subscriber / Terminals / Customer Layer - The subscriber layer connects internal/external customers equipment/users to the access layer.

This program covers replacement of obsolete IP network equipment in the most critical Core layer prioritising sites with the highest volume of business-critical services. Ergon Energy is aware of the need to effectively manage these assets, some are now approaching, have reached or have passed their original design life.

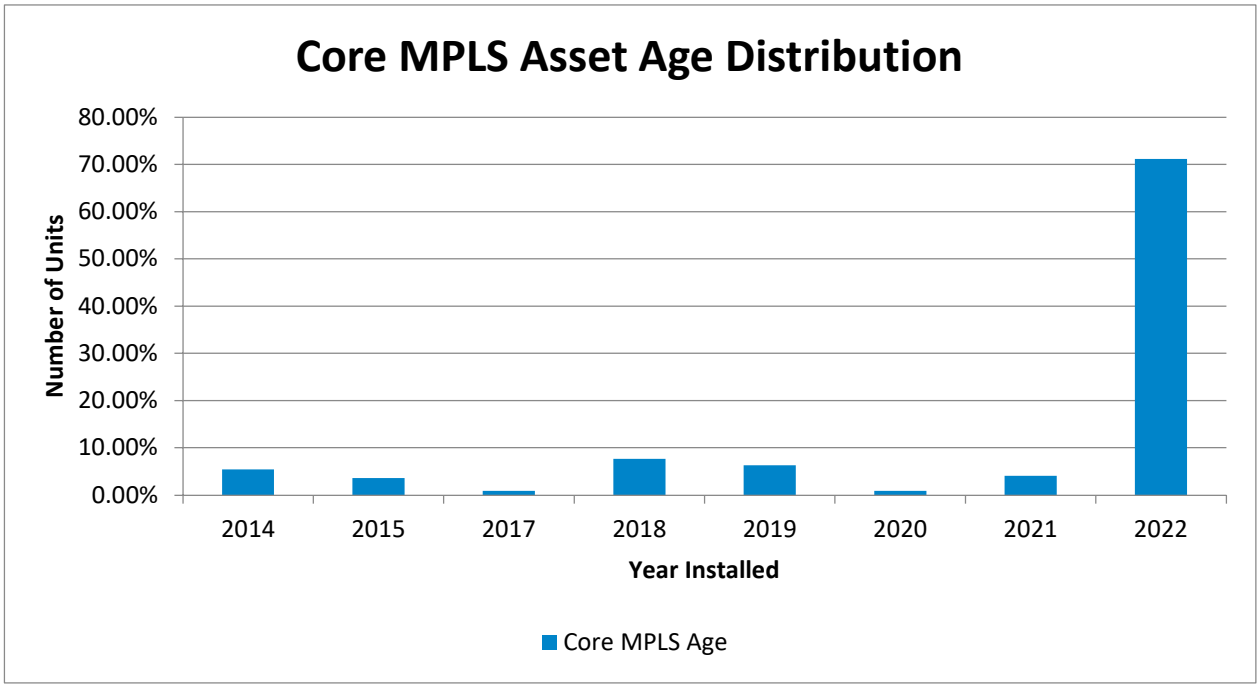
This is an ongoing risk-based replacement program that is divided into multiple projects to address differing needs, priorities and completion timings. This program is consistent with the Telecommunication Network Asset Management Plan.

3.2. Asset Management Overview

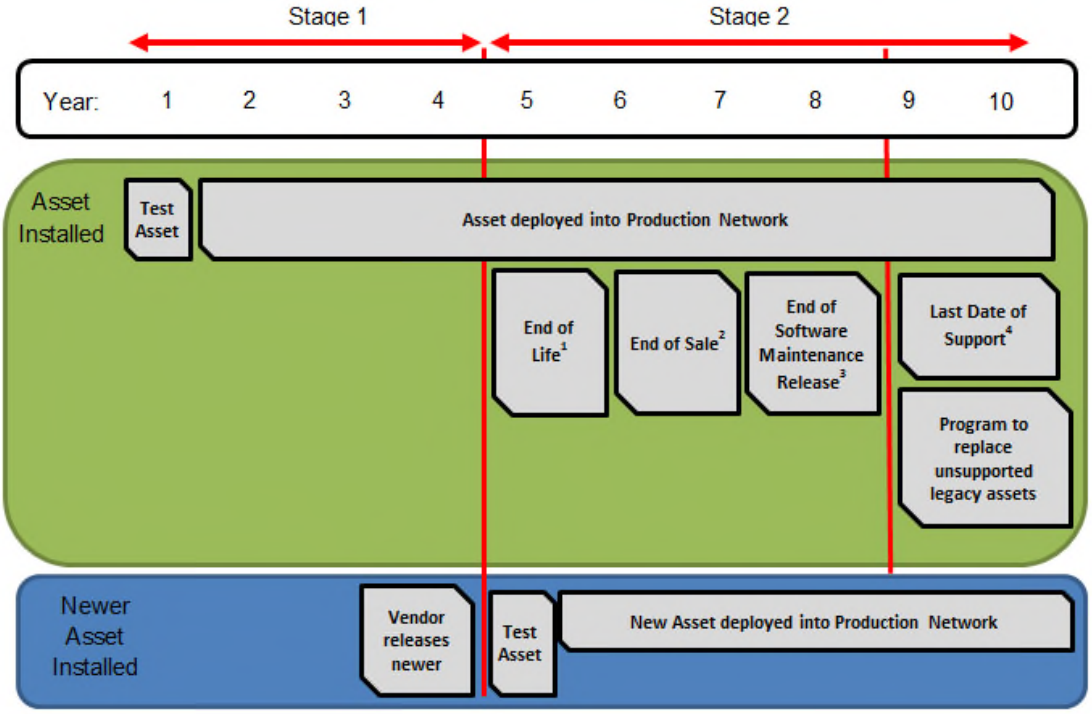
Ergon Energy has 1,396 IP operational network assets across numerous makes and models. The table below lists the total asset population quantities for each asset type within the network, the quantity that has exceeded vendor end of life support dates, the driver for replacement and the asset criticality to the business.

Asset Class / Technology Type	Total Quantity	2025-30 End of Life Quantity	Replacement Strategy
Core	161	30	Vendor support removal
Distribution	367	233	Proactive replace critical sites strategically – to use as spares for remaining fleet.
Edge	813	547	

The below figure represents the age profile for Core MPLS Equipment Assets. This program targets assets for replacement that were installed between 2014 and 2020 that have reached manufacturer End of Support dates:



The following diagram depicts the optimal asset lifecycle timeframes associated with IP 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.

4. IDENTIFIED NEED

4.1. Summary

This program seeks to manage risks and costs associated with provision of comms equipment by replacing equipment ahead of asset obsolescence and in service failure. Not proceeding with the program will require expensive reactive replacement when units fail in-service, will require more complex management arrangements to manage the older versions of equipment and will require reactive development of replacement arrangements once vendors no longer supply spare equipment for the reactive fail fix processes.

4.1.1. Asset Performance Considerations

Cyber Security Considerations

MPLS 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 MPLS assets in scope of this program has had in the order of 27 x Vulnerabilities and Exposures rated with High 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 in line with manufacturer recommendations which requires equipment to be in support.

CVE	Published Date	Impact
[redacted]		

Firmware Bugs

From the period between 2021 to 2024 the manufacturer has published 83 x software bugs that impact operation of the specific make/model of MPLS infrastructure deployed in the network.

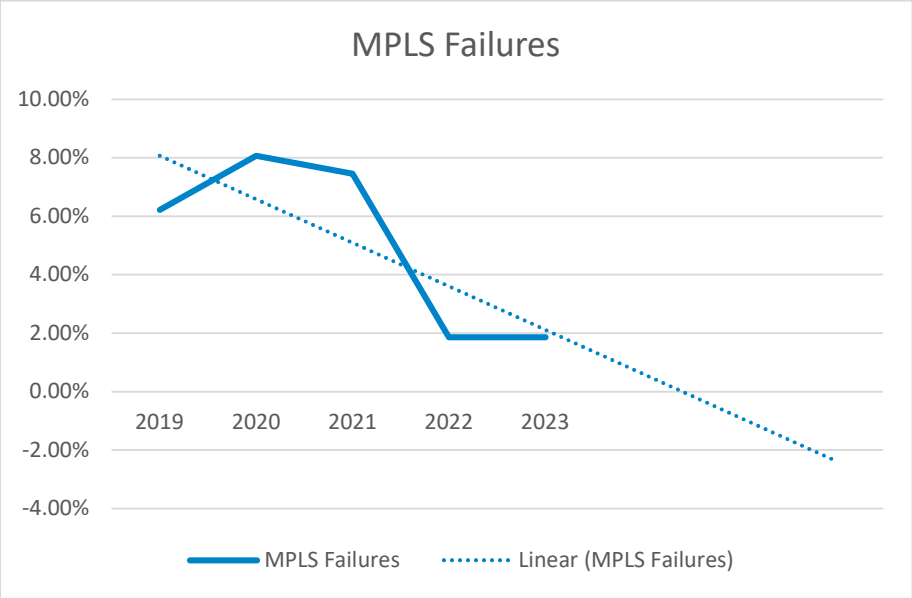
The manufacturer firmware release policy generally offers in the order of 12-18 months of full updates and bug fixes after the initial release, then in the order of 24-36 months where only critical bug fixes and security patches are provided.

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

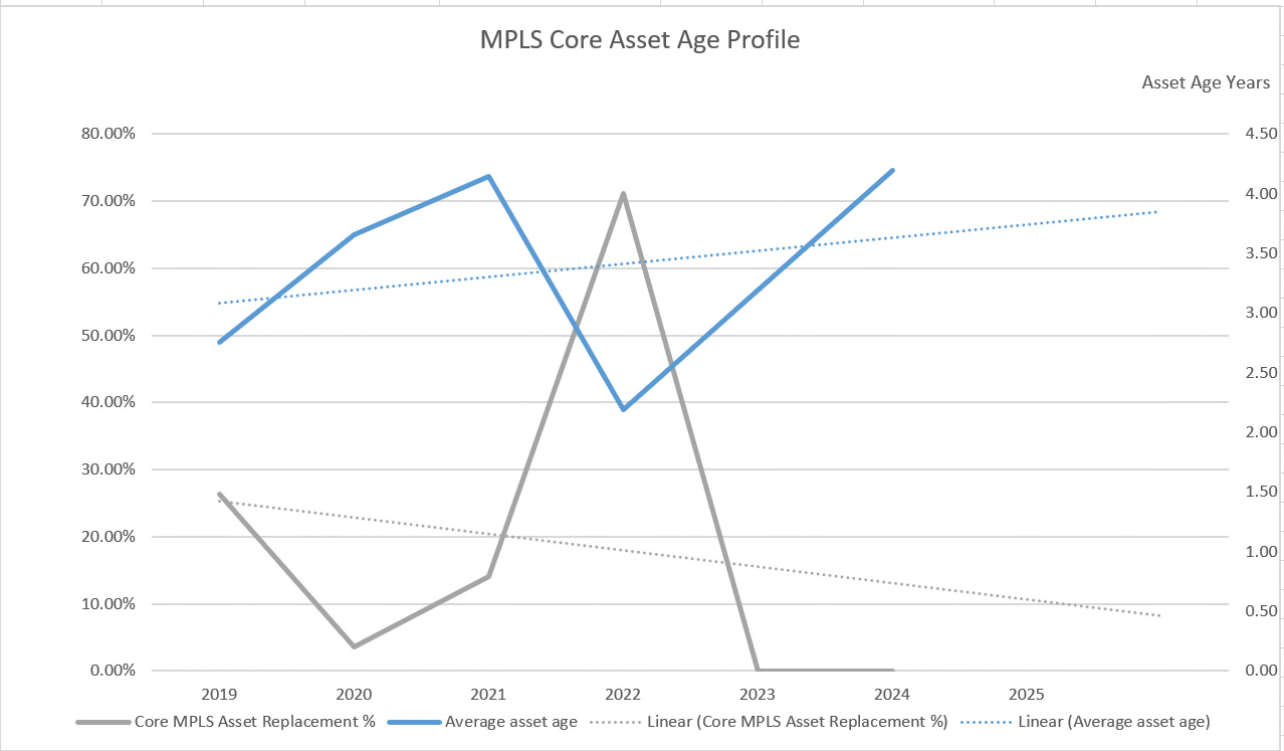
Failure Rates

Failure rates for MPLS Core assets are recorded across the entire fleet and not split into those that are obsolete and those that are running current vendor supported hardware/software revisions.

The downward trend is evident of benefits being realised from the previous MPLS Ethernet Aged replacement projects that occurred in 2022 (as evident in the age distribution trends below) which replaced 88 x obsolete assets.



However this downward trend will be temporary with the average age of the assets moving back to greater than 4 years by 2025 (as shown below, noting this assumes no proactive program is progressed), which could moves us back to failure rates 6% and above as noted for the 2019+ years above.



4.2. Options Analysis

Ergon Energy evaluated multiple options as follows to determine the most prudent asset management approach the IP/MPLS 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	30	$1.35M	$95K
Option 2 – Accept the AER proposed 37% reduction	19	$0.85M	-$267K
Option 3 – Counterfactual - Reactive replacement approach	10	$0.9M	$-763K

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 MPLS 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 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 **2 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 **30 network assets** during the term.

Total cost of this program $1,358,073

4.2.2. Option 2 – Accept the AER proposed 37% reduction

This option is accepting the AERs 37% reduction in the program which would result in total program expenditure of $855,586. This expenditure would only enable in the order of ~19 units (of 30) for proactive replacement in addition to an anticipated reactive replacement of 1 x failure per-annum 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 (EoSMR) 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.

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 with be funded through operating costs, with no capital investment in minor and major upgrade and/or replacement of the infrastructure.

The absence of 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.

The total estimated cost of the counterfactual case over the period is $905,382.

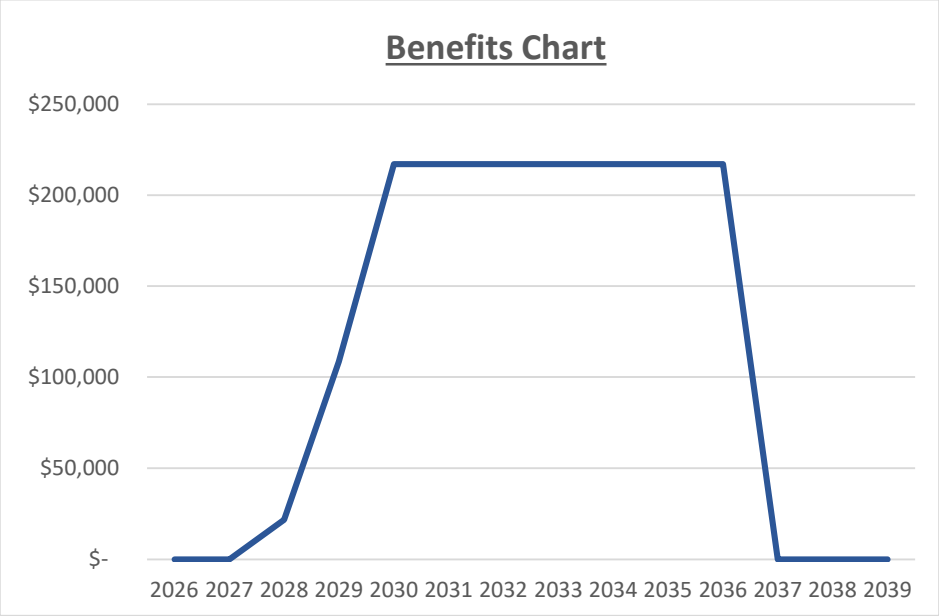
4.3. Risks

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 Scenarios	Description of Risk
IP/MPLS hardware or software defects occur on aged unsupported equipment requiring emergency replacement increasing costs.	With the continued use of unsupported IP/MPLS equipment with an observed susceptance to failure due to age, condition and vendor obsolescence will result in extended outages to business-critical services such as SCADA, Remote Engineering, Corporate, telephony and site security for an extended period. Complexities related to upgrading reactively from legacy equipment to current contracted equipment will take longer, cost more and require Ergon to hold significant spare stocks. There is an estimated likelihood that on a yearly basis 3% 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.
Sub-optimal investment in aging technology resulting in extra reactive works increasing costs.	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%. When equipment then 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 $0.82M.
Vendor support removal results in prolonged downtime and difficulty in troubleshooting and resolving network-related problems increasing the cost to serve.	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, resolve known cyber security and performance problems. Inability to support and patch these assets will leave Ergon exposed to such issues with anticipated cost of $0.24M over the period.
Failure of unsupported equipment causing extended SCADA outages resulting in delays to both planned and unplanned restoration works.	Hardware or software failure on obsolete IP/MPLS infrastructure hinders ability to remotely manage the power network resulting increased labour costs and delays in service restoration impacting customer reliability totalling 4 hours of an average MV feeder (2000kW) with an assumed VCR of $52 per kWh with a likelihood of 3% p.a.

The table below outlines the cost benefits for the preferred option which has only been modelled over the estimated asset life of ~9 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 – Hybrid proactive approach	$0	$0	$135,807	$543,229	$679,037	$1,358,073
Option 2 – Accept AER proposed reduction	$0	$0	$85,559	$342,234	$427,793	$855,586
Option 3 – Reactive replacement	$181,076	$181,076	$181,076	$181,076	$181,076	$905,382

5.2. NPV analysis

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

We have modelled the costs and benefits in our NPV in the way we would deliver the program absent of any deliverability constraints. The investments have been phased for deliverability in the capex model, and so there will be some differences in the capital cost phasing. This phasing does not change the preferred option for this investment."

The resulting NPV value calculated for the proposed program was $95,933.

Table 3 NPV analysis

Option	NPV	Discount rate		Benefits	
		2.5%	4.5%	125%	75%
Option 1 – Hybrid proactive approach	$95,933	$141,095	$57,534	$392,411	-$200,545
Option 2 – Accept AER proposed reduction	-$267,292	-$270,590	-$262,941	-$162,443	-$372,141
Option 3 – Reactive replacement	-$763,210	-$800,714	-$727,933	-$763,210	-$763,210

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 core MPLS 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: (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: (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 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:	
6.5.7 (c) (1) (i) the efficient costs of achieving the capital expenditure objectives	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. Specialised contractors are utilised as appropriate to ensure that costs are efficiently managed through market testing. Cost performance of the program will be monitored to ensure that cost efficiency is maintained.

NER capital expenditure objectives	Rationale
	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).
6.5.7 (c) (1) (ii) the costs that a prudent operator would require to achieve the capital expenditure objectives	The prudency of this proposal is demonstrated through the options analysis conducted. The prudency 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).
6.5.7 (c) (1) (iii) a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives	NA

Appendix 2: Reconciliation Table

Table 5 Reconciliation

Expenditure	DNSP	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
GRID COMMS Core IP MPLS Ethernet Aged REPEX ($ Direct)	Ergon	$0	$0	$136K	$543K	$679K	**$1.35M**