# Grid Comms Edge Router Replacement REPEX Ergon

## Justification Statement

15/ 10/ 2024

ERGON ENERGY NETWORK
Part of Energy Queensland

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## DOCUMENT VERSION

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

# 1. SUMMARY

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<tr><td>DNSP</td><td>Ergon Energy</td></tr>
<tr><td>Expenditure category</td><td>☒ Replacement ☐ Augmentation ☐ Connections ☐ Non-network</td></tr>
<tr><td>Identified need<br>(select all applicable)</td><td>☐ Legislation ☐ Regulatory compliance<br>☒ Reliability ☐ CECV ☒ Safety ☐ Environment ☒ Financial<br>☐ Other<br>An ongoing program to proactively replace aged and unsupported Edge Router assets prior to in-service failure. Proactive replacement ensures a reduction of time and costs of failures as the assets age beyond vendor support and experience an increased failure rate.<br>Current edge equipment is end-of-sale and support, furthermore current replacement equipment is not suitable for a like-for-like replacement resulting in additional complexity in replacement, however doing so provided Ergon Energy several operational and technical benefits.</td></tr>
<tr><td>Expenditure</td><td>
<table>
<tr><th>Year</th><th>2025-26</th><th>2026-27</th><th>2027-28</th><th>2028-29</th><th>2029-30</th><th>2025-30</th></tr>
<tr><td>$m, direct 2022-23</td><td>$0.65M</td><td>$0.65M</td><td>$0.65M</td><td>$0.65M</td><td>$0.65M</td><td>$3.25M</td></tr>
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</td></tr>
<tr><td>Benefits</td><td>This proactive program will reduce costs associated with managing Edge Router equipment failure in a ‘fail-fix’ nature. Proactive replacement reduces the number of spare assets required to be held and reduces the extent of service outage.</td></tr>
</table>

# 2. PURPOSE AND SCOPE

This document recommends the optimal capital investment necessary for replacement of obsolete Edge Router 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 ($3,251,133) 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 edge 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.
- Edge Layer - Aggregates services and connections to common capacity provided by the distribution layer. Typically provides capacity within a township.
- Subscriber / Terminals / Customer Layer - The subscriber layer connects internal/external customers equipment/users to the edge layer.

This program covers replacement of obsolete IP network equipment in the Edge 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.

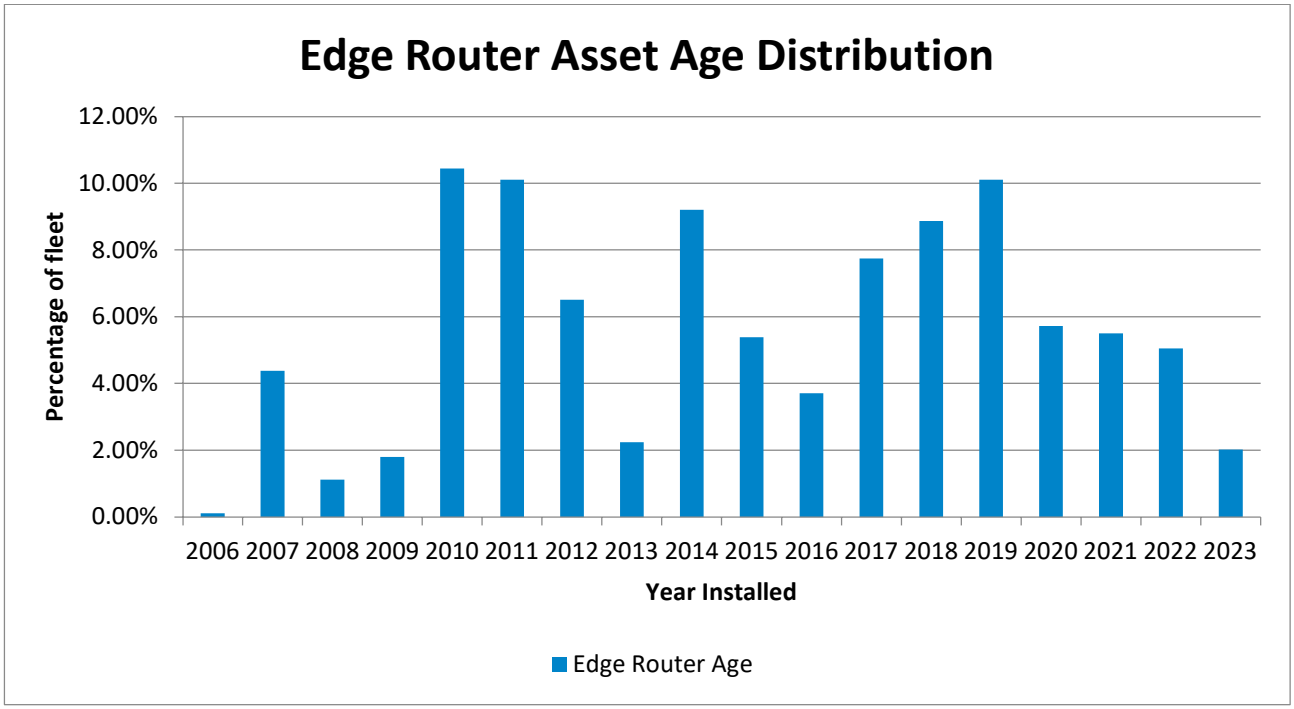
This is an ongoing risk-based replacement program that is divided into multiple projects to address differing needs, priorities and completion timings. This program is consistent with the Telecommunication Network Asset Management Plan.

## 3.2. Asset Management Overview

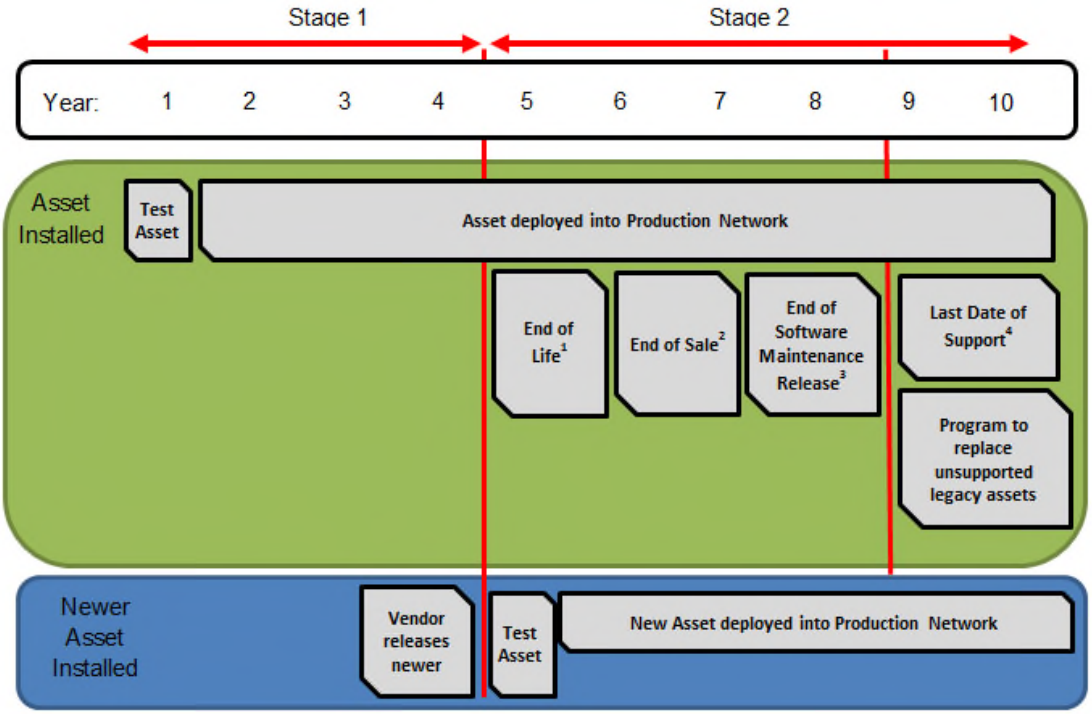
Ergon Energy has 1,396 IP operational network assets across numerous makes and models. The table below lists the total asset population quantities for each asset type within the network, the quantity that has exceeded vendor end of life support dates, the driver for replacement and the asset criticality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

| Asset Class / Technology Type | Total Quantity | 2025-30 End of Life Quantity | Replacement Strategy |
|---|---|---|---|
| Core | 161 | 30 | Proactive replacement |
| 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 Edge Router Assets:




The following diagram depicts the optimal asset lifecycle timeframes associated with IP network equipment. The optimal asset life is typically 10 years for telecommunications IP routers. 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 services by replacing router equipment ahead of asset obsolescence and in service failure. Not proceeding with the program will require expensive reactive replacement when in-service units fail, will require more complex management arrangements to manage the older versions of equipment and will require reactive development of replacement arrangement once vendors no longer supply spare equipment for the reactive fail fix processes.

The Edge Router telecommunications assets play a crucial role in the efficient management and operation of a reliable power network. It enables real-time telephony, monitoring, control and data

analysis which in turn leads to improved grid performance, reduced customer downtime, and enhanced grid resilience. As power grids continue to evolve with the integration of smart technologies and renewable energy sources, the role of these assets becomes even more critical in managing and optimising these complex and dynamic networks.

## 4.2. Asset Performance Considerations

### 4.2.1. Cyber Security Considerations

The obsolete Edge Router comms equipment in scope of this program has in the order of 13 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 in line with manufacturer recommendations which requires equipment to be in support.

As the manufacturer no longer do software maintenance releases for these end-of-life assets; to resolve these vulnerabilities requires full asset replacement to occur.

| CVE | Published Date | Impact |
|---|---|---|
| [redacted] | | |

### 4.2.2. Firmware Bugs

It is required to maintain vendor supported firmware revisions on these assets during their life in operation in order to obtain vendor support and patch known issues.

From the period between 2012 to 2023 the manufacturer has published 57 x software bugs that impact operation of the specific make/model of Edge Routing infrastructure deployed in the network.

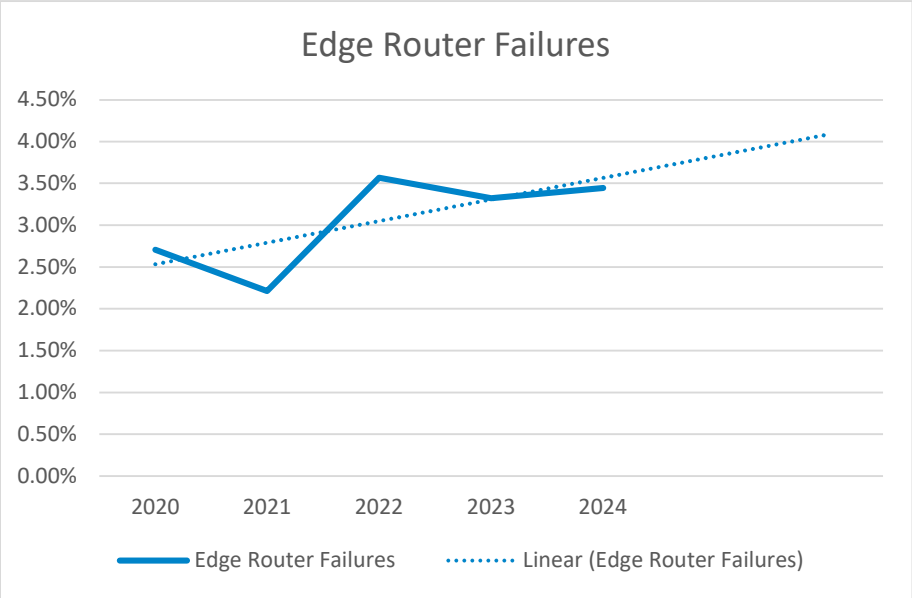
Since these assets are now obsolete the manufacturer is ceasing any further software development and any new bugs identified will require hardware replacement.

### 4.2.3. 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.

### 4.2.4. Failure Rate and Lack of Like for Like replacements

Current failure rate of Edge Router assets over the current RCP period is ~3.05% per annum that involve either hardware/software defects or performance degradation issues.




Current contracted standard equipment is not drop in like for like replacements and require a complete redesign for the sites communications arrangements. Any hardware failure where like for like spares do not exist could result in prolonged downtime, negatively impacting operational efficiency and causing costly delays.

### 4.2.5. 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.

## 4.3. Options Analysis

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

| Option | Qty Proactive | Total Proactive Cost | Qty Reactive | Total Reactive Cost | Total Cost | NPV |
|---|---|---|---|---|---|---|
| **Option 1 (Original) – Hybrid proactive approach**<br>*This was the original option which proposes to:*<br>• *Proactively upgrade software on all equipment once during the RCP.*<br>• *Development standards for 5 x latest model equipment and technology.*<br>• *Proactively replace 91 x sites to maintain vendor support and utilise recovered assets as spares for fail fix scenarios.* | 91 | $3.67M | 0 | $0 | $3.67M | $0.42M |
| **Option 2 (Preferred) – Standards development with proactive replacements**<br>*This is the preferred option which represents 20% cost savings when compared to Option 1 by removing the proactive software upgrades. This options proposes to:*<br>• *Development standards for 5 x latest model equipment and technology.*<br>• *Proactively replace 91 x sites to maintain vendor support and utilise recovered assets as spares for fail fix scenarios.* | 91 | $3.25M | 0 | $0 | $3.25M | $0.60M |
| **Option 3 – *AER proposed 37% reduction***<br>*This option accepts the AER proposed 37% reduction which results in the ability to:*<br>• *Proactively replace 57 x sites to maintain vendor support and utilise recovered assets as spares for fail fix scenarios.* | 57 | $2.31M | 25 | $1.99M | $4.31M | -$1.93M |
| **Option 4 – Wholesale replacement**<br>*Proactive replacement of all obsolete assets* | 547 | $15.63M | 0 | $0 | $15.63M | -$10.68M |
| **Option 5 – Counterfactual Reactive replacement only**<br>*No proactive replacement program or standards development for new technology* | 0 | $0 | 82 | $6.62M | $6.62M | -$6.16M |

### 4.3.1. Options 1 (Original) – Hybrid Proactive approach

This option was the original proposal which encompasses a multi-faceted approach as follows to ensure enhanced performance, improved stability, and increased reliability within our Edge Router network infrastructure:

- **Maintain software currency.** Once every 2-3 years its required to update firmware across the fleet of Edge Router 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 **5 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 **91 edge router assets** during the term.

The total costs for this program $3,673,597.

### 4.3.2. Options 2 (Preferred) – Standards development with proactive replacements

This option represents approximately 11.5% cost savings from the original proposed option through removal of the software currency from a proactive approach to a reactive approach when a need arises. This option will:

- **Develop and integrate latest equipment.** Includes development activities required to integrate **5** x latest new revisions of manufacturer equipment during the term.

- **Replace obsolete assets prior to their end-of-life dates.** This project includes proactive replacement of **91 edge router assets** during the term. Displaced infrastructure are to then be utilised as spares for fail fix of the remainder of the fleet.

The total costs for this program $3,251,133.

### 4.3.3. Options 3 – Accept AER proposed 37% reduction

This option is accepting the AERs 37% reduction in the program ($2.31M) and only replacing 57 assets.

For this option we would be likely performing some reactive replacements of between 20 and 30 units. If we assume 25 units would the actual expenditure that would be required would be the proactive program and the reactive program to cover the fail-fix where spares would not be available.

Simply scaling the counter factual case costs based on the percentage of the program that would be done reactively suggest that the total costs for this program likely to cost $2.31M (proactive component) + $1.99M (reactive component) :-= $4.31M (total).

The total costs for this program $4,310,219.

### 4.3.4. Option 4 – Wholesale Replacement

Ergon considered performing wholesale proactive replacement of all 547x obsolete edge router assets based on age, condition and vendor support removal as an alternate to the proposed multi-faceted approach that replaces a smaller subset however the program was grossly ($15.62M) more expensive than the proposed program and was rejected.

### 4.3.5. Option 5 – Counterfactual – Reactive replacement only

This program is intended to be purely proactive 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 no capital investment in minor and major upgrade and/or replacement of the 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 Edge Router equipment results in twice the cost to replace reactively in an unplanned manner for a range of reasons including:

- **Is not a like for like replacement:** Latest standards of equipment is not a like for like drop-in replacement. It requires redesigning the communications arrangements at the site which can involve replacing more than just the failed asset itself.
- **Broad business impacts:** An outage to the underlying telecommunications data centre infrastructure can lead to a failure of to protection 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:** Unplanned failures results 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 $6,624,585.

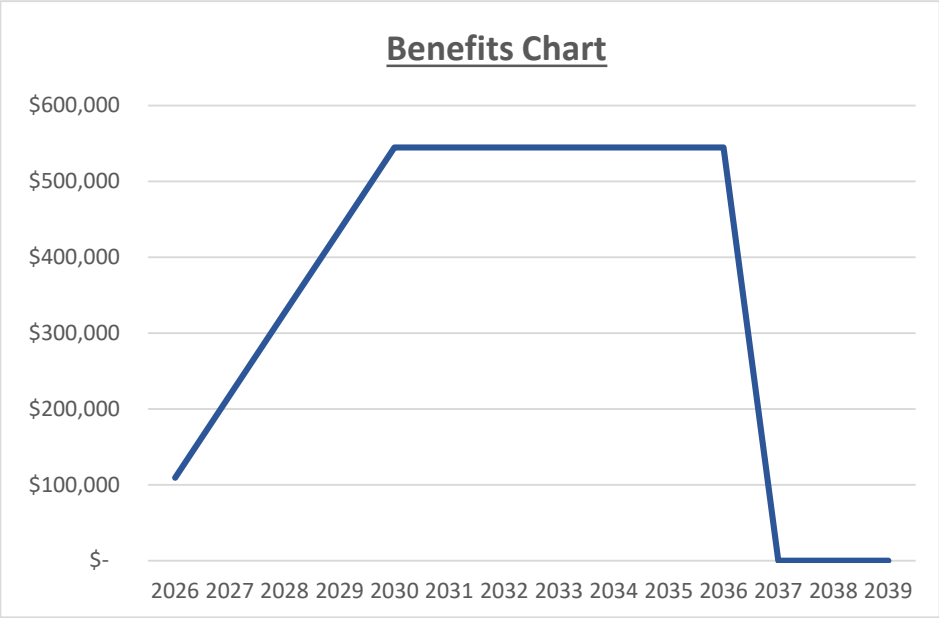
## 4.4. Risks

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 |
|---|---|
| Edge Router hardware or software defects occur on aged unsupported equipment requiring emergency replacement increasing costs | With the continued use of unsupported Edge Router 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.<br><br>There is an estimated likelihood that on a yearly basis 3.96% 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%.<br><br>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 $0.24M p.a. |
| 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.<br><br>Inability to support and patch these assets will leave Ergon exposed to such issues with anticipated cost of $0.29M 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 Edge Router asset 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 22kV 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** | $734,719 | $734,719 | $734,719 | $734,719 | $734,719 | $3,673,597 |
| **Option 2 – Standards development with proactive replacements** | **$650,227** | **$650,227** | **$650,227** | **$650,227** | **$650,227** | **$3,251,133** |
| **Option 3 – Accept AER proposed reduction** | $862,044 | $862,044 | $862,044 | $862,044 | $862,044 | $4,310,219 |
| **Option 4 – Wholesale replacement** | $3,126,804 | $3,126,804 | $3,126,804 | $3,126,804 | $3,126,804 | $15,634,021 |
| **Option 5 – Reactive replacement** | $1,324,917 | $1,324,917 | $1,324,917 | $1,324,917 | $1,324,917 | $6,624,585 |

## 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 $602,048.

**Table 3 NPV analysis**

| Option | NPV | Discount rate | | Benefits | |
|---|---|---|---|---|---|
| | | 2.5% | 4.5% | 125% | 75% |
| **Option 1 – Hybrid proactive approach** | $423,586 | $580,235 | $287,764 | $1,303,666 | -$456,493 |
| **Option 2 – (Preferred) Standards development with proactive replacements** | **$602,048** | **$760,611** | **$463,844** | **$1,437,712** | **-$233,616** |
| **Option 3 – Accept AER proposed reduction** | -$1,930,075 | -$1,959,195 | -$1,897,108 | -$1,504,247 | -$2,355,902 |
| **Option 4 – Wholesale replacement** | -$10,681,785 | -$11,110,329 | -$10,270,518 | -$10,057,479 | -$11,306,091 |
| **Option 5 – Reactive replacement** | -$6,166,631 | -$6,492,127 | -$5,862,372 | -$6,312,208 | -$6,021,055 |

# 6. APPENDICES

# 7. 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)**<br>meet or manage the expected demand for standard control services over that period | |
| **6.5.7 (a) (2)**<br>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 physical linear media assets. Without this program, these obligations would be at significant risk of being breached. |
| **6.5.7 (a) (3)**<br>to the extent that there is no applicable regulatory obligation or requirement in relation to:<br>(i) the quality, reliability or security of supply of standard control services; or<br>(ii) the reliability or security of the distribution system through the supply of standard control services,<br>to the relevant extent:<br>(iii) maintain the quality, reliability and security of supply of standard control services; and<br>(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)**<br>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)**<br>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 |

| NER capital expenditure objectives | Rationale |
|---|---|
| | enabling efficient use of labour resources in the delivery of the work programs.<br><br>Specialised contractors are utilised as appropriate to ensure that costs are efficiently managed through market testing.<br><br>Cost performance of the program will be monitored to ensure that cost efficiency is maintained.<br><br>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)**<br><br>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.<br><br>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)**<br><br>a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objectives | NA |

# 8. APPENDIX 2: RECONCILIATION TABLE

**Table 5 Reconciliation**

| Expenditure | DNSP | 2025-26 | 2026-27 | 2027-28 | 2028-29 | 2029-30 | 2025-30 |
|---|---|---|---|---|---|---|---|
| GRID COMSS Edge Router Replacement REPEX ($ Direct) | Ergon | $0.65M | $0.65M | $0.65M | $0.65M | $0.65M | **$3.25M** |