Grid Comms Fringe Network Replacement REPEX Ergon

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 Fringe Network Replacement
DNSP	Ergon Energy
Expenditure category	☒ Replacement ☐ Augmentation ☐ Connections ☐ Non-network
Identified need *(select all applicable)*	☐ Legislation ☐ Regulatory compliance ☒ Reliability ☐ CECV ☒ Safety ☐ Environment ☒ Financial ☐ Other Ergon Energy has strong reliance on public telco networks in fringe and remote rural areas of Queensland and changes in the market by 3rd party external vendors is a risk to the Ergon Energy telecommunication network. This is an ongoing program to ensure terminal equipment remains compatible with latest revisions of 3rd party technology services and to ensure associated issues with vendor product removal does not escalate to unmanageable levels in terms of costs and risk.
Expenditure	See table below
Benefits	This proactive program will reduce costs associated with moving to a reactive program, will reduce risks associated with increased outages of in service equipment and has a range of other advantages compared to a reactive strategy including increased performance, capacity and reliability of telecommunications services.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
$m, direct 2022-23	$0.13M	$0.13M	$0.13M	$0.13M	$0.13M	**$0.69M**

2. PURPOSE AND SCOPE

This document recommends the optimal capital investment necessary to support the development of solutions to allow ongoing replacement of obsolete Telecommunications Fringe network assets with new and later generations of equipment. 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 ($694,514) are in (2022/23) direct dollars.

3. BACKGROUND

3.1. Use of Public Networks

Ergon Energy's power network distribution assets are spread all over regional Queensland and use a mixture of communications technologies to provide the required services. Public telecommunications carrier networks are used extensively where it is not prudent for Ergon to build or maintain its own infrastructure. This comprises of 3rd party services utilising xDSL (Digital Subscriber Line), cellular and satellite technologies to communicate with many assets, such as PQ monitors, revenue & statistical meters, reclosers, AFLCs (Audio Frequency Load Control), substation security and SCADA controlled substation assets.

Along with the normal asset lifecycle management of this equipment, relying on public networks also bring further considerations. The public networks periodically go through rapid change and historically removed previous generations of technology from service to enable later generation of network equipment to be deployed. Due to the current reliance on public telco networks, changes in the market by external vendors is a risk to the Ergon Energy telecommunication network. Some recent examples of this issue include:

- The decommissioning of the 3G cellular network. In this instance all equipment that was only compatible with the 3G network had to be replaced prior to the public telecommunications carrier service disconnection dates.
- The decommissioning of ISDN (Integrated Services Digital Network) and PSTN (Public Switched Telephone Network) telephony lines. Public carriers' removal of ISDN services required Ergon to migrate to SIP (Session Initiation Protocol) equivalents.
- The decommission of ADSL (Asymmetric Digital Subscriber Line) and Frame-relay and other copper-based services required migration to VDSL (Very high speed Digital Subscriber Lines) and NBN (National Broadband Network) Ethernet Bitstream services.
- 3rd Party Satellite use-policy changes requiring Ergon to utilise other Business Satellite services.

- Satellite changes requiring firmware upgrades and introduction of new satellite terminals to ensure compatibility.
- Cellular terminal equipment with software compatibility issues resulting in terminal equipment locking up when toggling between 3G and 4G in fringe coverage areas. This required firmware upgrades across the entire fleet to ensure service availability and reliability.

3.2. Asset Management Overview

The table below lists the total asset population quantities for each asset type used to support Ergon's fringe telecommunications services. Included is Ergon infrastructure used to support the equipment and connect the power infrastructure to these cellular and satellite networks (e.g. IP switches, Power supply equipment etc).

The assets in this category predominately follow a fail-fix asset management approach, and to continue to utilise this approach and to minimise costs, we are proposing to continue to develop solutions that can be deployed during fail fix such that migrate us off poorly performing hardware and or solutions to new equipment / services. Creating these solutions will also ensure we have solutions ready for larger proactive programs anticipated to be commencing at the end of the coming regulatory period and extending all through the following regulatory period e.g. the 4G network switch off.

Asset / Service Type	Total Quantity	2025-30 End of Life Quantity
Pole top devices	2833	750
Satellite BGAN terminals	286	165
xDSL Routers	35	25
Other substation, power station fringe assets (predominately IP switch infrastructure and power supplies)	137	114

3.3. Asset Failures

Asset failure performance associated with the terminal equipment for the Fringe Network over the 2022 to 2024 period is 6.35%, this failure rate includes a significant number of firmware issues that resulted in equipment locking up, a need to attend site, upload a new firmware and restart the device.

However, given the recent large number of replacements (50% of fringe net equipment) associated with the 3G close down, this failure rate is expected to decrease. The estimated failures would be expected to halve with a projected failure rate of ~3%.

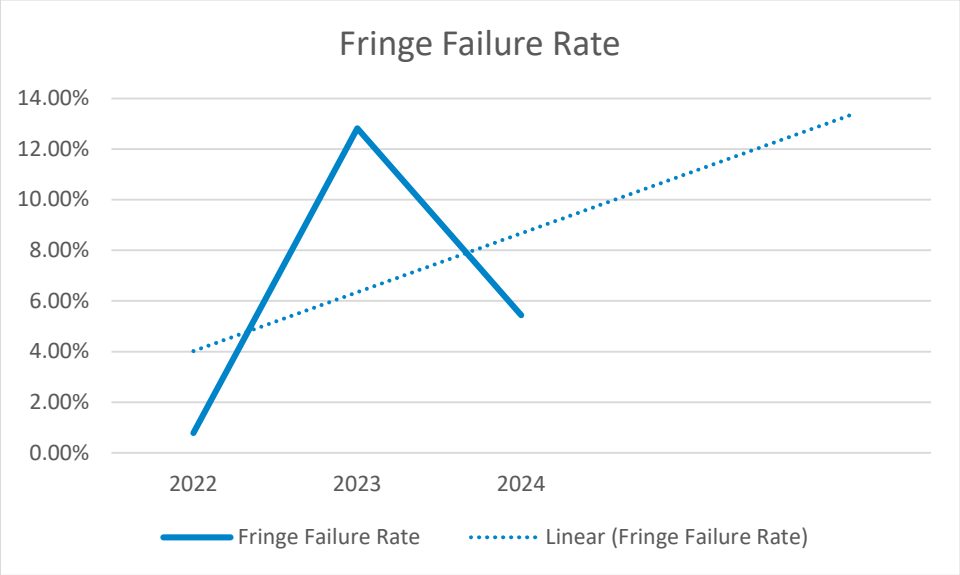


Figure 1: Fringe Equipment Failures

3.4. Vendor declining Performance / Systems End Of Life

Below are listed the various current or future considerations for the Fringe Network fleet for removal of commercial services and reduction in performance of existing services.

- Expected cellular network closure of 4G during AER 2030-35 period with the need to commence works (standards development and testing for 5G equipment) during the 2025-30 period.
- Performance deterioration for the BGAN Satellite Service. Ergon's existing Satellite network provider for assets in this category is increasingly becoming not fit for purpose due to significant performance decline experienced in current BGAN terminal operation. The service had a significant issue which saw around 60+ of our remote pole mounted reclosures uncontactable for over 6 months due to issues that decreased satellite coverage. The service continues to have increasing latency and high data usage costs. Devices are frequently toggling on/off with unreliable communications during periods when there is no faults on the satellite system. The figure below shows the number of pole mounted devices utilising satellite that are contactable sampled over a 5 day period.

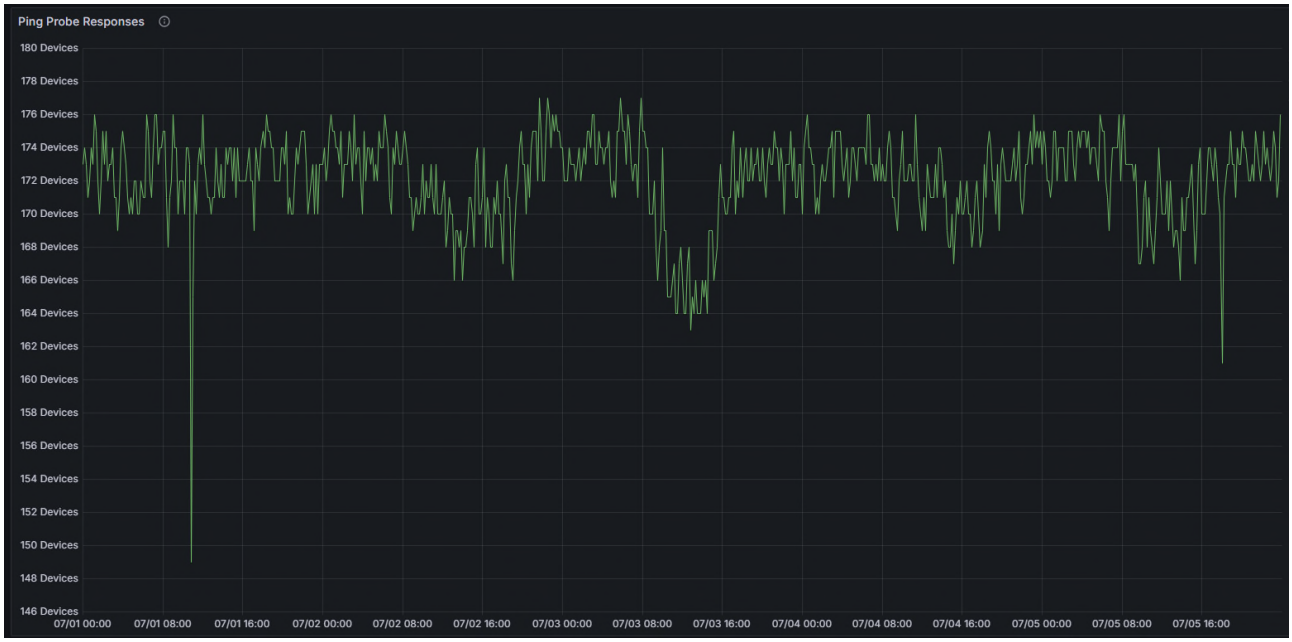


Figure 2: Responding Satellite unit counts over time

- Performance of Cellular services is degrading in remote locations. Overall performance of cellular network with daily cycle of losing connectively (longer than 10 minutes), multiple widespread outages, increasing latency and congestion issues impacting 1000+ units per day

    - As evident in the figure below, in remote areas Ergon has observed significant performance degradation on public cellular networks during the hours when the community is most active. The figure below shows the significant increase in latency for packets that for many applications can mean the services will not operate effectively or at all.

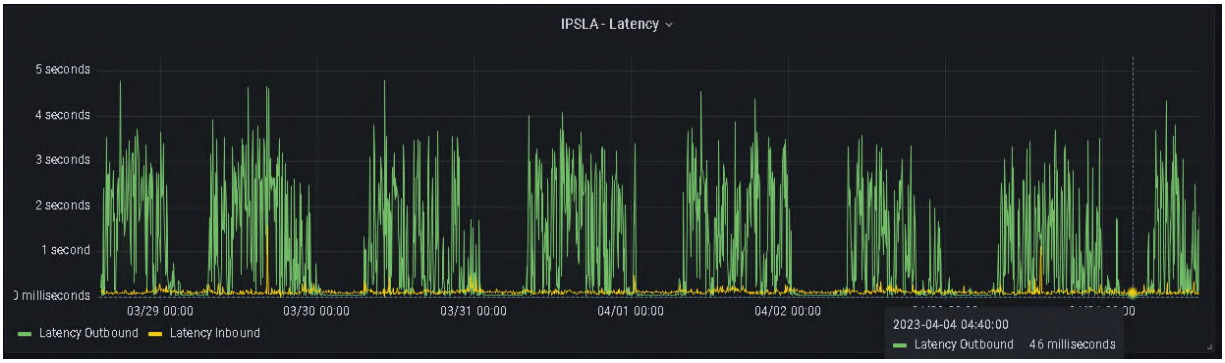


Figure 3: Latency performance of remote Cellular connected equipment over time

    - The below performance graph highlights the large number of cellular devices which are unavailable for longer than a 10 minute period in any in a 24 hour reporting period due to poor performance of the 3rd party carrier networks (single operator).

Over a third of the devices experience these issues on a daily basis. This is caused by cell coverage reduction as number of active devices per cell results in power restrictions, outages, network congestion and actual equipment failures. These cellular connected devices provide service to substations and discreet electrical assets such as reclosers, sectionalises, Line Fault Indicators etc.

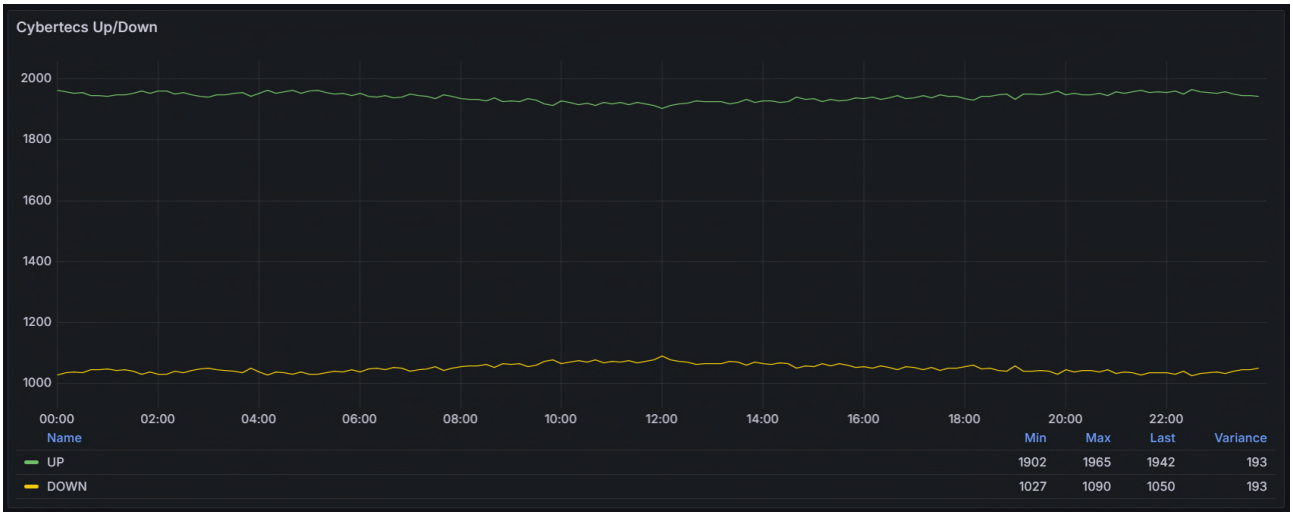


Figure 4: Cellular devices online performance

4. IDENTIFIED NEED

4.1. Summary

This program seeks to manage risks and costs associated with provision of comms equipment by having suitable options available ready for fail fix of equipment. These solutions will minimise deploying equipment that will cease operation prematurely when vendors remove service offering or continuing to use the same equipment at locations where there has been degradation of vendor provided services and new capability would resolve performance issues.

To achieve this EQL will continue the product selection, architecture development, testing and development of network standards / maintenance instructions, for new market services / equipment. This will allow replacement of older infrastructure during the fail fix maintenance process. Not proceeding with the program will result in deployment of assets that will have shorter asset lives, needing to be replaced at the time of Vendor removal of service and will remove the opportunity to improve service performance by moving off poorly performing services.

In the lead up to 2030 the below new services will need development of solutions to take advantage of them.

- 5G network in remote regional Queensland will expand significantly and quickly as carriers continue the rollout and ultimately begin to prepare for the 4G close down. Having solutions

that leverage this 5G network will maximise asset operating life and can be targeted where they would overcome current performance issues. EQL's existing standard equipment deployed in regional Queensland is based on older 4G technology therefore to ensure increased performance, longevity and compatibility with public networks Ergon will require development of new standard solutions.

- Low Earth Satellite coverage and service offerings in regional Queensland is expected to substitute older Geostationary satellite services currently utilised by Ergon Energy. The development and integration of these services to replace older service should overcome performance issues being experienced with current service offerings.

- CAT M1 equipment has been available for some time, EQL has utilised these for a number of different solutions however more work is required to develop the solution for use with more asset types.

4.2. Options Analysis

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

Option	Qty Proactive	Total Cost	NPV
Option 1 – Hybrid proactive approach *This was the original option which proposes to:* • *Proactively upgrade software on all equipment once during the RCP.* • *Development standards for latest model equipment and technology.* • *Proactively replace 22 x critical sites.*	22	$868,142	$2,282
Option 2 (Preferred) – Standards development with proactive replacements *This is the preferred option which represents 20% cost savings when compared to Option 1 by removing the proactive software upgrades. This option proposes to:* • *Development standards for latest model equipment and technology.* • *Proactively replace 18 x critical sites.*	18	$694,514	$52,150
Option 3 – Standards development only *This option accepts the AER proposed 37% reduction which results in the ability to development new standards only, however without any proactive replacements.*	0	$546,930	-$812,106
Option 4 – Counterfactual *No proactive replacement program or standards development for new technology*	0	$2,559,600	-$2,157M

4.2.1 Option 1 (Original) – Hybrid proactive approach

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

Maintain software currency

Once every 2-3 years its required to update firmware across the fleet of Fringe network hardware to resolve bugs, improve performance, 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 and new iterations of 3rd Party telecommunications services

Ergon's replacement strategy for FringeNet assets is to develop the relevant standards for newer revisions of technology when it's prudent to do so, then only deploy on an as need basis in scenarios such as asset failures, 3rd party commercial product removal or where the business requires new services deployed. If Ergon continue to deploy the older revisions of technology (once the market suppliers has released the newer revisions) then

the value for money is significantly decreased with a much shorter life. This project includes development activities required to integrate **5 x new models** of terminal equipment during the term and standardise on **2 x new technologies.**

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.

Ergon's strategy for the vast majority of assets in this class is to run beyond the manufacturer End of Life and replace only if there is a failure or need to maintain service. This project includes proactive replacement of **22 of the most critical assets** during the period which represents < 1% of the overall fleet which is intended to be used as field trials to validate the technology deployment in the field to then subsequently determine them as fit for purpose in Failed In Service arrangements.

The total costs for this program $868,142.

4.2.2 Option 2 (Preferred) – Standards development with proactive replacements.

This is the preferred option which represents 20% cost savings and higher NPV when compared to Option 1. This option will:

Develop and integrate latest equipment and new iterations of 3rd Party telecommunications services

This project includes development activities required to integrate **5 x new models** of terminal equipment during the term and standardise on **2 x new technologies (e.g. alternate to existing satellite service possibly CAT M1 and low earth orbit satellite solutions)**.

18 sites will be strategically selected for field trials of the new equipment which will target sites with obsolete infrastructure. These will be spread evenly on technology type and location of installation to validate performance in the wide range of Ergons operating area. The new standards will then be used for drop, in like for like replacements when existing asset fleets fail in service and will also be used for new asset deployments as required.

Unlike option 1 the following **will not** occur to achieve 20% cost reduction without adversely impacting the program NPV:

- Updates to equipment firmware to maintain software currency. Under this option the software upgrades will not occur and will be evaluated if/when a defect or need is identified.
- Proactive replacement of sites has been reduced by 4.

Total Cost of this program is $694,514.

4.2.3 Option 3 – Standards development only

This option is accepting the AERs 37% reduction in the program. This expenditure will only enable Ergon to conduct the required standards development work as per Option 1 and 2 with extremely limited deployment of only 5 x sites to pilot the new assets/technology.

Total Cost of this program is $546,929.

4.2.4 Option 4 - Counterfactual – Reactive replacement only

This program is intended to be purely reactive in nature. The counterfactual considers the continued use of the current Fringe network asset types regardless of options to provide upgraded equipment to improve availability performance or to maximise asset useful life.

It is estimated the failure rate of ~3% would result in approximately 158 failures over the 5 year period of these EoL assets, when these assets are replaced under fail fix processes no new asset type / services would be available:

- Replacement Fringe asset with same “old technology” solution will require replacement again at a later date incurring addition OPEX and CAPEX cost to the business. Example replacing failed 3G Modem with another 3G Modem with 3G Cellular network during this period would have meant that asset life would have only been up to 3 years.
- Replacement Fringe asset with same “old technology” solution rather than changing the technology type will miss the opportunity to move onto better performing systems an continuing to occur OPEX costs associated with poorly performing systems.

Total Cost of this program is $2,559,000.

4.3. Risks

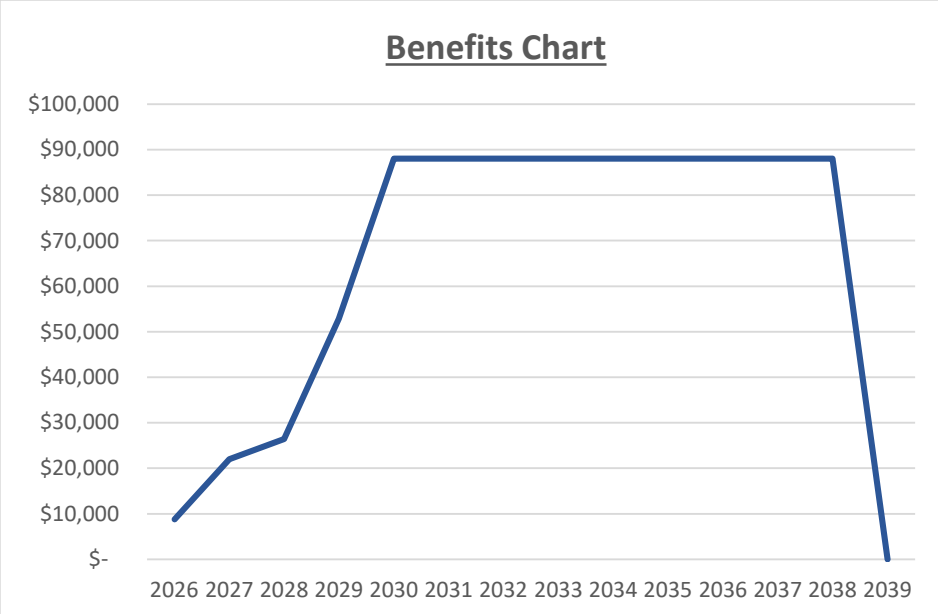
Table below outlines the risk assessment for the counterfactual scenario with no proactive program in place to address develop the required standards.

Table 1 Risks Associated with the Counterfactual

Risk Scenarios	Description of Risk
Sub-optimal labour costs in continuing triaging and diagnosing aging technology related faults that are the result of the degrading performance that would have been avoided if newer	Without a proactive program to develop, test and integrate new fringe equipment and technology, as manufacturers release newer revisions of technology, Ergon would continue to waste effort in triaging faults and issues associated with older technology rather than replace them with newer variants in failure scenarios. It is estimated there is approx. 1 x sites per week for 2 hours

technology was adopted sooner.	
Sub-optimal investment in aging technology resulting in extra reactive works increasing costs.	Without a proactive program to develop, test and integrate new fringe equipment and technology, as manufacturers release newer revisions of technology, Ergon would continue to deploy the older existing standards, thereby reducing overall asset life by up to 60%. When services and equipment then goes End of Sale, Ergon would reactively need to quickly test new alternative arrangements 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 $0.18M per annum.

The table below outlines the cost benefits over the program period and asset life of ~12 years.



5. ECONOMIC ANALYSIS

5.1. Cost summary 2025-30

Table 2 Cost summary 2025-30

Options	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Option 1 – Hybrid proactive approach	$86,814	$130,221	$43,407	$260,443	$347,257	$868,142
Option 2 (Preferred) – Standards development with proactive replacements	$138,903	$138,903	$138,903	$138,903	$138,903	$694,514

Options	2025-26	2026-27	2027-28	2028-29	2029-30	Total 2025-30
Option 3 – Standards development only	$109,386	$109,386	$109,386	$109,386	$109,386	$546,930
Option 4 – Counterfactual	$255,960	$383,940	$127,980	$767,880	$1,023,840	$2,559,600

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.

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 $52,150.

Table 3 NPV analysis

Options	NPV	Discount rate		Benefits	
		2.5%	4.5%	125%	75%
Option 1 – Hybrid proactive approach	$2,282	$34,657	-$24,812	$181,138	-$176,573
Option 2 (Preferred) – Standards development with proactive replacements	$52,150	$88,354	$21,315	$211,551	-$107,251
Option 3 – Standards development only	-$812,106	-$868,990	-$760,225	-$899,871	-$724,341
Option 4 – Counterfactual	-$6,133,358	-$6,645,850	-$5,670,705	-$7,141,048	-$5,125,668

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 communications assets. 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 Fringe Network Replacements REPEX ($ Direct)	Ergon	$0.13M	$0.13M	$0.13M	$0.13M	$0.13M	**$0.69M**