Grid Comms P25 Replacement Ergon Energy

Justification Statement

07/ 10/ 2024

ERGON ENERGY NETWORK
Part of Energy Queensland

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DOCUMENT VERSION

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

1 SUMMARY

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The P25 Trunked radio network provides critical voice communications for operational switching, work force co-ordination and safety for Ergon Energy.

This project is part of an ongoing program to proactively manage the P25 radio network assets in the Southern and Northern region through an 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.

Proactive replacement ensures a reduction of time and costs of failures as the assets age and experience an increased failure rate.</td></tr>
<tr><td>Expenditure</td><td>
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<tr><th>Region</th><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>Southern</td><td>$m, direct 2022-23</td><td>$0.23M</td><td>$0.23M</td><td>$0.63M</td><td>$0.63M</td><td>$0.63M</td><td>$2.38M</td></tr>
<tr><td>Northern</td><td>$m, direct 2022-23</td><td>$0.21M</td><td>$0.21M</td><td>$0.56M</td><td>$0.56M</td><td>$0.56M</td><td>$2.11M</td></tr>
<tr><td>Total</td><td>$m, direct 2022-23</td><td>$0.44M</td><td>$0.44M</td><td>$1.20M</td><td>$1.20M</td><td>$1.20M</td><td>$4.49M</td></tr>
</table>
</td></tr>
<tr><td>Benefits</td><td>This 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.

The program will reduce risks associated with potential network wide disruptions to business-critical functions involving the operation and control of the distribution network.</td></tr>
</table>

2 PURPOSE AND SCOPE

This document recommends the optimal capital investment necessary for replacement of obsolete Mobile P25 Digital Radio 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 ($4,499,064) are in (2022/23) direct dollars.

3 BACKGROUND

3.1 Asset Population / Site Summary / Capability

Ergon Energy's Telecommunications Network Assets enable mission critical real-time voice and data communications to allow automation, remote monitoring and control of the power network, enable ability to co-ordinate safe and efficient work activities as well as extend the reach of corporate information systems across a common infrastructure.

The P25 Trunked radio network provides critical mobile voice communications for operational switching co-ordination, work force co-ordination and safety for Ergon Energy. Additionally, P25 provides GPS tracking of the vehicles and inbuilt safety distress button (with location information) which is available at the control centre and area operations managers providing safety, delivery efficiency and potentially reliability benefits.

The P25 Network has been implemented over the past 11 years at 12 Core sites and 115 Base station sites, providing voice communications to over 1200 in-vehicle/handheld radios. The P25 network provides the primary means of voice communications during disasters, operational switching and safety events for EQL network in the North and South regions.

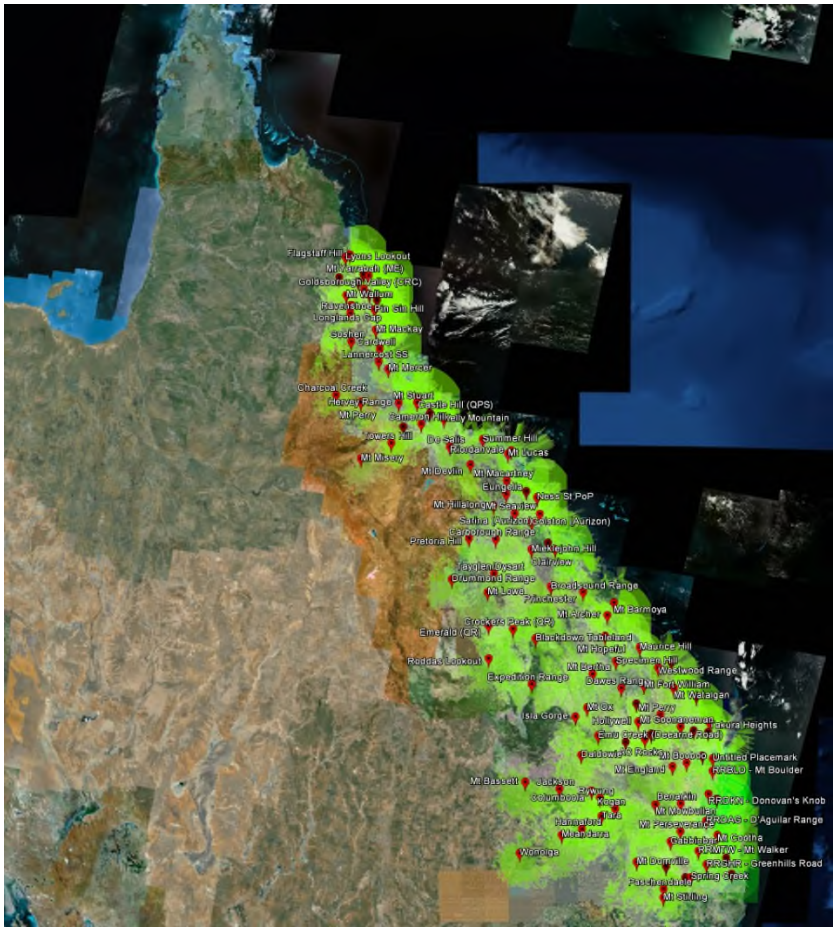


Figure 1: Distribution of P25 Assets

The P25 network provides coverage of a significant portion of the electrical network and in conjunction with other supporting technologies, SatPTT & Cellular enable field group voice communications.

3.2 Asset Management Overview

3.2.1 Asset Summary

Ergon Energy's existing P25 Mobile Digital Radio network was originally installed at a total capital investment of $93.432M. The P25 network assets are separated into a three-layered architectural framework .

1. P25 Core Sites (RFSS) – The RFSS sites form the most critical, being the central core distributed across 12 x sites. These RFSS sites were predominately installed between 2011 and 2014 with all the hardware and software systems having already become obsolete since then.
2. P25 Base Station sites – The RF sites are generally situated on hill tops to provide extended VHF coverage to subscriber's radios. Several base station components have gone end of supply and represent a key operational risk with regard to continuity of voice communications between field crews, control centres and area operations management.
3. Subscriber radios – Radios are generally hand-held or installed in-vehicles and are the handset used by users to make voice calls. SATPTT technology is used in areas where there is no existing P25 coverage.

The table below lists the total asset population quantities for each asset type within the P25 network. Currently selected critical components in the base station infrastructure (base station controller) are end of sale / end of support and 100% of the Core and RF electronic assets will have reached vendor end of life dates by 2030.

Asset Class / Technology Type	Total Quantity	2025-30 End of Life Quantity	Asset Criticality	Replacement Strategy
P25 CORE SITES (RFSS)				
Network Assets (routers, switches, firewalls etc)	18	18	High Component failure leads to network wide outages.	Proactive replacement to maintain manufacturer support.
Servers	32	32		
Software Systems	1	1		
P25 BASE STATION SITES (RF) – SOUTHERN REGION				
Network Assets (routers, switches, radios etc)	84	84	Medium Component failure leads to regionalised outages.	Proactive replace critical sites strategically – to use as spares for remaining fleet.
Base Stations	202	202		
Channel Controllers	51	51		
P25 BASE STATION SITES (RF) – NORTHERN REGION				
Network Assets (routers, switches, radios etc)	73	73	Medium Component failure leads to regionalised outages.	Proactive replace critical sites strategically – to use as spares for remaining fleet.
Base Stations	177	177		
Channel Controllers	44	44		
SUBSCRIBER RADIOS				

In-Vehicle	1200	N/A	Minor Component failure leads to individual subscriber outages.	Reactive – fix on fail.
Handheld				
Kiosks	26	26		
Local Operator Consoles				

3.2.2 Age Distribution

The majority of the P25 assets were installed between 2011 and 2018 and has a nominal asset life of approximately 12 years. The graph below highlights the age distribution of the installed assets:

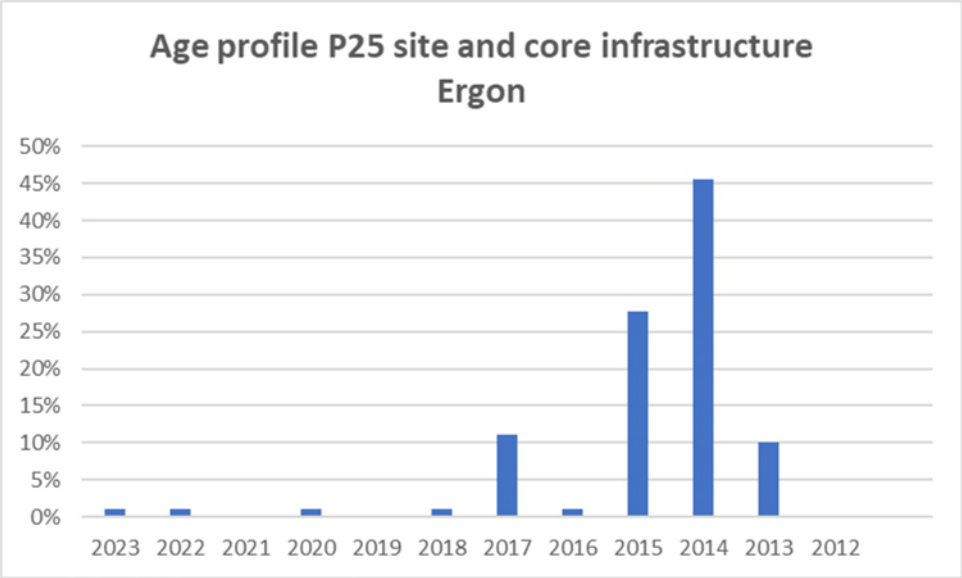


Figure 2: Field Mobile Radio Asset Age Distribution Northern and Southern Region

3.2.3 Asset Failure Rates

The number of vendor support tickets raised on average is approximately 51 per annum to address software issues, bug fixes, firmware updates, patches, configuration support and hardware replacements.

Below is an indication of typical failure rates during a 12-month period between July 2022 and June 2023:

Asset Class / Technology Type	Failures during 22/23 Financial year
P25 Servers	3
Network Assets (routers, switches, radios etc)	26
Base Stations	16

Channel Controllers	22

The software that runs on P25 hardware requires technically complex configuration updates to maintain the device's functionality. When the vendor stops product support then the only source of software updates ceases. In addition, since the software is considered closed source, it cannot be "fixed" by anyone but the vendor. As assets become obsolete and vendors cease support, rectification of failures can involve extended outages and occur across the entire population of the asset model.

4 IDENTIFIED NEED

4.1 Summary

This program seeks to manage costs and risks associated with provision of field voice comms (P25) 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 Inservice and no spares are available to replace equipment, 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 P25 network is critical during disasters, severe weather events and emergencies, all of which Ergon Energy faces on a regular basis. It is also critical for day-to-day operations where cellular networks have no coverage in the Coastal regions. Ergon Energy currently relies on this ageing radio system to support voice telecommunications to staff involved in the maintenance and repair of the network. Whilst for day-to-day operations (in areas where coverage is available and staff are issued phones) mobile phones can and are used, history has shown they cannot be relied on for essential telecommunications in times of emergency such as severe weather events and outages to public telephony networks.

4.2 Options Analysis

Ergon Energy evaluated multiple options to determine the most prudent asset management approach for the P25 network system. Ergon's strategy is to continue to maintain and extend the life of the existing P25 network to maximise the significant prior investment to date in P25 technology deployments in the Southern and Northern operating regions.

Option	Replacements			Total Cost	NPV
	Core	Base Stations	Subscribers		
Option 1 (Proposed) – Life extension of the existing P25 network using compatible replacement equipment	3	22	0	$4.49M	$179K
Option 2 – (Original proposal) Replace with alternative P25 technology solution not compatible with existing infrastructure	3	34	0	$10.46M	$42K

Option 3 - Replace with public network service provider	NA	NA	1200	$11.90M	-$2.12M
Option 4 - Accelerated program with minimal risk	12	115	0	$19.99M	-$6.76M
Option 5 Counterfactual (Purely reactive program)	0	22	0	$8.99M	-$7.58M

4.2.1 Option 1 (Proposed) – Life extension of the existing P25 network using compatible replacement equipment.

This option proposes a multi-faceted hybrid approach to ultimately extend the P25 network technology to beyond the 2025-30 regulatory period through a prudent spares mining asset management approach which requires both proactive and reactive maintenance activities to ensure that the infrastructure remains fit for purpose.

- **Development of drop-in Base Station replacement solution:**

  Recent market research has identified that potential commercially available like for like replacement solutions exist for End of Life P25 components that is compatible with existing infrastructure. It is required to complete the necessary standards development work to validate and determine how this can be achieved.

  A drop-in replacement solution would alleviate any deliverability issues based on the reduced complexity to deploy and enable seamless integration with existing network in both planned and reactive replacement scenarios.

- **Proactively replace critical base station sites:**

  Out of the 115 total base station sites installed across Ergon Energy, the most critical sites will have their associated P25 assets targeted for replacement under this project. Utilising the newly developed Base Station solution 12 x sites in the Southern region and 10 x sites in the Northern region will be replaced thus providing new equipment with low in service failure rates at the most critical sites.

  Note: there is risk that a new replacement Base Station solution may not be a like for like replacement. Should this occur, at the time it will be required to re-assess the proactive replacement quantities with view to potentially increase should failure rates increase to then use as spares to support the remaining fleet.

- **Replace obsolete RFSS Core hardware/software 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 P25 components. 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 Core RFSS components, 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 program intends to prioritise the most critical central core equipment, by replacing obsolete assets at 3 of the 12 x RFSS Core sites and where possible rationalise and consolidate the equipment installed.

Advantages	Disadvantages
• Direct replacements enable cost effective pathway for P25 age replacement and return to service projects. • No requirement to make changes to the 1200+ field radios installed in vehicles.	• Risk that the replacement solution does not integrate seamlessly resulting in higher costs.

The total costs for this program $4,499,064.

4.2.2 Option 2 – Replace with alternative P25 technology solution (not compatible with existing Core infrastructure).

This was the original proposed program, prior to recent market updates that now provide potential like for like replacement solution. This option proposes to evaluate alternative suppliers of modern equivalent Push to Talk technology solutions to replace obsolete base stations.

As base station infrastructure is highly likely not to be directly compatible with the existing Core network, it would be required to deployed parallel Core infrastructure to support the new base station and develop integrations with the existing network to enable a staged replacement of the end-of-life P25 components.

Base station assets targeted for replacement will be selected strategically based on age and criticality based on those providing the highest concentration of voice calls.

Out of the 115 total base station sites installed across Ergon Energy this option proposes to replace 24 x sites in the Southern region and 10 x sites in the Northern region with recovered equipment to then be used as strategic spares for the remaining fleet.

Advantages	Disadvantages
• New supplier technology may provide additional capability providing broader business benefits. • Multiple suppliers technology may create some competitive advantages.	• Increased complexity with many integration and interoperability issues. • Additional upskilling of operational staff required in alternative suppliers' technology.

The total costs for this program which was previously represented in two separate North and South cases was $10,462,941.

4.2.3 Option 3 - Replace with public network service provider

Ergon considered the option of minimising continued investment in its private P25 network and commence fitting vehicles with a new Push to Talk (PTT) communications technology solution that leverages 3rd party public cellular/satellite networks service providers. This option would require:

- **Development of new solution:**

  It would be required for Ergon to go to the open market to determine suitable 3rd party public networks that would meet the requirements, then conduct the necessary concept testing and standards development works including integration with the existing network to enable a seamless migration.

- **Deployment of new solution to each subscriber:**
  Ergon has in the order of 1200 x subscribers/vehicles fitted with P25 radios. It is highly likely that all subscribers will require radio and terminal equipment changes prior to the decommissioning of legacy P25 Radio infrastructure.

Advantages	Disadvantages
• New technology may provide broader business benefits such as enabling broader field workforce automation capability.	• Investments in the existing P25 network to date not fully realised. • Limited technology providers in the market that meets requirements that can be deployed at scale for reasonable cost. • Large impacts to the workforce with technology changes required to 1200+ radios deployed throughout QLD. • Significantly higher ongoing operational costs. • Reliance on any public network is known to be problematic during periods of peak congestion and natural disasters when Ergon depends on this communications service the most for restoration activities.

The total costs for this program $11,902,528.

4.2.4 Option 4 - Accelerated program with minimal risk

Ergon considered performing wholesale proactive replacement of all obsolete P25 base station 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 ($19.99M) more expensive than the proposed program and was rejected.

In addition to being extremely cost prohibitive, there was concerns in the deliverability due to being labour intensive and results in existing investments in the P25 technology not being fully realised.

4.2.5 Option 5 – Counterfactual (Purely reactive program)

This program is intended to be purely proactive in nature. The counterfactual considers the continued use of the current P25 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 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 result in loss of voice communications considered essential to the business as P25 components have gone end of sale and spares are nearing depletion.

Should failure rates continue with approximately 22 failures over the 5 year period requiring reactive return to service action which is estimated to cost at least 2 times to restore services due to assets having gone end of sale, remaining spares eventually becoming depleted and no like for like replacements are available. There are several factors that can lead to these significantly higher costs:

- Replacement of P25 assets is estimated to cost twice as much due to current contracted equipment is not a like for like replacement. It involves replacing both Core and RF equipment to maintain compatibility and potential changes to subscriber units.
- Reactively replacing P25 assets can result in longer mobile voice communication outages, which adds indirect costs due to service outages, business impacts and the urgency of securing specialised resources and equipment to restore.
- 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.

The counterfactual cost for the AER period is estimated at $8,998,088

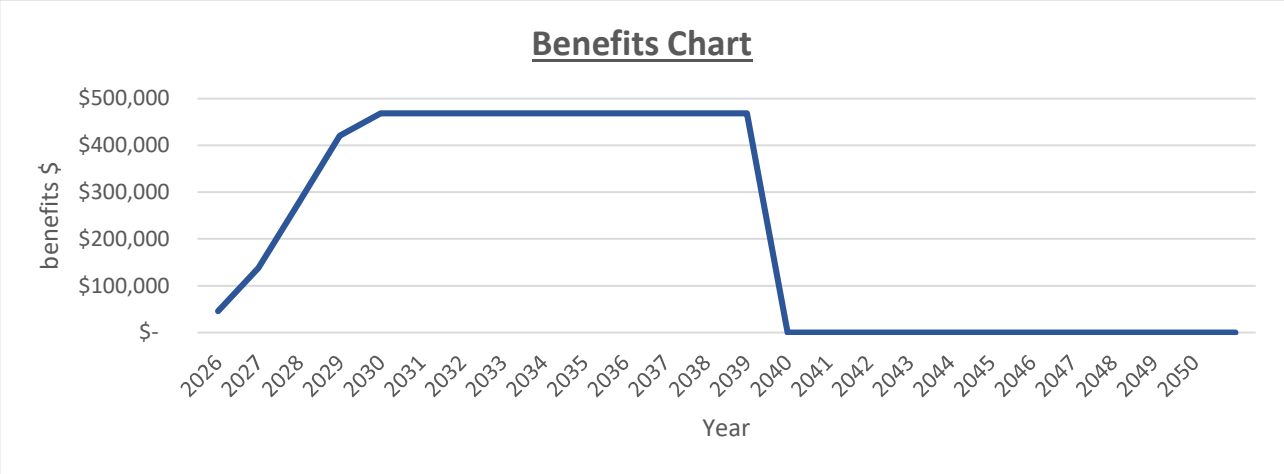
4.3 Risks

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).

Risk Scenarios	Description of Risk
Failure of obsolete P25 Hardware/Software Systems that results in significant mobile voice outages to large geographical regions and significant costs to perform the reactive replacement.	With the continued use of unsupported, unmanaged P25 network equipment with an observed susceptance to failure will result in extended outages and business impacts such as: • Annual failure probability estimated at 5% with at least double the cost to replace assets reactively under an outage condition due to the P25 technology evolution since originally installed 10+ years ago and integration into existing Core systems is not necessarily a like for like replacement. • Inability for field crews to communicate effectively on group call functionality which is heavily utilised for day to day planned work activities that will hinder restoration times particularly during emergency/natural disaster events. This is estimated to result in additional costs in the order of $0.11M.
P25 equipment fails affecting field crews operating in areas out of cellular range (but in	P25 equipment failure in locations of poor or no mobile cellular coverage will significantly hinder ability for field crews to communicate effectively between each other and the control rooms resulting in business impacts such as:

locations where P25 voice comms has coverage), results in inability to communicate with staff, potential safety impacts and restoration delays for planned/unplanned power restoration works.	• Delays to both planned and unplanned restoration works estimated to cause power restoration delays totalling 8 hours of an average 22kV feeder (2000kW) with an assumed VCR of $52 per kWh with a likelihood of 1% p.a. • Inability to utilise safety distress button capability on radios and the ability to report vehicle GPS location services to report on safety incidents such as vehicle rollover / impacts. Estimated very low probability of occurring however should a staff member be involved in an accident; significant delays will occur in responding that may result in a fatality or serious injury.

The table below outlines the cost benefits for the preferred option which has only been modelled over the estimated asset life of ~12 years.



5 ECONOMIC ANALYSIS

5.1 Cost summary 2025-30

Table 1 Cost summary 2025-30

Option	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Option 1 – Life extension (proposed)	**$474,896**	**$949,791**	**$1,424,687**	**$1,424,687**	**$474,896**	**$4,748,956**
Option 2 – Technology change	$1,517,126	$2,406,476	$2,981,938	$2,668,050	$889,350	$10,462,941
Option 3 – Public Carrier Network	$404,928	$2,874,400	$2,874,400	$2,874,400	$2,874,400	$11,902,528

Option	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Option 4 – Wholesale replacements	$2,106,524	$2,112,602	$5,642,159	$5,642,159	$5,642,159	$21,145,602
Option 5 – Counter factual	$1,799,618	$1,799,618	$1,799,618	$1,799,618	$1,799,618	$8,998,088

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 $179,261.

Table 2 NPV analysis

Option	NPV	Discount rate		Benefits	
		2.5%	4.5%	125%	75%
Option 1 – Life extension (proposed)	**$179,261**	**$380,633**	**$10,408**	**$1,199,962**	**-$817,879**
Option 2 – Technology change	$42,968	$534,194	-$369,899	$2,309,303	-$2,199,805
Option 3 – Public Carrier Network	-$2,125,643	-$1,998,498	-$2,225,114	-$155,750	-$4,079,887
Option 4 – Wholesale replacements	-$6,767,097	-$6,562,931	-$6,904,955	-$4,202,723	-$9,308,339
Option 5 – Counter factual	-$7,585,118	-$7,957,849	-$7,234,523	-$7,585,118	-$7,585,118

APPENDICES

Appendix 1: Alignment with the National Electricity Rules

Table 3 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 P25 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 provision of standard control services. 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 provision of Standard Control Services. They are critical in ensuring safety through provision of voice communications for field operations.
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 4 Reconciliation

Expenditure	DNSP	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
GRID COMMS P25 Replacement	Ergon	$0.44M	$0.44M	$1.20M	$1.20M	$1.20M	**$4.49M**