Business Case Replacement of Field Mobile Voice Communications in Coastal Areas

ERGON. ENERGY NETWORK

Executive Summary

Field mobile radio networks provide Ergon Energy's field workforce primary mission critical voice communications. The Field Mobile Radio strategy has a focus on quality, availability and reliability to support a safe and efficient work environment for our field crews. Ergon Energy's existing analogue two-way field voice radio system was first implemented over thirty years ago. As a result, the condition of various components of the network has been deteriorating.

Replacement of Field Mobile Voice Communications in Coastal Areas is a strategic proposal that reduces the risk associated with failure of an ageing communications network and provides a continuous capability for critical voice communications for Ergon Energy's field crews, as part of the Energy Queensland (EQL) Strategic Asset Management Plan (SAMP). A program is currently underway to replace the VHF (Very High Frequency) network along Queensland coastal areas where infrastructure and operational field staff are in the highest density with P25 digital network.

A significant portion of this program has now been completed under a number of approved individual projects. To ensure ongoing operational capability, the remaining "in-fill" P25 radio coverage gaps in Far North, North and Central Queensland areas will be required. Leaving these areas using the aged VHF equipment would unduly place workers in those areas at heightened risk and create a stranded set of sites which cannot communicate with the wider Ergon Energy P25 system.

Two options were considered but rejected for this business case; the counterfactual option which involves leaving the existing aged VHF equipment in service, and the option to a use a commercial product for field workforce communications. The counterfactual has been rejected because it will lead to the loss of field workforce communications, and commercial products have been rejected due to the complexity of integrating them into the existing P25 digital network. Two network options were evaluated for this business case:

Option 1 – Continue P25 implementation, filling in the remaining gaps in Far North, North and Central Queensland.

Option 2 – Deployment of satellite push-to-talk (SATPTT) into operational vehicles instead of installing the last remaining P25 base stations.

Ergon Energy aims to minimise expenditure in order to keep pressure off customer prices, however understands that this must be balanced against critical network performance objectives. These include network risk mitigation (e.g. safety, bushfire), regulatory obligations (e.g. safety), customer reliability and security and preparing the network for the ongoing adoption of new technology by customers (e.g. solar PV). In this case operational efficiency and safety are strong drivers, as the field workforce requires mission critical voice communications.

To this end, Option 1 is the preferred option, as it has the least negative Net Present Value (NPV) result of the two options (-$5.4M, compared to -$28.3M for Option 2). The direct cost of the program is $4.4M in real 2018/19 across the 2020-25 regulatory period.

The direct cost of the project for each submission made to the AER is summarised in the table below. Note that all figures are expressed in 2018/19 dollars and apply only to costs incurred within the 2020-25 regulatory period for the preferred option.

Regulatory Proposal	Draft Determination Allowance	Revised Regulatory Proposal
$4.4M	N/A	$4.4M

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1. Introduction

Field mobile radio networks provide Ergon Energy's field workforce primary mission critical voice communications. The Field Mobile Radio strategy has a focus on quality, availability and reliability to support a safe and efficient work environment for our field crews. Ergon Energy's existing analogue two-way field voice radio system was first implemented over thirty years ago. As a result, the condition of various components of the network has been deteriorating and requires replacement.

1.1 Purpose of document

This document recommends the optimal capital investment necessary for replacement of field mobile voice communications in coastal areas to reduce the risk associated with failure of an ageing communications network and provide a continuous capability for critical voice communications for Ergon Energy's field crews.

This is a preliminary business case document and has been developed for the purposes of seeking funding for the required investment in coordination with the Ergon Energy Revised Regulatory Proposal to the Australian Energy Regulator (AER) for the 2020-25 regulatory control period. Prior to investment, further detail will be assessed in accordance with the established Energy Queensland (EQL) investment governance processes. The costs presented are in $2018/19 direct dollars.

1.2 Scope of document

This document outlines the proposed strategic works, other options considered, and the risk reductions achieved through the proposed works.

1.3 Identified Need

Ergon Energy aims to minimise expenditure in order to keep pressure off customer prices, however understands that this must be balanced against critical network performance objectives. These include network risk mitigation (e.g. safety, bushfire), regulatory obligations (e.g. safety), customer reliability and security and preparing the network for the ongoing adoption of new technology by customers (e.g. solar PV). In this case operational efficiency and safety are strong drivers, as the field workforce requires mission critical voice communications.

The need for this work stems from the critical nature of the field mobile voice communications system, the operation of which enables staff safety and reliability outcomes. This proposal aligns with the CAPEX objectives and criteria from the National Electricity Rules as detailed in Appendix C.

1.4 Energy Queensland Strategic Alignment

Table 1 details how the replacement of field mobile voice communications contributes to Energy Queensland's corporate and asset management objectives. The linkages between these Asset Management Objectives and EQL's Corporate Objectives are shown in Appendix D.

Table 1: Asset Function and Strategic Alignment

Objectives	Relationship of Initiative to Objectives
Ensure network safety for staff contractors and the community	Consistent and continuous radio coverage allows field staff to continue to communicate with each other and coordinate response, in both day-to-day operations, as well as during emergencies and natural disasters.
Meet customer and stakeholder expectations	The ability for field staff to maintain adequate voice communication will ensure customers continue to receive high levels of service as field staff respond to network incidents or carry out planned work.

Objectives	Relationship of Initiative to Objectives
Manage risk, performance standards and asset investments to deliver balanced commercial outcomes	Risks associated with inadequate radio coverage will be mitigated, with the least cost and technically feasible option being selected to address this risk.
Develop Asset Management capability & align practices to the global standard (ISO55000)	Voice communication for field crews will enable more efficient asset management and condition monitoring of assets.
Modernise the network and facilitate access to innovative energy technologies	The preferred solution modernises an ageing field voice communications system, allowing for additional benefits such as secure communication, establishment of talk groups and improved vehicle safety monitoring features.

1.5 Applicable service levels

The applicable service levels for this project are the requirements for Health and Safety at work for staff members who are working at remote sites plus the need to deliver a reliable electricity supply. Safety is the number one priority for Ergon Energy - safety for employees, customers and the community. “Zero injuries” remains the aspirational goal and the Ergon Energy Health, Safety and Environment Improvement Plan initiatives and actions will ensure progress towards this goal. Reliability of electricity supply is crucial for our customers and this project contributes to the delivery of reliability standards through enabling the staff to communicate effectively, especially during major natural disasters when other forms of communication can be disabled.

1.6 Compliance obligations

Table 2 shows the relevant compliance obligations for this proposal.

Table 2: Compliance obligations related to this proposal

Legislation, Regulation, Code or Licence Condition	Obligations	Relevance to this investment
QLD Electrical Safety Act 2002 **QLD Electrical safety Regulation 2013**	We have a duty of care, ensuring so far as is reasonably practicable, the health and safety of our staff and other parties as follows: • Pursuant to the Electrical Safety Act 2002, as a person in control of a business or undertaking (PCBU), EQL has an obligation to ensure that its works are electrically safe and are operated in a way that is electrically safe.[1] This duty also extends to ensuring the electrical safety of all persons and property likely to be affected by the electrical work.[2]	This proposal sets out work to complete a unified voice communication system for field workers, enabling them to access emergency services and other support, when needed.

[1] Section 29, *Electrical Safety Act 2002*
[2] Section 30 *Electrical Safety Act 2002*

Legislation, Regulation, Code or Licence Condition	Obligations	Relevance to this investment
Distribution Authority for Ergon Energy or Energex issued under section 195 of *Electricity Act 1994* (Queensland)	Under its Distribution Authority: • The distribution entity must plan and develop its supply network in accordance with good electricity industry practice, having regard to the value that end users of electricity place on the quality and reliability of electricity services. • The distribution entity will ensure, to the extent reasonably practicable, that it achieves its safety net targets as specified. • The distribution entity must use all reasonable endeavours to ensure that it does not exceed in a financial year the Minimum Service Standards (MSS)	This proposal helps to provide efficient co-ordination of works in outage scenarios, minimising the disruption to customers and improving the reliability of the service.

1.7 Limitation of existing assets

Ergon Energy's existing analogue two-way field voice radio system was first implemented over thirty years ago. As a result, the condition of various components of the network has been deteriorating. In addition, the production of the major electronic elements of the network ceased in 2011, meaning there is limited availability of replacement equipment if required for a fault. This means that failure of any component of this ageing network has the potential to result in reduced coverage for mobile field voice communication.

In 2010/11, an aggregated program to replace the VHF network with a P25 network gained Ergon's Investment Review Committee (IRC) and board endorsement and the first P25 project was released. This program was aimed at replacing the VHF network along Queensland coastal areas where infrastructure and operational field staff are in the highest density. The majority of this program has now been completed under a number of individual projects. However, there are a number of sites outstanding to complete the remaining "in-fill" P25 radio coverage gaps in Far North, North and Central Queensland areas. Leaving these areas using the aged VHF equipment would unduly place workers in those area at heightened risk and create a stranded set of sites which cannot communicate with the wider Ergon Energy P25 system.

2 Counterfactual Analysis

2.1 Purpose of asset

The existing analogue VHF system is intended to provide mission critical communications in the field for Ergon Energy staff, reducing the risk to staff of being unable to make contact in emergency situations, by enabling live voice communication, and increasing the level of service through efficient co-ordination of works. VHF technology has been widely used worldwide for analogue vehicle radio networks. VHF vehicle mounted radios are installed in operational vehicles and communication is via "walkie-talkie" like handsets. Vehicle units are networked and can communicate to other radios on the network.

2.2 Business-as-usual service costs

The business as usual service costs require the operation and maintenance of two separate systems, the existing P25 network and the ageing VHF network. With the VHF network having several components out of manufacture, the maintenance costs to repair any failures or faults in the VHF network will increase over time as replacement parts become difficult or impossible to obtain.

2.3 Key assumptions

The assumed counterfactual in this instance is to continue to use the aged VHF system, maintaining it until a major component cannot be sourced due to it not being in production since 2011. It is assumed that the field communications are still able to provide some level of risk mitigation to staff, but to a reduced level compared with the proposed implementation of P25.

2.4 Risk assessment

This risk assessment is in accordance with the EQL Network Risk Framework and the Risk Tolerability table from the framework is shown in Appendix E.

Table 3: Risk Assessment

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Normal day to day: Inadequate radio coverage, due to in-service failure of aged VHF assets, results in **higher risk of delay in response from emergency services to accidents** involving workers in remote locations.	Safety	4 *(multiple serious injuries/ illnesses)*	2 *(very unlikely)*	**8** ***(low)***	2019
Natural Disaster: Significant disruption to radio coverage as a result of natural disasters results in a higher **risk of delay in emergency services' response to accidents** involving workers in affected areas. Additionally, environmental conditions where restoration activities take place during natural disasters are typically worse than during normal operations.	Safety	4 *(multiple serious injuries/ illnesses)*	2 *(very unlikely)*	**8** ***(low)***	2019

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Normal day to day: Inadequate radio coverage, due to in-service failure of aging VHF components, increases the risk associated with essential communication for switching and safety of crews resulting in **increased restoration times >3 hours**.	Customer Impact	2 *(interruption >3hrs)*	6 *(almost certain)*	**12** ***(moderate)***	2019
Natural Disaster operations: Significant disruption to radio coverage as a result of natural disasters results in a lack of essential communication for switching and safety of crews resulting in **increased restoration times >3 days**.	Customer Impact	5 *(interruption > 3 days)*	2 *(very unlikely)*	**10** ***(low)***	2019

Further Details of the risk ratings and descriptions can be found in Energy Queensland's Network Risk Framework.

2.5 Retirement decision

Retiring the VHF system in the remaining operational areas would leave workers without critical voice communications in the field, greatly increasing the likelihood of the risks identified in Section 2.4. This would create an unacceptable risk both to the safety of the workers and to the ability to provide an adequate service. No retirement or de-rating option is available.

3 Options Analysis

3.1 Options considered but rejected

The 2010/11 business case to replace the VHF mobile radio network evaluated alternative options including different radio technologies (such as Tetra), cellular phone, satellite phones, do nothing and deferment of implementation. There has been no change to the underlying assumptions and assessment that were presented and approved through Ergon's Network Investment Review Committee and IRC. To this end, two sets of options were considered but rejected:

Counterfactual option

The counterfactual option to 'do nothing' and leave the existing, ageing VHF network in place has been rejected because it will leave the field workforce without a suitable communication network. This would reduce operational efficiency and increase the risk to the field workforce.

Commercial options

No existing commercial product can be leveraged to establish a single cost-effective platform for Ergon Energy that meets the Field Mobile Radio strategy requirements. Limitations include:

- Mobile Networks: Commercially available mobile carrier networks are not designed for carriage of mission critical traffic requiring high availability. Carriers have actively discouraged the use of their mobile platforms to support time-sensitive safety systems or critical communications. Their networks are designed and deployed based on maximising commercial business and consumer revenue. This has been evident in the performance of mobile carrier networks in significant natural disaster events since 2000. Significant mains power outages and high mobile traffic volumes have resulted very poor mobile network availability extending over widespread geographical areas during these times. The carrier network limitations are worsened in rural locations where carrier mobile base stations have minimal emergency power plant redundancy and coverage overlap. There is significant evidence that mobile networks perform poorly during natural disasters. In particular it is noted that:
  - During cyclone Debbie in 2017, some 116 mobile base stations were impacted and mobile coverage at Airlie Beach was unavailable for more than one week; and
  - During cyclone Yasi in 2011, some 159 mobile base stations were impacted for significant periods due to power outages
- Satellite Networks: Widespread deployment of commercial satellite products based on historical experience are susceptible to network congestion during times of high network usage, such as during natural disasters. In addition, the capital cost of the handsets compares unfavourably to other options where the appropriate infrastructure is available.
- The Government Wireless Network (GWN) is not available outside the South-East corner

In summary, while no single existing commercial solution can meet the Field Mobile Radio strategy requirements, P25 remains superior for implementation in the coastal regions, considering quality, availability and reliability in coastal areas.

Other options for alternate systems have been rejected due to the need to integrate with the recent P25 work in other areas, which is only achievable through installing a P25 system in the remaining VHF areas.

3.2 Identified options

Option 1 – Continue P25 Implementation

It is proposed to continue with Ergon Energy's replacement of its ageing VHF field mobile voice communications with a P25 digital radio network. This involves installation of 18 new P25 base stations and other associated works to complete P25 radio coverage in coastal areas. It is anticipated that these works will be completed by 2021.

Having completed the installation of a number of P25 base stations under other projects, the unit cost for delivery is well understood. In addition, a large proportion of the Ergon Energy fleet vehicles already have P25 handsets installed, with this project only requiring 50 new handsets to deliver full coverage in the coastal region.

Option 2 – SATPTT (Satellite Push-to-talk)

The next-most reliable option involves the deployment of SATPTT into operational vehicles instead of installing the last remaining P25 base stations. A large number of operational vehicles would be involved with implementation of this option as the P25 bases proposed to be installed under "Option 1 – Continue P25 Implementation" are dispersed throughout the majority of the existing Ergon P25 network (all Ergon P25 locations except those located in the South-West area). If "Option 2 – SATTPTT" was selected all operational vehicles with a P25 handset that operate outside the South-West area would require a SATTPTT installation to maintain a consistent, safe and effective mobile communications network for field operations. The total number of vehicles requiring a SATTPTT installation is estimated at 1,100.

3.3 Economic analysis of identified options

3.3.1 Cost versus benefit assessment of each option

The Net Present Value (NPV) of each option has been determined by considering costs and benefits over the program lifetime from FY2020/21 to FY2039/40, using EQL's standard NPV analysis tool.

Capital Costs

The replacement of the existing radio infrastructure in the highest risk areas commenced in the current regulatory period, as per Ergon Energy Network Business Case – P25, Mackay Maryborough CH3 Projects. Subject to approval, implementation in the remaining areas will occur in the next regulatory period. The cost breakdown for Options 1 and 2 is shown in Table 4, below. These figures assume a 20-year operating life, with fixed operating costs in real terms.

Table 4: Cost comparison of options

$m direct, 2018/19		18/19	19/20	20/21	21/22	22/23	23/24	24/25	2020-2025 CAPEX Total (Nominal)
P25 Implementation	***CAPEX***	***3.6***	***9.4***	**4.2**	**0.2**	**0**	**0**	**0**	**4.4**
	OPEX	*-*	*-*	0.08	0.08	0.08	0.08	0.08	
SATPTT	***CAPEX***	***0***	***0***	**0**	**16.0**	**0**	**0**	**0**	**16.0**
	OPEX	*-*	*-*	-	0.91	0.91	0.91	0.91	

Due to the high risk associated with the Business as Usual case, where the VHF continues to be operated until it fails in-service, this scenario is not considered any further as an option.

Results

Using the capital and operating costs outlined above, the NPV of each option has been determined. he Regulated Real Pre-Tax Weighted Average Cost of Capital (WACC) rate of 2.62% has been applied as the discount rate for this analysis (as per EQL's Standard NPV Tool). The results of the analysis are summarised in Table 5. The analysis shows that Option 1 is the preferred option, as it has the lowest costs over the program life.

Table 5: Option NPV results ($ 000s)

Option	PV CAPEX	PV OPEX	NPV
Option 1 – Continue P25 roll-out	-4,283	-1,193	**-5,476**
Option 2 – SATPTT Equivalent Coverage	-15,146	-13,128	**-28,274**

3.4 Scenario Analysis

3.4.1 Sensitivities

The proposed works are sensitive to the failure rate of the existing VHF system. If the failure rate were to accelerate, causing items to fail in-service before the works are completed, this could leave areas of the Ergon Energy network without critical voice communications. Such a failure in-service would require the work schedule to be brought-forward as repair of the VHF system is unlikely to be possible in the short term due to the scarcity of spares. This could result in either a lack of emergency help for individual(s) at the site or the inability to reinstate primary systems during a natural disaster, resulting in extended outages for customers at a critical time. Given that the P25 roll-out is expected to occur over the next two years, this sensitivity has not been used in an adjusted NPV.

3.4.2 Value of regret analysis

In terms of selecting the "least regret option", by not carrying out the final stages of implementation of Ergon Energy-wide P25 (option 1), the initial cost of the sites already with P25 would be wasted capital. The stranded sites would not be able to communicate with the P25 system, thus creating stranded VHF assets. In the worst case, failure of the aged VHF major components could occur while someone is working in the area and needs help in an emergency. The proposed continuation of the P25 implementation is considered to be least regret as it replaces assets nearing their end of life with proven technology which is more reliable.

3.5 Qualitative comparison of identified options

3.5.1 Advantages and disadvantages of each option

Table 6 details the advantages and disadvantages of each option considered.

Table 6: Assessment of Options

Options	Advantages	Disadvantages
Option 1 – continue implementation of P25 at remaining 18 sites	• Existing P25 network across highest risk sites in Ergon Energy. • Vehicle units are networked and can communicate with other vehicles, control centres and mobile phones. • The vast majority of design work for all three projects has been completed under previously approved partial release of funds. • Project management will be completed by an existing internal specialised Telco Project Manager • The Telco group will provide the majority of specialised technical consultation to external contractors and also complete reviews of works. • Digital encryption for secure communications, establishment of talk groups and improved vehicle safety monitoring.	• The work under these projects is largely specialised. It involves expansion of the communications network and significant civil work at communication sites. • Cost uncertainty exists as there are significant civil builds involved with all projects. • Work will largely be completed using external resources for all remaining design (vast majority of this work relates to construction support and as-built).
Option 2 - SATPTT	• Does not require infrastructure to be built	• Availability can be compromised during natural disasters due to network congestion • Requires new handsets in all Ergon Energy fleet vehicles, in addition to existing P25 handsets in some vehicles • Requires the operation of both the existing P25 network and SATPTT, ensuring no “black-spots”
Do nothing	• Low initial cost as only maintenance on existing system required	• Unknown cost and time-scale of replacing system when irreplaceable component fails • Existing system is not reliable for critical communications in a natural disaster or emergency situation • Existing VHF sites cannot communicate with sites where P25 has already been implemented • No technical support for system from manufacturer as it is out of production • Aging components have an increased risk of failure

3.5.2 Alignment with network development plan

In order to address the risks associated with inadequate voice communication coverage across Queensland, a common proposed Ergon Energy Field Mobile Voice Communications strategy has been established. The P25 implementation aligns with the medium and long-term strategy. The preferred option aligns with the Asset Management Objectives in the Distribution Annual Planning Report. In particular it manages risks, performance standards and asset investment to deliver balanced commercial outcomes while modernising the network to facilitate access to innovative technologies.

3.5.3 Alignment with future technology strategy

This program is aligned with the Future Grid Roadmap and Intelligent Grid Technology Plan as it seeks to modernise the communications capability of the Ergon Energy network, extending the existing P25 system in operation at other sites and replacing ageing VHF equipment which is no longer in production. Improving communications reliability enables staff safety and reliability outcomes, allowing Energy Queensland staff to perform restoration and maintenance activities in a more efficient manner, maintaining affordability of the distribution network while also maintaining safety, security and reliability of the energy system.

3.5.4 Risk Assessment Following Implementation of Proposed Option

Table 7: Risk Assessment following Implementation of Proposed Option

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Normal day to day: Inadequate radio coverage, due to in-service failure of aged VHF assets, results in higher **risk of delay in response from emergency services to accidents** involving workers in remote locations.	Safety	*(Original)* *4 (multiple serious injuries/illnesses)* (Mitigated) 4 *(multiple serious injuries/illnesses)*	*2 (Very Unlikely)* 1 *(Almost No Likelihood)*	***8 (Low)*** **4 *(Very Low)***	2019
Natural Disaster: Significant disruption to radio coverage as a result of natural disasters results in a higher **risk of delay in emergency services' response to accidents** involving workers in affected areas. Additionally, environmental conditions where restoration activities take place during natural disasters are typically worse than during normal operations.	Safety	*(Original)* *4 (multiple serious injuries/illnesses)* (Mitigated) 4 *(multiple serious injuries/illnesses)*	*2 (Very Unlikely)* 1 *(Almost No Likelihood)*	***8 (Low)*** **4 *(Very Low)***	2019
Normal day to day: Inadequate radio coverage, due to in-service failure of aging VHF components, increases the risk associated with essential communication for switching and safety of crews resulting in **increased restoration times >3 hours**.	Customer	*(Original)* *2 (interruption to 1,000 customers, >3hrs, twice in one month)* (Mitigated) 2	*6 (Almost Certain)* 2 *(Very Unlikely)*	***12 (Moderate)*** **4 *(Very Low)***	2019

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
		(interruption to 1,000 customers, >3hrs, twice in one month)			
Natural Disaster operations: Significant disruption to radio coverage as a result of natural disasters results in a lack of essential communication for switching and safety of crews resulting in **increased restoration times >3 days**.	Customer	*(Original)* *5* *(interruption to 50,000 customers, > 3days)* (Mitigated) 5 *(interruption to 50,000 customers, > 3days)*	*2* *(Very Unlikely)* 1 *(Almost No Likelihood)*	***10*** ***(Low)*** **5** ***(Very Low)***	2019

4 Recommendation

4.1 Preferred option

The preferred option is to complete the Planned Rollout of the P25 two-way mobile network in coastal areas.

4.2 Scope of preferred option

There are 18 P25 base stations proposed to be installed involving work at 20 backhaul sites. The majority of these sites require civil work and infrastructure installation that may include telecommunications site works, access track upgrades, foundation works, installation of structures (towers and poles), installation external cabinets, establishing hybrid solar power systems, generators, radio transmission equipment, active equipment and P25 base stations. Some of this work commenced in the current regulatory period under a previous approval.

To reduce the duration of the projects they will be partially overlapped, based on resource and contractor availability, to achieve full P25 system implementation by the end of 2021.

Appendix A. References

Note: Documents which were included in Energy Queensland's original regulatory submission to the AER in January 2019 have their submission reference number shown in square brackets, e.g. Energy Queensland, *Corporate Strategy [1.001], (31 January 2019).*

Energy Queensland, *Asset Management Overview, Risk and Optimisation Strategy [7.025]*, (31 January 2019).

Energy Queensland, *Corporate Strategy [1.001],* (31 January 2019).

Energy Queensland, *Future Grid Roadmap [7.054],* (31 January 2019).

Energy Queensland, *Intelligent Grid Technology Plan [7.056],* (31 January 2019).

Energy Queensland, *Network Risk Framework*, (October 2018).

Ergon Energy, *Distribution Annual Planning Report (2018-19 to 2022-23) [7.049]*, (21 December 2018).

Appendix B. Acronyms and Abbreviations

The following abbreviations and acronyms appear in this business case.

Abbreviation or acronym	Definition
$, nominal	These are nominal dollars of the day
$, real 2019-20	These are dollar terms as at 30 June 2020
2020-25 regulatory control period	The regulatory control period commencing 1 July 2020 and ending 30 Jun 2025
AER	Australian Energy Regulator
Augex	Augmentation capital expenditure
CAPEX	Capital expenditure
CBRM	Condition Based Risk Management
Current regulatory control period or current period	Regulatory control period 1 July 2015 to 30 June 2020
DAPR	Distribution Annual Planning Report
DNSP	Distribution Network Service Provider
EQL	Energy Queensland
GSL	Guaranteed service level
GWH	gigawatt hours
GWN	Government Wireless Network
HV	High voltage
IRC	Investment Review Committee
kV	kilovolt
kVA	Kilovolt ampere
kW	Kilowatt
kWh	kilowatt hour
LV	Low voltage
MSS	Minimum Service Standard
MW	megawatt
NEL	National Electricity Law
NEM	National Electricity Market
NEO	National Electricity Objective
NER	National Electricity Rules (or Rules)
Next regulatory control period or forecast period	The regulatory control period commencing 1 July 2020 and ending 30 Jun 2025
NMI	National Metering Identifier
NNA	Non-network alternatives

Abbreviation or acronym	Definition
NSP	Network Service Provider
O&M	Operating and Maintenance Allowance (OPEX)
OPEX	Operating and Maintenance Expenditure
PCBU	Person in Control of a Business or Undertaking
POE	Probability of exceedance
Previous regulatory control period or previous period	Regulatory control period 1 July 2010 to 30 June 2015
PV	Photovoltaic (Solar PV)
R&D	Research and development
Regulatory Proposal	Energex or Ergon Energy's proposal for the next regulatory control period submitted under clause 6.8 of the NER
Repex	Replacement capital expenditure
RIT-D	Regulatory Investment Test - Distribution
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SATTPTT	Satellite Push-to-talk
SCADA	Supervisory Control and Data Acquisition
UDMS	Unified distribution management system
VCR	Value of customer reliability
VHF	Very High Frequency
WACC	Weighted average cost of capital

Appendix C. Alignment with the National Electricity Rules (NER)

The table below details the alignment of this proposal with the NER capital expenditure requirements as set out in Clause 6.5.7 of the NER.

Table 8: Alignment with NER

Capital Expenditure Requirements	Rationale
6.5.7 (a) (2) The forecast capital expenditure is required in order to comply with all applicable regulatory obligations or requirements associated with the provision of standard control services	In accordance with QLD Electrical Safety Act 2002 and QLD Electrical safety Regulation 2013, this expenditure will improve the safety of field workers through reliable voice communications. This will particularly benefit workers in emergency situations by enabling them to contact emergency services without delay.
6.5.7 (a) (3) The forecast capital expenditure is required in order to: (iii) maintain the quality, reliability and security of supply of supply of standard control services (iv) maintain the reliability and security of the distribution system through the supply of standard control services	This proposal sets out work to complete a unified voice communication system across the area, enabling efficient coordination of works and particularly of responses to failure scenarios in order to restore supply to customers.
6.5.7 (c) (1) (i) The forecast capital expenditure reasonably reflects the efficient costs of achieving the capital expenditure objectives	The Unit Cost Methodology and Estimation Approach sets out how the estimation system is used to develop project and program estimates based on specific material, labour and contract resources required to deliver a scope of work. The consistent use of the estimation system is essential in producing an efficient CAPEX forecast by enabling: • Option analysis to determine preferred solutions to network constraints • Strategic forecasting of material, labour and contract resources to ensure deliverability • Effective management of project costs throughout the program and project lifecycle, and • Effective performance monitoring to ensure the program of work is being delivered effectively. 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 forecast capital expenditure reasonably reflects a realistic expectation of the demand forecast and cost inputs required to achieve the capital expenditure objective	The prudency of this proposal is demonstrated through the options analysis conducted and the quantification of risk and benefits of each option. 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).

Appendix D. Mapping of Asset Management Objectives to Corporate Plan

This proposal has been developed in accordance with our Strategic Asset Management Plan. Our Strategic Asset Management Plan (SAMP) sets out how we apply the principles of Asset Management stated in our Asset Management Policy to achieve our Strategic Objectives.

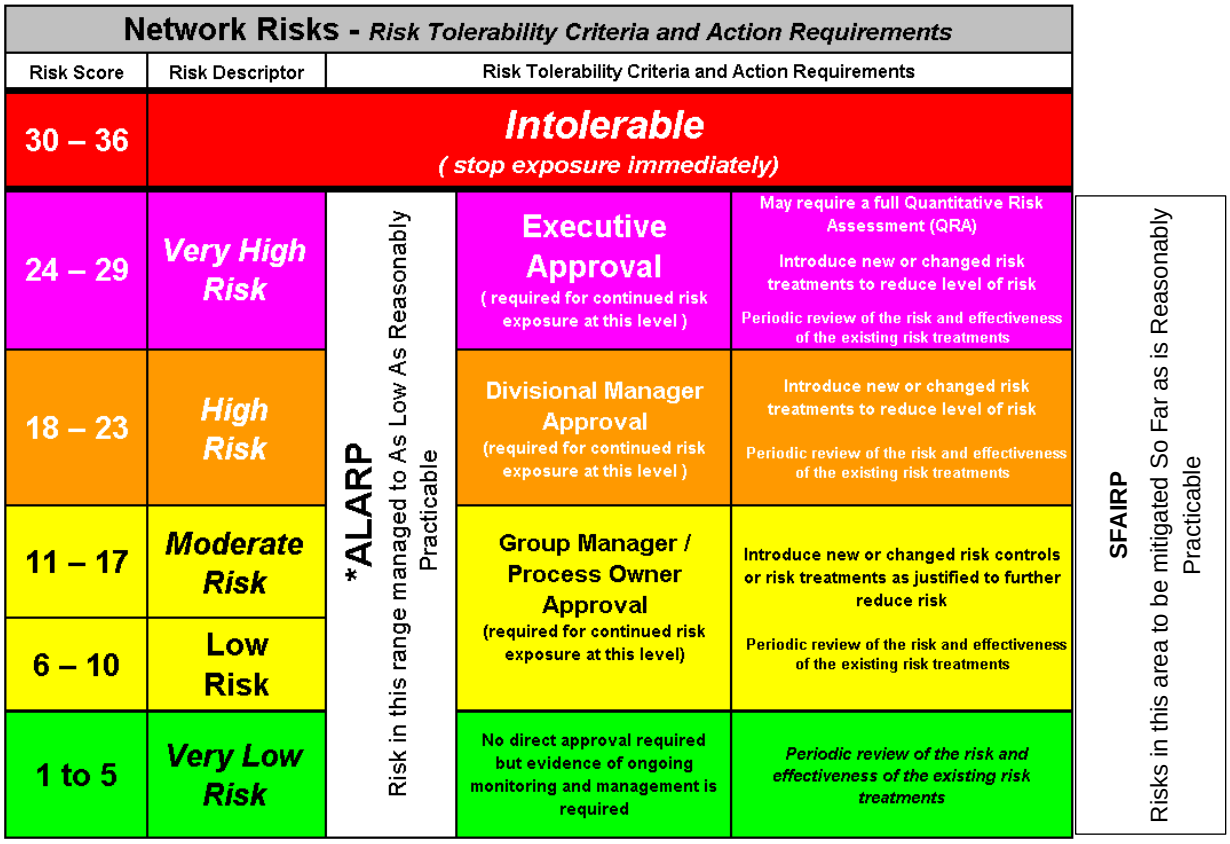
Table 1: "Asset Function and Strategic Alignment" in Section 1.4 details how this proposal contributes to the Asset Management Objectives.

The Table below provides the linkage of the Asset Management Objectives to the Strategic Objectives as set out in our Corporate Plan (Supporting document 1.001 to our Regulatory Proposal as submitted in January 2019).

Table 9: Alignment of Corporate and Asset Management objectives

Asset Management Objectives	Mapping to Corporate Plan Strategic Objectives
Ensure network safety for staff contractors and the community	**EFFICIENCY** ***Operate safely as an efficient and effective organisation*** Continue to build a strong safety culture across the business and empower and develop our people while delivering safe, reliable and efficient operations.
Meet customer and stakeholder expectations	**COMMUNITY AND CUSTOMERS** ***Be Community and customer focused*** Maintain and deepen our communities' trust by delivering on our promises, keeping the lights on and delivering an exceptional customer experience every time
Manage risk, performance standards and asset investments to deliver balanced commercial outcomes	**GROWTH** ***Strengthen and grow from our core*** Leverage our portfolio business, strive for continuous improvement and work together to shape energy use and improve the utilisation of our assets.
Develop Asset Management capability & align practices to the global standard (ISO55000)	**EFFICIENCY** ***Operate safely as an efficient and effective organisation*** Continue to build a strong safety culture across the business and empower and develop our people while delivering safe, reliable and efficient operations.
Modernise the network and facilitate access to innovative energy technologies	**INNOVATION** ***Create value through innovation*** Be bold and creative, willing to try new ways of working and deliver new energy services that fulfil the unique needs of our communities and customers.

Appendix E. Risk Tolerability Table



Network Risks - *Risk Tolerability Criteria and Action Requirements*					
Risk Score	Risk Descriptor	Risk Tolerability Criteria and Action Requirements			
30 – 36	***Intolerable*** *(stop exposure immediately)*				
24 – 29	*Very High Risk*	*ALARP Risk in this range managed to As Low As Reasonably Practicable	**Executive Approval** (required for continued risk exposure at this level)	May require a full Quantitative Risk Assessment (QRA) Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments	SFAIRP Risks in this area to be mitigated So Far as is Reasonably Practicable
18 – 23	*High Risk*		**Divisional Manager Approval** (required for continued risk exposure at this level)	Introduce new or changed risk treatments to reduce level of risk Periodic review of the risk and effectiveness of the existing risk treatments	
11 – 17	*Moderate Risk*		**Group Manager / Process Owner Approval** (required for continued risk exposure at this level)	Introduce new or changed risk controls or risk treatments as justified to further reduce risk Periodic review of the risk and effectiveness of the existing risk treatments	
6 – 10	Low Risk				
1 to 5	*Very Low Risk*		No direct approval required but evidence of ongoing monitoring and management is required	*Periodic review of the risk and effectiveness of the existing risk treatments*	

Figure 1: A Risk Tolerability Scale for evaluating Semi-Quantitative risk score

Appendix F. Reconciliation Table

Reconciliation Table Conversion from $18/19 to $2020	
Business Case Value	
(M$18/19)	$4.40
Business Case Value	
(M$2020)	$4.57