

Strategic Scope Operational Technology Environment 2020-25

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1. Introduction

PROJECT SUMMARY INFORMATION			
Work Request Description	OT Environment Replacements		
Work Request Number		Work Request Required by Date	2025
Initiating Work Group	Asset Standards	Strategic Scope Contact	
Business Owner	MGR Lifecycle Engineering Intelligent Assets		
Direct Value:	\$2.1M		

NOTE: – This document does not constitute approval of any funds or financial delegation. It is used to provide a high-level description and justification of an allocation of funds in future years. The above direct value is presented as \$18/19 direct dollars.

2. Existing Arrangements / Background

Ergon owns and operates an Operational Technology Environment (OTE) which is predominately situated at Ergon operated data centres in Townsville and Rockhampton. The Ergon OTE provides a secure computing environment, architected to support real-time and high criticality computing solutions for the operation and control of the Ergon distribution network. The OTE consists of communications switching equipment, firewalls, application managers and servers.

The OTE is a separate network to the Corporate IT network and implements strict controls around the interconnection points with the Corporate IT network. The network spans across two data centres in Townsville and Rockhampton.

3. Rationale / Benefits

The Network Asset Management Policy requires that Ergon implement procedures, plans, and programs that ensure compliance with legislation and statutory requirements. Acts and Regulations place a range of obligations on Ergon relating to the safety and performance of assets. Replacement and refurbishment of network assets shall be employed as a means of discharging these obligations where other activities such as inspection, test, and maintenance are either ineffective or are not cost effective. This program will ensure that the Ergon can continue to operate critical systems such as TOTEM, PQ Sapphire and a range of other power network applications.

Customers benefits from proceeding with this initiative:

- Ensures that customer outage durations are not negatively impacted by ensuring that the management of the power network via the Mater station can be maintained at current performance levels
- Ensure efficient and cost effective coordination of field resources via ensuring that Master Station, voice services and other power network applications continue to operate at current performance levels,

- Supporting the provision of a cost effective network for customers by managing cyber security risks associated with obsolescence and potential impacts from malicious cyber attacks

4. Drivers

Technical obsolescence is a major driver for the replacement of OTE Equipment. Once the software, firmware or hardware of the equipment becomes obsolete, the continued operation of these assets presents an increased risk to Ergon due to the increased risk of an unrecoverable in-service failure.

Ergon has a legislated requirement to comply with the NER and AEMO reporting standards pertaining to instances where power system protection is lost. Under circumstances resulting in the failure of any 132 / 110 kV (and some 33kV) protection circuits, Ergon must notify Powerlink who will subsequently notify AEMO of the outage. Ergon is required to restore the affected protection service “as soon as possible”, during which time AEMO may call for the feeder to be de-energised if it determines that having a feeder in service without protection would compromise the security of the network.

In order to reduce the length of in-service failures, Ergon maintains spare equipment holdings for its OTE equipment. For equipment that no longer has an associated vendor supply contract – those that are obsolete or obsolescent – spares are typically sourced from units that have been proactively removed from service elsewhere in the network. This strategy has been adopted as it is rarely possible to perform like-for-like replacements using different equipment models or different vendors due to physical, functional or configuration differences. Without internal spares holdings, a lengthier replacement process would need to be completed, which would lead to an unacceptable return to service delays in emergencies or unplanned failure situations.

In-service failure can significantly impact Ergon until repairs are carried out, potentially resulting in the following:

- Loss of Master Station functions and associated systems - or the delivery of data to Master station for processing - resulting in the inability to remotely operate and manage the power networks, along with risks to planned and reactive works.
- Loss of TOTEM¹ and/or PQ Sapphire² and associated systems - or the delivery of data from TOTEM for processing - resulting in the inability to collect and view non-SCADA power system data.
- Loss of cyber-security protections, exposing vulnerabilities in network security.

5. Scope

The OTE Refurbishment program considers a range of aging assets for the generation of this plan, including the following:

¹ TOTEM historical non SCADA network information analytics and data storage platform

² PQ Sapphire – Analytic package for power quality data provide from network devices

- IP (Internet Protocol) Switch
- IP Firewall
- Appliance Manager
- Applications Server

6. Exclusions

This program does not consider equipment that has been deployed as part of the Ergon Telecommunications Network, including but not limited to Corenet and Ubinet. All Ergon Telecommunications Network equipment has been included in the Obsolete Telecommunications plan.

7. Assumptions

It is anticipated that all equipment vendors will provide End-of-Life notices for equipment not currently End-of-Life before the end of the 2020-2025 period.

8. Supporting Information

Current Population

The table below shows the current population of equipment covered by this plan. Further detail including the age profiles for these asset types can be found in the associated “EQL Operational Technology Equipment Plan”.

Asset Type	Population	Expected Lifespan	# of Units that Exceed Lifespan in 2020-2025 Period
Switch	7	7	7
Server / Appliance Manager	28	7	28
Router	-	7	-
Firewall	10	7	10
Carrier Gateway	-	7	-
VoIP Phone	-	7	-

Table 1 – Population

Proposed Replacement Numbers

The table below shows the recommended replacement quantities of each of the three proposed options for the 2020-2025 AER period.

Asset Type	Replacements Recommended			
	Option 1 (Replace on Age)	Option 2 (Replace on Age and Condition)	Option 3 (Replace to Support Fail-Fix)	Option 4 (Do Nothing)
Switch	7	7	4	0
Server / Appliance Manager	28	28	7	0
Router	-	-	-	-
Firewall	10	6	3	0
Carrier Gateway	-	-	-	-
VoIP Phone	-	-	-	-

Table 2 – Quantities of Replacements in Proposed Options

9. Options Considered

9.1 Option 1 – Minimum Risk Case, replace based on age

Option 1 presents the replacement scenario with the least risk for the network, in which assets are replaced at the end of their expected lifespan so as to eliminate any risk that arises through operating these assets past this point. These expected lifespans represent what is typical for the given asset, and as such continued operation is done so with an increased risk of in-service failure.

The quantities of replacements for the 2020-2025 period have been adjusted to consider existing projects that are underway and will be replacing assets before or during the current AER period.

This option recommends the following quantities of replacements:-

Asset Type	Replacements
Switch	7
Server / Appliance Manager	28
Router	-
Firewall	10
Carrier Gateway	-
VoIP Phone	-

Table 3 – Quantities of Replacements in Option 1

9.2 Option 2 – Optimised Case, replace based on age and condition

Option 2 presents an optimised replacement scenario in which aged assets that are still in an acceptable condition and predicted to be suitable for continued operation throughout the 2020-2025 period are not considered for replacement.

Asset Type	Replacements
Switch	7
Server / Appliance Manager	28
Router	-
Firewall	6
Carrier Gateway	-
VoIP Phone	-

Table 4 – Quantities of Replacements in Option 2

9.3 Option 3 – High-Risk Case, replace only enough units to support fail fix

Option 3 is a high-risk approach that continues to utilise assets outside of vendor supply & support contracts. This option prioritises replacements for strategic spares holdings in order to facilitate a fail/fix approach, accompanied with reduced system capabilities. This quantity of replacements would remove existing system redundancies in order to produce sufficient spares, introducing intolerable risks to the continued operation of Ergon's OTE under current network standards.

Asset Type	Replacements
Switch	4
Server / Appliance Manager	7
Router	-
Firewall	3
Carrier Gateway	-
VoIP Phone	-

Table 5 – Quantities of Replacements in Option 3

9.4 Option 4 – “Do Nothing”

Option 4 is to “Do Nothing”, in which the replacement of assets is managed purely on a fail-fix basis. Whilst this may represent the ‘cheapest’ option in the short-term, it results in significant increases in risk associated with operating assets beyond their supported operational lifespan.

A consequence of continuing to operate obsolete and aged equipment is the reduced ability to carry out repairs in an efficient manner due to the inability to access vendor spares and technical support.

Some equipment failures would result in an outage of services including remote network access and management for extended durations. As more assets exceed their expected lifespan, the organisation will be unable to restore OTE functionality if large numbers of in-service failures occur. During severe weather events and power network outages, in-service failures of OTE equipment would expose work crews and the public to increased safety risks as restoration coordination becomes more difficult and the network requires manual switching.

9.5 Option Selection

Option 2 is the preferred selection, as it presents the most balanced outcome for the network between residual risk and cost. Option 2 ensures that existing assets continue to be supported by the supplier and that spares are readily available for replacements.

Option 1 mitigates all known risks, however, does so at a significant cost, option 3 does not mitigate the risks associated with end of life equipment issues and option 4 leaves risk exposure as per the table below noting that risk exposure will increase over time.

10. Risk Assessment

The risk that the organisation would be exposed to at the start of the regulatory period if no action is taken is detailed in the table below. This risk will continue to increase if not addressed.

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
Ergon OTE program is not approved. OTE environment experiences an end of life equipment issues with no existing fix available and manufacturer unable to remediate. OTE functions out of service during extreme weather. A wires-down event occurs while the OTE is inoperable and controllers are unable to de-energise the line remotely resulting in a single fatality.	Safety	5	3	15	2020
Ergon OTE program is not approved. OTE environment fails due to end of life equipment issues with no existing fix available and manufacturer unable to remediate. OTE functions out of service. 15,000 customers experience service interruptions due to the increased time to identify the cause of the fault and restore as OTE is unable to support.	Customer	4	3	12	2020
Ergon OTE program is not approved. OTE environment fails due to an end of life equipment issue with no existing fix available and manufacturer unable to remediate. OTE functions out of service. Inability to remotely control the majority of Ergon network for the duration of the outage.	Business	6	3	18	2020

Table 6 – Risk Assessment

By proceeding with Option, the 2 risks detailed above are mitigated by:

- (Safety) Replacing OTE equipment that has no spares, no longer have vendor support and are at risk of in-service failure with new equipment to avoid common modes of failure.
- (Customer) Replacing OTE equipment that has no spares, no longer have vendor support and are at risk of in-service failure with new equipment to avoid common modes of failure.
- (Business) Replacing OTE equipment that has no spares, no longer have vendor support and are at risk of in-service failure with new equipment to avoid common modes of failure.

Network Risk Evaluation Matrices:

- [Consequence and Likelihood Table](#)
- [Tolerability Scale](#)

Risk Justification Statement:

With this level of safety, customer and business risk, “Do nothing” is not an acceptable option based on the principles of ALARP. With risk treatment as identified in option 1, the likelihood reduces to ‘almost no likelihood to occur’ ($L=1$) as the failure rate would be reduced and the manufacturer would be obliged to remediate if a failure occurred. This would have a treated risk score of low or very low for all categories of risks.

Risk Assessment Outcome:

The network (business) risk the organisation would be exposed to if the project was not undertaken is not deemed to be as low as reasonably practicable (ALARP). Addressing the risks as detailed above through implementation of the preferred option will reduce Energy Queensland’s risk exposure.

11. Delivery Timeframe

Equipment replacements would be progressively rolled out over the AER 2020 -2025 period.

12. Cost Summary

Year	2020-21	2021-22	2022-23	2023-24	2024-25
Labour	\$88,761	\$88,761	\$88,761	\$88,761	\$88,761
Material / Equipment	\$320,000	\$320,000	\$320,000	\$320,000	\$320,000
Grand Total:	\$408,761	\$408,761	\$408,761	\$408,761	\$408,761

Table 7 – Cost Summary in 2018-19 dollars

Note – the above cost summary is presented in \$18/19 direct dollars.

Appendix A. Definitions, Abbreviations and Acronyms

BESS	Battery Energy Storage System
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DER	Distributed Energy Resource
DSO	Distribution System Operator
ENA	Energy Networks Association
ENTR	Electricity Network Transformation Roadmap
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
HV	High Voltage (35kV – 230kV AC)
IS	Isolated System
LV	Low Voltage (50V – 1 000V AC)
MEGU	Micro Embedded Generating Units
MV	Medium Voltage (1kV – 35kV AC)
NER	National Electricity Rules
PQ	Power Quality (of the network)
PV	(Solar) Photovoltaic System
QoS	Quality of Supply (to a customer)
SCADA	Supervisory Control and Data Acquisition
ZS	Zone Substation