

Strategic Scope Physical Linear Media 2020-25

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1. Project Summary Information

PROGRAM PROJECT SUMMARY INFORMATION			
Work Request Description	Ergon Energy - Physical Linear Media		
Work Request Number	1344431	Work Request Required by Date	30/6/2025
Initiating Work Group	JACI2 – IGS Telecommunications	Strategic Scope Contact	Adam Hanson
Business Owner	Ana Smith de Perez		
Direct Value:	\$3,486,307 over 6 years (\$2,904,130 over AER period)		

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.
- All dollar values stated are in \$18/19 direct dollars unless otherwise specifically stated.

2. Existing Arrangements / Background

The Communication Physical Linear Media Program addresses conditional issues with specific linear assets, which includes; communication pilot cable and fibre cable creep. Linear communication assets are the primary or secondary communication path for the communication network which includes the transmission of protection, SCADA and field voice services. The network contains approximately 42kms of pilot cable and 1,610kms of fibre cable. The majority of pilot and fibre cables are located in urban areas and are susceptible to major weather events.

This is an ongoing risk based replacement and rectification program that will be divided into multiple projects to address differing needs, priorities and completion timings. This program is consistent with the strategy as detailed in the Telecommunications Asset Management Plan and Intelligent Grid Technology Plan.

3. Rationale / Benefits

The replacement and rectification of the communication linear assets are required to ensure that the network remains operational. Failure to do so could result in the loss of services that are provisioned for safety and to support basic services for the efficient completion of operational and supervisory activities for the power network.

The Network Asset Management Policy requires the Company to implement procedures, plans and programs that ensure compliance with legislation and statutory requirements. Acts and Regulations place a range of obligations on the Company 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 not cost effective.

The customer benefits of this work include:-

- Cost effective and prudent expenditure to maintain current performance for pilot cable related customer outages
- Supports maintaining current level of cost associated with plant stress, premature aging and damage caused when primary protections services failure to operate due to cabling faults
- Investment principles and optimised investment plans that balance network risk, cost and performance (service) outcomes: Promotes replacement of assets at end of economic life as necessary to balance network risk, cost and performance (service) outcomes.

3.1 Legislated Requirements

Ergon Energy is bound by the National Electricity Rules (NER). Whilst various aspects of the NER are impacted by pilot cable reliability, the most pertinent is the requirement outlined in Schedule S5.1.2.1(d):

The Network Service Provider must ensure that all protection systems for lines at a voltage above 66 kV, including associated inter-tripping, are well maintained so as to be available at all times other than for short periods (not greater than eight hours) while the maintenance of a protection system is being carried out.

To adhere to this requirement Ergon Energy needs to ensure the pilot cable network associated with protection for high voltage lines is well maintained. For instances where a protection function is unavailable due to a pilot cable fault, whether faults are a result of progressive cable degradation or some form of external mechanical damage, Ergon Energy has an obligation to restore the protection function of the line “as quickly as possible”. In the event of a failure of any 132kV, 110kV or certain 33kV protection schemes, Ergon Energy is required to notify.

Powerlink who will subsequently notify AEMO of the outage. AEMO may determine that having a line in service without the relevant protection function will compromise the security of the network should a fault occur, and require Ergon Energy to de-energise the line.

Without suitable alternative communications paths that can be relied upon during service outages, Ergon Energy risks its ability to meet these legislative requirements.

3.2 Customer and Business Impact

As the metallic pilot network reaches the end of its design life, the reliability and performance of the individual cables rapidly decrease. This has various impacts as outlined in the following sections.

3.2.1 Tripping of Feeder Protection Scheme When Cables / Cores Fail.

In some limited cases such as DC direct inter-tripping and some feeder differential schemes, when cables/cores fail the protection may mal operate, causing tripping of feeders and resulting in loss of supply. This has potential customer impacts.

3.2.2 Increased Risk of Plant Damage and Larger than Necessary Outages

For periods when protection circuits are not operating there are potential risks to plant damage / premature aging due to longer periods before backup protection clears faults. There are also increased outage impacts should a fault occur during the period of communication issues. While the duration of protection circuits not operating is normally a short period during repairs, in some cases such as a silent failure, it can be an indeterminate period.

3.2.3 Security in the Power Network May be Reduced

If a protection circuit is lost on a 33KV, 110KV and 132KV feeder (and for certain important 11kV feeders) it may be necessary to de-energise the feeder. This results in an abnormal network configuration and loss of N-1 security until such time as the circuits can be returned, increasing the risk of otherwise un-necessary outages.

3.2.4 Loss of Contingency Capability

When issues occur, various indirect consequences can increase the risk to the organisation. For example, the failure of a pilot cable can result in the inability to utilise contingency feeders.

3.2.5 Alternate Paths Inoperable when Required

Ergon Energy in many cases relies on alternative paths for the cable to allow services to be rerouted when a fault occurs. Increasingly these alternative paths cannot be relied on to allow services to be re-routed.

4. Drivers

Condition is the major driver for the replacement of the communication linear assets that are utilised by Ergon Energy. Once the condition of the linear asset is below the designed requirements various risk factors begin to increase until ongoing use of the asset is considered as intolerable.

This program is required due to the following additional drivers;

1. Linear Assets
 - a. These legacy assets are experiencing increasing reliability issues.
 - b. Pilot cable is utilised by legacy relay equipment which is scheduled to be replaced with modern equivalents.
 - c. Fibre creep reported from field and telecommunication groups, ad hoc rectification work has been undertaken.
 - d. Improve asset condition and network resilience.
 - e. Individual assets assessed and replaced/repared on a condition base.

5. Scope

There are a number of activities being completed under this program which have the following scope:

- Pilot Cable Replacement: estimated cost is \$2,691,278 over a 6 year period commencing 2019/20.

- Identify the pilot cable that has the highest priority for replacement.
- Engage relevant business units to ensure equipment utilising the pilot cable is considered and changed if necessary.
- Construct fibre and install new equipment, migrate services from pilot cable to fibre.
- Decommission pilot cable.
- Fibre Creep: estimated cost is \$794,950 over a 6 year period commencing 2019/20.
 - Identify fibre cables that have creep issues through liaising with field communications and telecommunications team.
 - Prioritise the fibre cable with issues and develop a program of work to rectify the issue.
 - Engage relevant business units to rectify the issue.
 - Test the fibre to ensure the issue is resolved.

6. Exclusions

The Return to Service (RTS) project is excluded from the program and will operate in conjunction to mitigate risk of in-service failures.

7. Assumptions

Assumptions Included:

- The linear assets do not experience an accelerated failure rate.
- Asset condition assessed from field Communication Technicians based on the same criteria and acceptable standard.
- The fibre creep rectification work is successful and the issue does not return for the remaining life of the asset.
- The replacement fibre meets the expected life forecasted.
- The infrastructure that is utilised for pilot cable can be reused for fibre cable.
- No delay or extended delivery times greater than 3 months.

8. Supporting Information

Please refer to the following sources for supporting information;

1. Asset Management Plan – Telecommunications.
2. Intelligent Grid Technology Plan.

9. Options Analysis

9.3 Option One - Accelerated Program

Replace all pilot cable and rectify fibre creep issues as soon as an alternative is possible. This proposal is not considered prudent as it unnecessarily brings forward expenditure and is

potentially less cost efficient as bundling of replacements based on geographical sites may not be complete.

9.4 Option Two – (Recommended) Risk Based Rolling Program

Pilot cable and fibre creep risk replacement and rectification driver: Continue focus on cost efficient and prudent replacement and rectification of assets based on risk assessments that include condition assessment and criticality of the specific services. The replacement and rectification of pilot cable and fibre creep where feasible will be bundled with other work at the specific site locations.

9.5 Option Three - Risk Based Rolling Program with Maximum Risk

Only proactively replace pilot cable and rectify fibre creep where the pilot or fibre cable carries core critical services. Pilot and fibre cable that carries less critical services will only be replaced reactively when significant issues are identified by the Communication Network Operational Centre. This will significantly increase the risk of outages as there is no preventive maintenance on both pilot and fibre cable. This approach is not recommended as there will be an increased risk placed in staff, contractors and the community from failing assets and extended network outages. The business will possibly fail to reach the safety objective goals.

9.6 Option Four - Do Zero

Failure to replace and rectify pilot cable and fibre creep would result in the failure rate continuing to rise resulting in unacceptable risk to the communication network and increase the risk to staff, contractors and the community. The business will possibly fail to reach the safety objective goals.

10. Risk Assessment

The network (business) risk the organisation would be exposed to if the project was not undertaken:

Risk Scenario	Risk Type	Consequence (C)	Likelihood (L)	Risk Score	Risk Year
<u>SCADA</u> – Failure of linear media connection results in loss of visibility of SCADA derived data which leads to a reduced capacity to remotely control half of the Energex / Ergon network.	Business Impact	4	5	20	2019
<u>Protection</u> – Failure to duplicate communication paths for protection services results in a breach of National Electricity Rules and an improvement notice issued by the regulator.	Legislated	4	5	20	2019

<u>Protection</u> - Unstable or failed communications path results in delayed relay operation and the fault is unable to be cleared within specified timeframes resulting in a single fatality.	Safety	5	3	15	2019
<u>Corporate voice/data</u> – Failure of corporate voice, data and internet communication results in inability access to corporate IT systems and to remotely control or manage the network across multiple sites.	Business Impact	4	3	12	2019

Table 1 – Risk Assessment

10.1 Network Risk Evaluation Matrices

- Consequence and Likelihood Table
- Tolerability Scale

10.2 Risk Justification Statement

- Option One – reduces the risk but with poor cost efficiency.
- Option Two – reduces the risk to ALARP in manner that is prioritised by cost efficiencies.
- Option Three – risk exposure remains as detailed above until reactive work has been completed.
- Option Four - risk exposure remains as detailed above.

10.3 Risk Assessment Outcome (Option Two)

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 Ergon Energy's risk exposure.

The work will be prioritised and organised into geographical bundles to reduce overall program costs. The risk exposure is greater than option one as unidentified fibre creep issues and pilot cable faults could cause network outages, however, this will be actively managed to ensure the loss of critical services is minimised for operational sites. The adoption of higher risks (options three and four) expose the business to unsatisfactory risks as an outage must occur on the network before rectification work is undertaken to resolve the underlying issues. In addition, due their reactive nature, these options are more expensive than the recommended option two.

11. Delivery Timeframe

This program has an ongoing requirement to maintain critical operational and supervisory services to meet externally and internal driven requirements. The replacement and rectification of pilot cable and

fibre creep will be prioritised based on risk. The activities are evenly distributed and will be completed from 2019/20 through 2024/25:

Program Description	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	Total
Internal Ergon asset risk replacement driver:							
Pilot Cable Replacement (routes)	6	6	7	7	7	7	40
Fibre Creep Rectification (fibre section)	3	3	3	3	3	3	18
TOTAL		6	6	7	7	7	58

Table 2 – Delivery Timeframe

12. Project Cost Summary

The scope of work was costed based on;

- Internal Ergon Energy asset risk replacement driver:
 - Pilot Cable Replacement: costs and resources required to replace fibre cable are well established as these activities have been ongoing over the last 10 years.
 - Fibre Creep Rectification: costs and resources required to rectify fibre creep have been periodically performed on an ad hoc basis. These activities have been ongoing over the last 10 years.

	FY 2019/20	FY 2020/21	FY 2021/22	FY 2022/23	FY 2023/24	FY 2024/25
Labour	\$348,985	\$348,032	\$348,032	\$348,032	\$348,985	\$348,072
Material	\$233,113	\$232,476	\$232,476	\$232,476	\$233,113	\$232,515
Total:	\$582,098	\$580,508	\$580,508	\$580,508	\$582,098	\$580,587

Table 3 – Cost Summary

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