Control Systems

Business Case

24 January 2024

Part of Energy Queensland

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DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
Draft v0.1	Draft	13/09/2023	Snr Engineer Assets
Draft v0.2	AER Document Initial Release	31/10/2023	Engineer Asset Strategy
V1.0	Finalised	15/11/2023	Manager Asset Strategy

RELATED DOCUMENTS

Document Date	Document Name	Document Type
JAN 2024	Asset Management Plan - Control Systems	PDF

1 SUMMARY

<table>
<tr><th>Title</th><th>Control System Replacements</th></tr>
<tr><td>DNSP</td><td>Ergon Energy Network</td></tr>
<tr><td>Expenditure category</td><td>☒ Replacement ☐ Augmentation ☐ Connections ☐ Tools and Equipment
☐ ICT ☐ Property ☐ Fleet</td></tr>
<tr><td>Identified need</td><td>☒ Legislation ☐ Regulatory compliance ☒ Reliability ☐ CECV ☒ Safety ☐ Environment ☐ Financial ☐ Other

The objective of this business case is to outline the limitation forecast associated with control boards in accordance with the lifecycle management strategies detailed in the Asset Management Plan. Additionally, this Business Case provides the necessity for interventions, both in terms of volume and financial allocations during the regulatory period 2025-30.

Ergon Energy has an ongoing program of work towards the replacement of high-risk and ageing problematic control boards within its network. To meet the challenges of Ergon Energy retiring its problematic and ageing population; control board replacements will be an ongoing endeavor. With critical spares quickly depleting, the growing cost of replacements after unplanned failure will be significant and prolong Ergon Energy’s exposure to network safety, reliability, and financial risks.</td></tr>
<tr><td>Expenditure</td><td>
<table>
<tr><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>$m, direct 2022-23</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td><td>1.5</td><td>7.5</td></tr>
<tr><td>Replacement</td><td>10</td><td>10</td><td>10</td><td>10</td><td>10</td><td>50</td></tr>
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</td></tr>
<tr><td>Optimal timing and NPV analysis</td><td>Within the framework of the Network Planning Process, an assessment is conducted for the limitations associated with each control system module. Subsequently, individual projects are initiated, and an assessment undertaken to determine the optimal timing for their replacement. This procedure involves performing Net Present Value (NPV) analysis, risk assessment, and consolidating activities with other network assets in suboptimal condition at a designated timing. This ensures prudency and efficiency, ultimately curbing the financial impact on our customers and the broader community.

Attachment 5.2.01 SCS Capex model – January 2024 outlines our overall investments for the 2025-2030 period, which will include control systems with other investments. Business cases for those investments are available on request.</td></tr>
</table>

2 PURPOSE AND SCOPE

The purpose of this document is to outline the forecast volumes of replacement and expenditure associated with pole mounted plant (PMP) for problematic control boards in accordance with the lifecycle management strategies detailed in the Control Systems Asset Management Plan.

This business case should be read in conjunction with the Asset Management Plan - Control Systems. All dollar values in this document are based upon 2022-23 dollars and exclude overheads.

3 BACKGROUND

Pole mounted plant (PMP) recloser control boards play a crucial role in enabling SCADA to operate field-based switch equipment, ensuring safe operation and control of the network. These control boards facilitate the necessary functions of field-based switch equipment, such as network protection, network switching and minimizing customer outages in the event of a fault. These control boards have an expected life of 25 years.

3.1 Asset Population

There are approximately 2,800 reclosers control boards across the Ergon Energy network as per Figure 1.

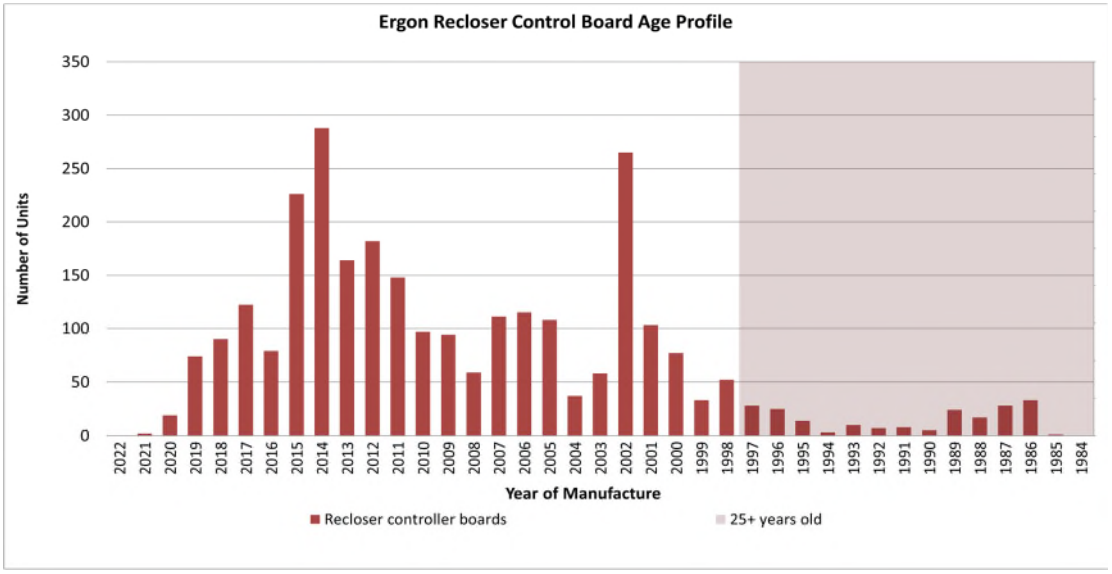

Figure 1: Age Profile

3.2 Asset Management Overview

Ergon Energy adopts a number of strategies in managing the asset. These include:

- **Preventative maintenance**: which is performed in accordance with the inspection and Maintenance Standard Tasks with maintenance intervals outlined in the Maintenance Activity Frequency

- **Corrective Maintenance**: undertaken when inspection and condition monitoring classify defects as outlined in the Lines Defect Classification Manual and Substation Defect Classification Manuals
- **Proactive Replacement:** is the management strategy used in conjunction asset performance monitor and trending to replace problematic assets.

Ergon Energy manages our critical spares by proactively reviewing and adjusting stock levels held in stores and managing spares recovered from projects for 'like for like' applications. Where possible, replacement of defective or failed control boards with 'like for 'like spares is the preferred option.

3.3 Asset Performance

A control board is deemed to have failed if it can no longer perform its basic function of detecting and tripping to isolate power system faults or operation on demand. Failures appear to be decreasing in the present year due to mild storm activities experienced during 2021-22 as per Figure 2.

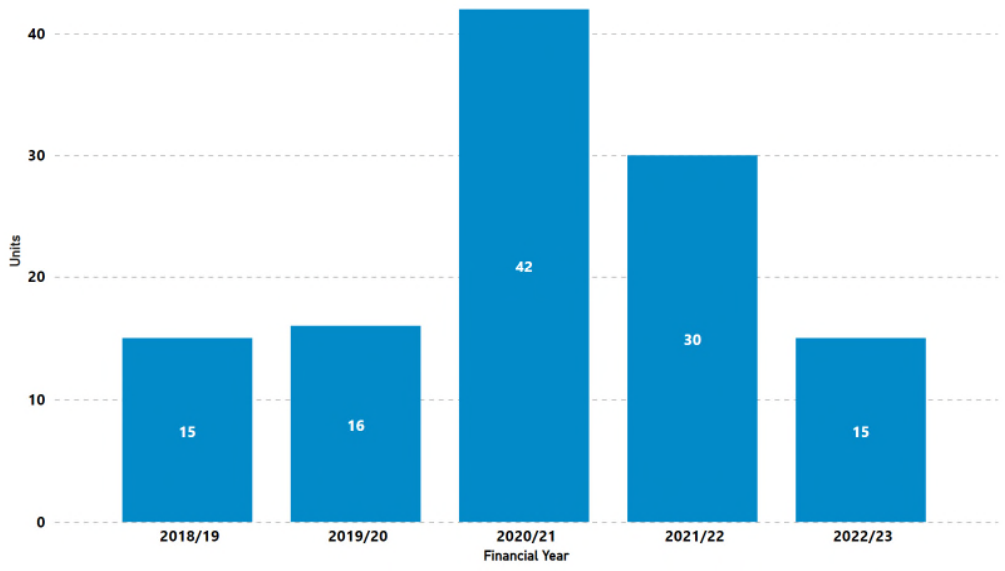

Figure 2: Unassisted Control System Failures

A control board is classified as defective if one or more component is not performing as expected but the control board can still perform its basic function of detecting and tripping to isolate power system faults or operation on demand. Defects quantities appear to be decreasing in the last three years as per Figure 3. This is most likely due to replacement of the failed recloser controller boards and sub-components; hence the decrease in defects in the last 3 years.

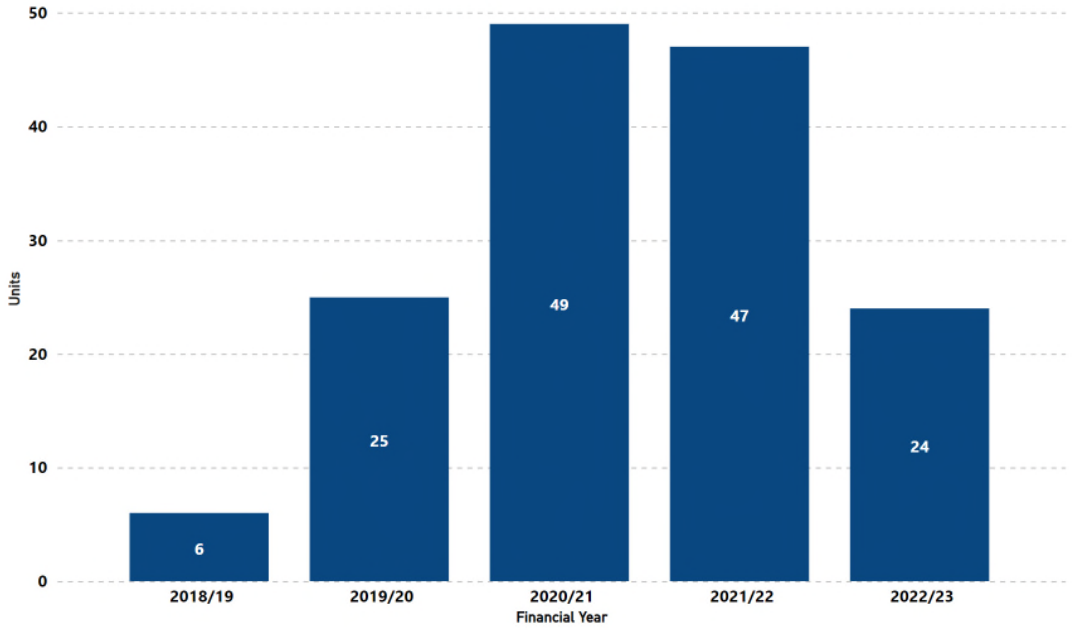

Figure 3: Control System Defects

3.4 Consequence of Failure

Consequences of an in-service failure has been assessed across four value streams and are relevant to this business case:

- **Reliability:** Represents the unserved energy cost to customers of network outages and is based on an assessment of the amount of Load at Risk in circumstances where the recloser control board fails and the recloser function is inhibited. This may result in loss of supply until crews are able to temporary bridge the recloser until the failed control board has been replaced or repaired.
- **Financial:** The financial cost is derived from an assessment of the likely replacement costs incurred by the failure of the asset. This cost can substantially increase for emergency replacements.
- **Safety:** There is a risk of multiple serious injuries or fatality following a failure of a recloser control board. Additionally, a recloser control board failure could lead to widespread asset damage inside/outside of the substations causing significant public safety issues.
- **Environmental:** It is unlikely for a failure of a recloser control board to result in environmental impact/contamination.

3.5 Likelihood of Consequence (LoC)

The likelihood of consequence refers to the probability of a particular outcome or result occurring because of a given event or action. To estimate the likelihood of consequence, Ergon Energy has utilised a combination of historical performances and researched results.

Ergon Energy has analysed past events, incidents, and data to identify patterns and trends that can provide insights into the likelihood of similar outcomes occurring in the future. Additionally, Ergon Energy also has conducted extensive research to gather relevant information and data related to the respective risk criteria.

4 IDENTIFIED NEED

4.1 Problem and/or Opportunity

Ergon Energy has a substantial number of recloser control boards that pose significant issues. Problematic control boards constitute 77% of the overall control board population and have been experiencing a rising number of failures, malfunctions, and unavailability for procurement. The major challenge lies in replacing these problematic control boards with current contract control boards, which differ in make and model.

The observed increase in failures across the Ergon Energy region during storm seasons underscores the urgent need for critical spares to swiftly restore assets and normalise network configurations. Prompt action is required to address any potential depletion of spares, given the critical role of these devices in reducing customer outages during fault scenarios. Failure to do so could jeopardise Ergon Energy's ability to meet guaranteed service levels and minimum standards, particularly if outage rate increase.

The unavailability of spares exposes Ergon Energy to the following risks:

- Abnormal network configurations, such as bypassing the PMP, which can lead to operational challenges.
- Inability to provide high-speed protection, jeopardising the safety of staff, the public, and primary assets.
- Potential for larger customer outages resulting from abnormal network configurations during faults.
- Significant financial impacts due to unplanned and urgent corrective maintenance, potentially requiring the replacement of entire PMPs.

It is essential for Ergon Energy to prioritise the availability of spare parts to mitigate these risks, ensure operational efficiency, and uphold their commitment to customer service and safety.

4.2 Compliance

This business case is guided by the following legislation, regulations, rules and codes:

- Electricity Act 2002 (Qld)
- National Electricity Rules (NER)
- Electrical Safety Act 2002 (Qld)
- Electrical Safety Regulation 2013 (Qld)
- Queensland Electrical Safety Code of Practice 2020 – Works (ESCOP)
- Work Health & Safety Act 2011 (Qld)
- Work Health & Safety Regulation 2011 (Qld)
- Ergon Energy Corporation Limited Distribution Authority No D01/99

5 ASSET LIMITATION FORECAST SUMMARY

5.1 Problematic Control Board

Table 1 identifies the forecasted replacement volume for the high-risk problematic control boards. This forecast is an estimate of the likely level of replacements included with other projects in our program of work.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	2025-30
$m, direct 2022-23	1.5	1.5	1.5	1.5	1.5	7.5
Replacement	10	10	10	10	10	50

Table 1: Forecasted Replacement Volume

6 RECOMMENDATION

The proposed volume provides the best balance of benefits and risks for the organisation.