Distribution Switches Replacements

Business Case

25 January 2024

Part of Energy Queensland

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DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
Draft v0.1	Initial Draft	14/09/2023	Asset Engineer
Draft v0.2	Draft	14/10/2023	Snr Engineer Asset Strategy
V1.0	Finalised	16/11/2023	Manager Asset Strategy

RELATED DOCUMENTS

Document Date	Document Name	Document Type
JAN 2024	Asset Management Plan – Switches	PDF
NOV 2023	Risk Modelling - Weibull – Switches v0.1	Docx & Excel
JUN 2023	RIN 2.2 Compare 2021-22 (Rosetta)	Excel
NOV 2023	Ergon 2022-23 - Category Analysis - RIN Response - Consolidated - 23 November 2023 – PUBLIC (16058117.2)	Excel
AUG 2023	Maintenance Activity Frequency (MAF) – Release 2	PDF
JUN 2023	Maintenance Acceptance Criteria (MAC) – Release 11	PDF
OCT 2023	Lines Defect Classification Manual	PDF
JUL 2023	Substation Defect Classification Manual	PDF
OCT 2023	Australian Government, Department of the Prime Minister and Cabinet (Office of Best Practice Regulation) – Best Practice Regulation Guidance Note - Value of a Statistical Life:	PDF
ND	Australian major natural Disasters.xlsx (a compendium of various sources)	Excel

1 SUMMARY

Title	ERG Switches Business Case AER 2025-30
DNSP	Ergon Energy Network
Expenditure category	☒ Replacement ☒ Augmentation ☐ Connections ☐ Tools and Equipment ☐ ICT ☐ Property ☐ Fleet
Purpose	The purpose of this business case is: • to evaluate the benefits of the proposed volume of Switches for the AER regulatory period 2025-2030 investment • to support the Ergon Energy forecast capital expenditure over the regulatory period via a cost benefit analysis
Identified need	☒ Legislation ☒ Regulatory compliance ☒ Reliability ☐ CECV ☒ Safety ☒ Environment ☒ Financial ☐ Other Ergon Energy is committed to adopting an economic, customer value-based approach when it comes to ensuring the safety and reliability of the network. To demonstrate the advantages of this approach for the community and businesses over the modelling period, they have employed Net Present Value (NPV) modelling. This commitment is in line with their efforts to maximise value to our customers. Ergon Energy replaces distribution switches to ensure safety, reliability, environmental, and financial risks are managed in the best interest of consumers. In regulatory period 2025-30, Ergon Energy observed that the replacement volume of switches was tracking higher than expected. The improved replacement data analysis confirmed an escalating replacement rate for switches. Predominantly the step change in distribution switches is being replaced because of the pole replacements that aimed at improving asset performance and operation efficiency result in cost effective replacement strategy. The growth in replacements within these programs has consequently led to an increase in the volume of switch replacements. The justification for the upsurge is detailed on their respective business cases, The review also provided us the opportunity to review the defect classifications to ensure prudent asset management practices are followed to maximise customer benefit. This outcome from this analysis and benefit of consequential replacement has achieved better asset performance compared to the other options.

<table>
<tr><td>Alternate options</td><td>
Three different options were considered as follows over the counterfactual (Current defect rate - Average 711 per year) replacements:

Option 1 - REPEX Model Cost Scenario – Average 374/yr
Option 2 - REPEX Model Lives Scenario – Average 213/yr
Option 3 - Additional Targeted – Average 1,143/yr

</td></tr>
<tr><td>Expenditure</td><td>
This business case relates to defective switch replacement outside of substation and fuses. (Excluding the fuses related to distribution transformer).
<table>
<tr><th>Year
$m, direct 2022-23</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>Switch Defect*</td><td>6.7</td><td>6.7</td><td>6.7</td><td>6.7</td><td>6.7</td><td>33.5</td></tr>
<tr><td>Consequential#</td><td>6.2</td><td>6.3</td><td>6.4</td><td>6.5</td><td>6.5</td><td>31.9</td></tr>
<tr><td>Switch Total</td><td>12.9</td><td>13.0</td><td>13.1</td><td>13.2</td><td>13.2</td><td>65.4</td></tr>
<tr><td>Fuse Defect*</td><td>9.2</td><td>8.4</td><td>8.4</td><td>8.4</td><td>8.4</td><td>42.8</td></tr>
<tr><td>Consequential#</td><td>24.1</td><td>25.2</td><td>25.5</td><td>25.6</td><td>25.8</td><td>126.2</td></tr>
<tr><td>Fuse Total</td><td>33.3</td><td>33.6</td><td>33.9</td><td>34</td><td>34.2</td><td>169</td></tr>
</table>
* Expenditure considered for this business case.
# Expenditure included in other investment programs (Pole Replacement, Overhead Conductor)
</td></tr>
<tr><td>Benefits</td><td>
After a thorough evaluation of all available options, it has been determined that Ergon Energy will continue with Counterfactual. This option has been chosen over other options, as it provides the best balance of benefits, deliverability and lower safety risk for our customers, with a focus on optimizing existing processes and enhancing efficiencies where possible.
</td></tr>
</table>

2 PURPOSE AND SCOPE

The purpose of this document is to outline the forecast expenditure and volumes associated with distribution switches including Air Break Switch (ABS), Gas Break Switch (GBS), and Ring Main Units (RMUs) for the Regulatory period 2025-30. The business case includes the analysis of different options, to ascertain prudency through financial NPV modelling, considered to manage the increasing replacement volumes to comply with regulatory obligations, maintain service delivery performance including customer reliability standards and customer quality standards, and maintain the safety of the network for the Queensland community.

This document is to be read in conjunction with the Switches Asset Management Plans. All dollar values in this document are based upon real 2022/23 dollars, excluding any overheads.

3 BACKGROUND

Following a thorough examination of actual performance, it became evident that while the defect rate had been reducing gradually, the increase in switch replacement volume was primarily attributed to the consequential replacements occurring under the defective pole replacement and targeted overhead reconductoring program. The principal factor driving the higher replacement rates for both poles and conductors was the escalating failure rate of these assets, necessitating an accelerated increase in replacement volumes. This proactive approach was taken to reduce the failure rates to acceptable levels, thereby mitigating public safety and reliability risks.

Ergon Energy wished to assure itself, the regulator, and internal and external stakeholders that the switch asset management strategies proposed, provide value to the community and shareholders over time through the provision of safe and reliable overhead network and a more secure electricity supply for consumers in rural and regional Queensland.

3.1 Asset Population

As per 2021-22 RIN data, Ergon Energy have a total of 46,963 Distribution Switches (including Ring Main Units, Air Brake Switches, Gas Break Switches). An age profile of all distribution switch assets is shown in Figure 1.

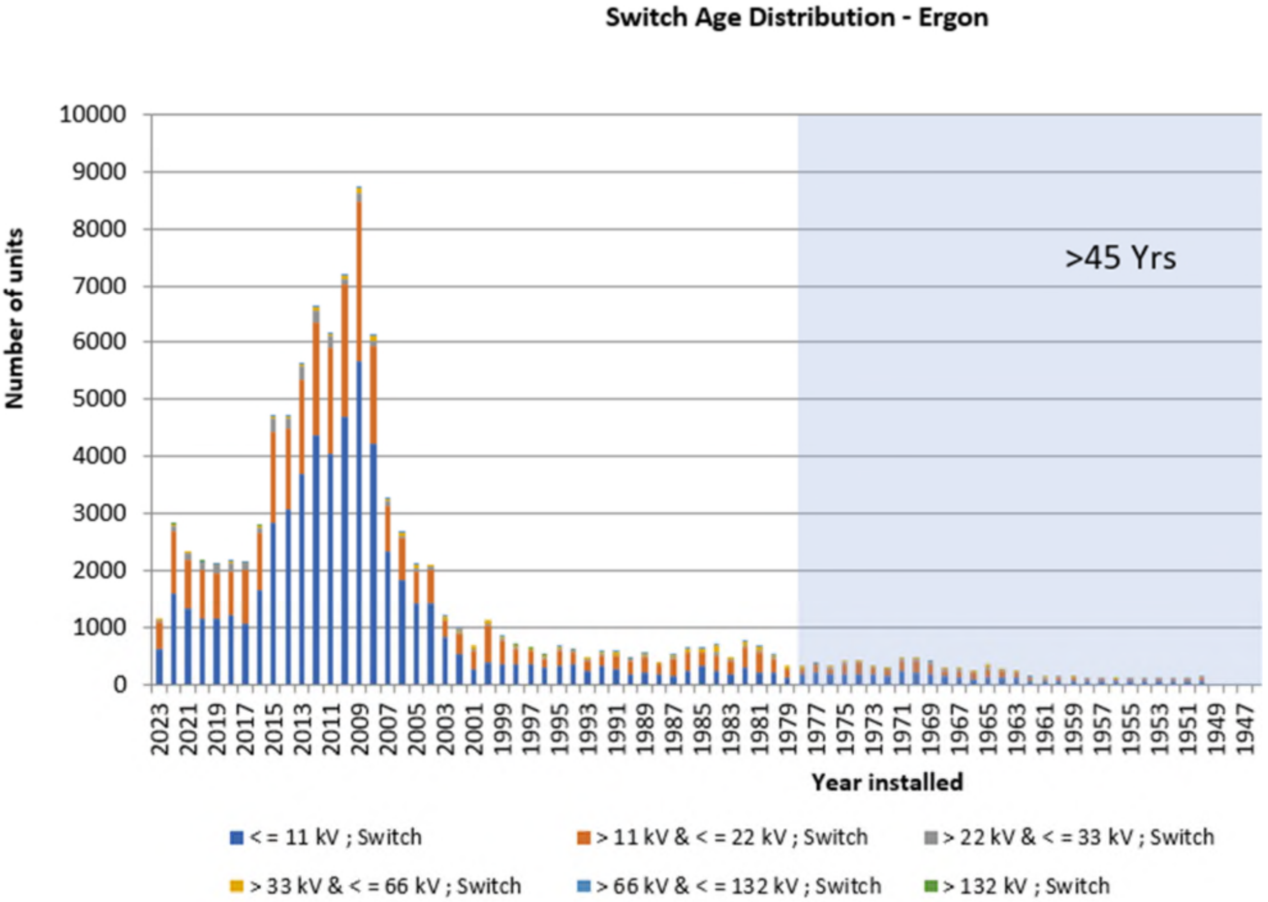

Figure 1: Age profile Switches

3.2 Asset Management Overview

Pole top switches are inspected periodically as required by Ergon Energy Maintenance Activity Frequency policy and require very little maintenance except for removal of vegetation and animal detritus. They are reactively replaced, due to either electrical failure or poor condition as assessed by ground-based inspection. It is generally considered uneconomical to refurbish switches; they are routinely scrapped once removed.

Ground Mounted Switches are also inspected periodically and certain types of RMUs, such as oil and polymer RMUs, require additional maintenance to ensure safe and correct operations.

End of asset life is determined by referencing the benchmark standards defined in the Defect Classification Manuals and or Maintenance Acceptance Criteria. Replacement work practices are optimized to achieve bulk replacement to minimize overall replacement cost and customer impact.

Where risk levels and identifiable criteria indicating assets are either at or near end of life, switches may be targeted for replacement. Consequential replacement is typically undertaken with other work such as feeder refurbishment programs or bundled into logical groups for efficiency of delivery and cost.

3.3 Asset Performance

Two functional failure modes of switches have been defined in this model are found in the Table 1.

Functional Failure Type	Description
Catastrophic **(Unassisted Failures)**	Loss of structural or conductivity integrity of any component associated with the switch, excluding any associated pole top hardware or other pole mounted plant, cable accessories or ground mounted plant, such that the external or internal condition of switch/component required immediate intervention. Functional failure of a switch asset under normal operating conditions not caused by any external intervention such as abnormal weather or human
Degraded **(Defects)**	A switch asset deemed defective based on observed physical and serviceability criteria and if not rectified within a prescribed timescale (P0/P1/P2) could result in failure.

Table 1: Description of Functional Failure

Identified defects are scheduled for repair according to a risk-based priority scheme (P0/P1/P2). The P0, P1 and P2 defect categories relate to priority of repair, which effectively dictates whether normal planning processes are employed (P2), or more urgent repair works are initiated (P1 and P0).

The key causes of defective failures are corrosion of metallic enclosures, operational issues, loose connection/high resistance, insulation ageing and degradations of associated components causing loss of conductivity and strength in the switch. If the defective asset is left unattended to, it will eventually cause an unassisted failure of the switch.

Figure 2 and Figure **3** displays the number of unassisted and defect failures respectively over the last five years of period.

A significant reduction in failures and defects can be observed after 2019/20. This could be mainly due to the consequential replacements.

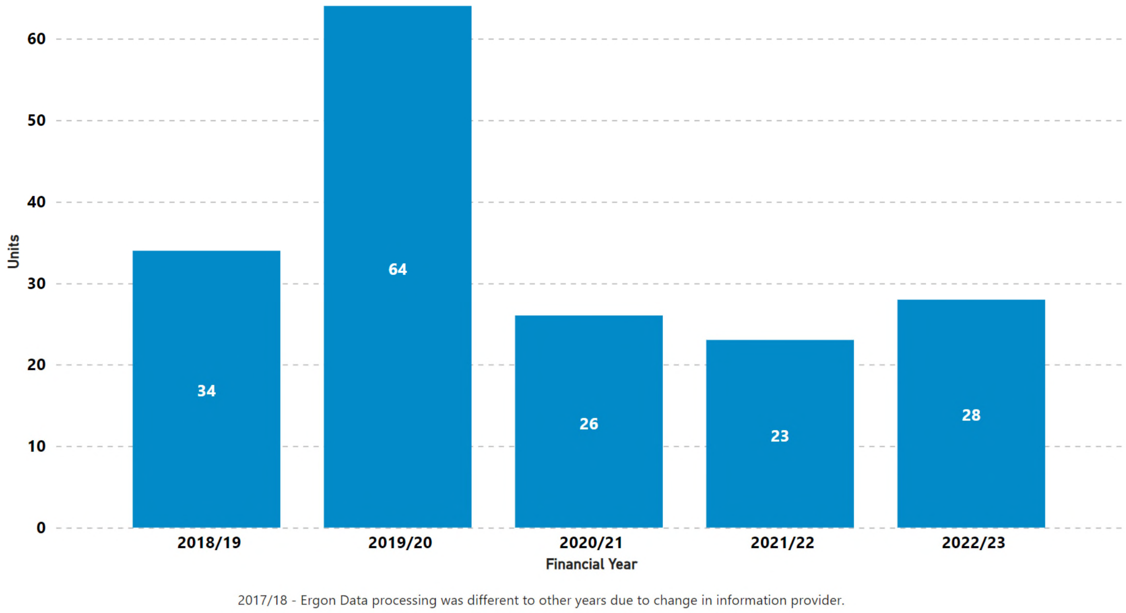

Figure 2: Switches Failure Volume

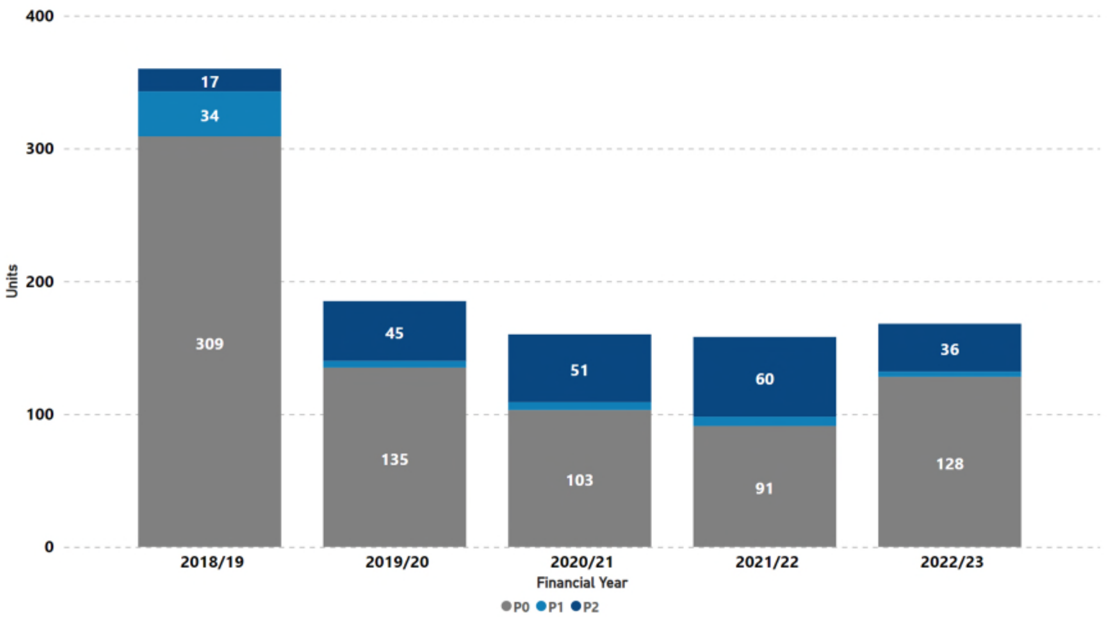

Figure 3: Switches Defect Volume

4 RISK ANALYSIS

Our cost-benefit analysis aims to optimize our risk calculation at the program level, so that we can maximize the benefits to our customers. After conducting a cost-benefit analysis using net present value (NPV) modeling, we will select the preferred replacement option based on the most positive NPV of the volumes considered. In the case of this business case, the most positive NPV validates that the volume of replacement undertaken over the regulatory period 2025-30 is a prudent approach.

The monetised risk is simply calculated as per the calculation in Figure 4.

Figure 4: Monetised Risk Calculations

Ergon Energy broadly considers five value streams for investment justifications regarding replacement of widespread assets. These are shown in Figure 5. For conductors, only four of the value streams are considered; the 'Export' is not material to conductors.

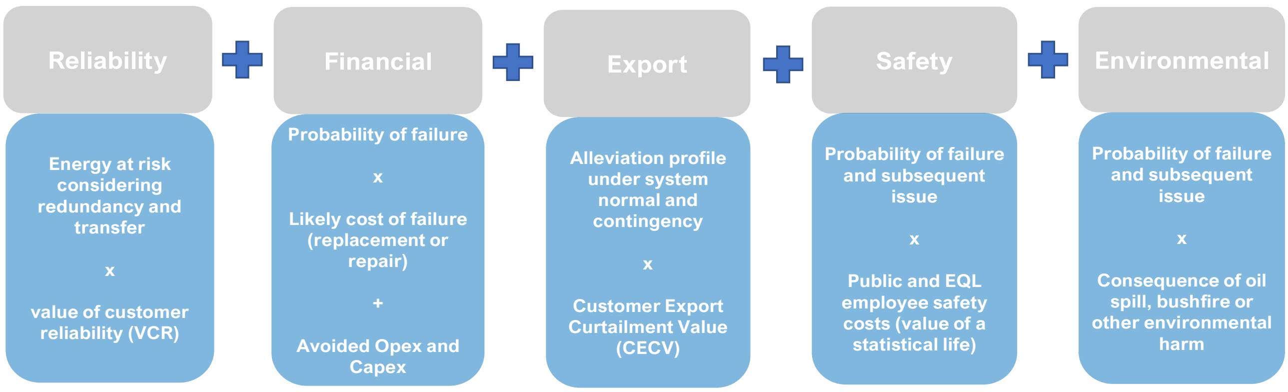

Figure 5: Risk Streams for Assets

4.1 Probability of Failure (PoF) – Weibull Analysis

Due to the limited condition data available for the implementation of an Asset Health Index (AHI), the Weibull distribution model was utilised instead due to its flexibility and ability to model skewed data. The Statistical model Weibull Distribution has been developed for switches having only observed inspection and not having measured data to predict the PoF such as Low Voltage service cables, Pole Top Structures, and Switches to assist with the replacement management of ageing assets. The calculated probability of failure (PoF) from the Weibull distribution function allows calculation of an individual PoF for each asset, categorised by age, in the population.

EQL utilise the switches failure history with inferred the failure age to model switches. Based on Distribution Switch's majority population profile, the categories included in the business case are ABS, GBS, and RMUs.

The Eta (scale factor) and Beta (shape factor) of the switches produced from the Weibull distribution curve as per Table 2 and Figure 6.

Switch Type	Weibull Variables	Value
ABS	Beta β	1.4
	Eta η	28
GBS	Beta β	1.6
	Eta η	22
RMU	Beta β	1.9
	Eta η	18.5

Table 2: CDF Weibull Variables – Switches – All Type

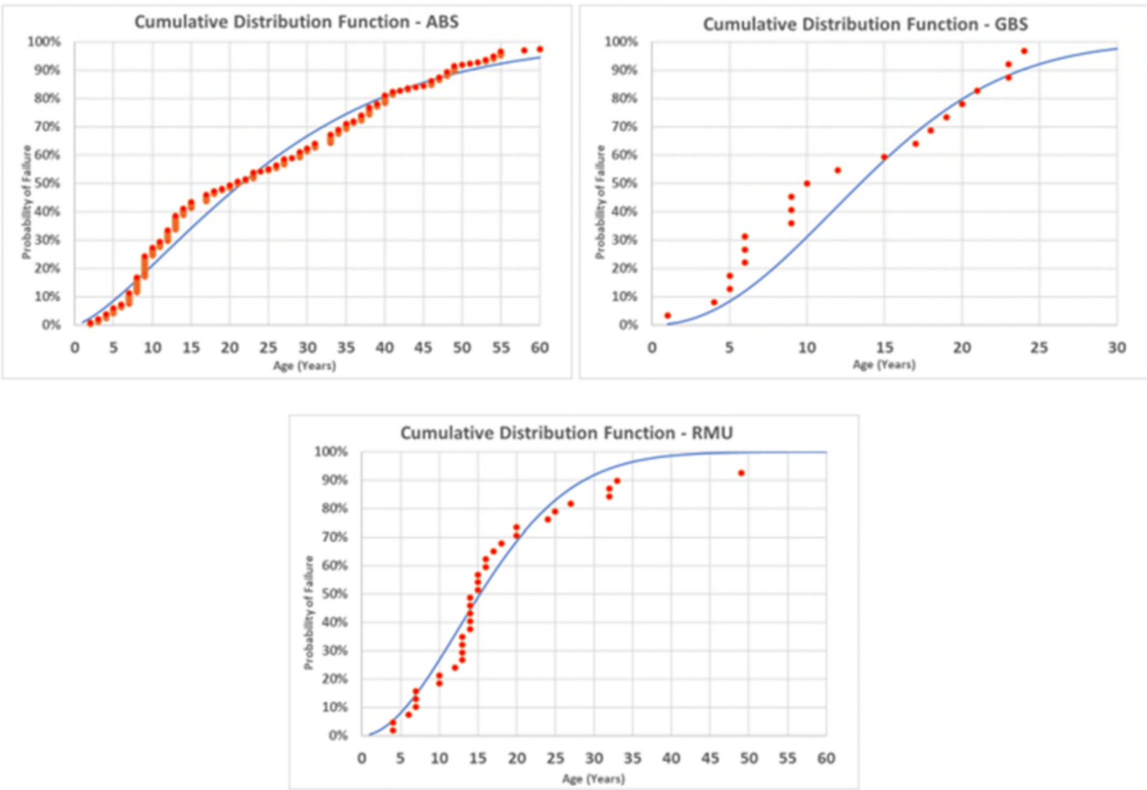

Figure 6: Weibull Cumulative Distribution Function

4.2 Consequence of Failure (CoF) and Likelihood of Consequence (LoC)

The key consequence of switch failures that have been modelled are reliability, financial, safety and environmental. The CoF refers to the financial or economic outcomes if an event were to occur.

The LoC refers to the probability of a particular outcome or result occurring because of a given event or action. To estimate the LoC, 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 such as bushfire.

To the extent possible the CoF and LoC are estimated for each switch age band.

4.2.1 Reliability

Reliability represents the unserved energy cost to customers of network outages caused by the switch and is based on an assessment of the amount of Load at Risk during repair time. The following assumptions are used in developing the risk cost outcome for a switch failure:

- **Lost load:** Each switch age band is modelled individually, with the relationship developed between the switch and the feeder that it is installed at. The historical average load on each 11kV feeder in our network is utilised to determine the kW lost following a switch failure as larger population of switches are in 11kV network. We have utilised one third of the historic average load on the feeder, which represents the most likely outcome, as the data regarding the exact electrical location of the switch that may fail in future in a feeder cannot be predicted accurately.
- **Value of Customer Reliability Rate:** We have used the Queensland average VCR rate.
- **Probability of Consequence**: Majority of the in-service switch failures results in an outage to customers.

4.2.2 Financial

Financial cost of failure is derived from an assessment of the likely replacement costs incurred by the failure of the asset, which is replaced under emergency. The following assumptions have been used in developing the safety risk costs for a pole failure:

- **Switch replacement:** different unit cost of switch replacement has been taken based on the subject matter expert estimation for different switch types typically around $4K to $30K.
- **Switch Defect Rectification:** As switches are not economical to refurbish or repair, the defect rectification cost is assumed to be like replacement cost.
- **Probability of Consequence:** all in-service switch failures result in a need to replace the switch under emergency.

4.2.3 Safety

The safety risk for a switch failure is primarily that a member of the public is in the presence of a catastrophic event. This could result in a fatality or injury. For our modelling we have used August 2022 published document from Australian Government, Department of the Prime Minister and Cabinet (Office of Best Practice Regulation) – Best Practice Regulation Guidance Note – Value of a Statistical Life:

- Value of a Statistical Life: $5.4m
- Value of an Injury: $1.35m
- Disproportionality Factor: 6 for members of the public.
- **Probability of Consequence**: Following an unassisted asset failure in Ergon Energy, there is a 1 in 20 years chance of causing a fatality and 2 in 20 years chance of a serious injury based on historical data evidence. The average number of safety incidents has been derived by analysing 20 years of Significant Electrical Incident data. Historically, the data shows, switch has not been the cause of fatality, therefore the fatality incident due to a conductor asset unassisted failure has been considered for the modelling purpose.

4.2.4 Environmental – Bushfire

The value of a Bushfire Event consists of the safety cost of a fatalities and the material cost of property damage following a failed switch causing downed conductor and fire. For our modelling we have used:

- **Value of Bushfire:** $22.3m – which includes average damage to housing and fatalities following a bushfire being started. In Queensland as per Australian major natural Disasters.xlsx (a compendium of various sources), there were 122 homes lost and 309 buildings lost during bushfires between 1990 and present (2021) across 12 significant fire records. Homes were estimated an average cost of $400,000 while the buildings were estimated at an average cost of $80k.
- **Safety Consequence of bushfire –** Safety consequences are evaluated on same assumptions as safety incident consequence in 4.2.3 with a frequency of 0.5 per incident as there has been 6 fatalities recorded across those 12 bushfire incidents in Queensland.
- **Probability of Consequence:** In EQL, fire caused by the distribution switches is not recorded. The services bush fire risk is used to infer the distribution switches bush fire risk. Due to the low population in compare with services, the chances of having bush fire are very low. 10% of the services bush fire risk cost is used in distribution switches.

5 CONSEQUENTIAL REPLACEMENT

Within the scope of the pole and overhead conductor replacement investments, we always assess the condition of the equipment attached to the assets and determine the feasibility and cost-effectiveness of replacing them. This equipment includes pole top structures, transformers, service lines, and switches. Consequently, when evaluating the benefits of this approach for our customers, we consider the investments and advantages associated with these consequential replacements in our analysis of the respective Poles and Overhead Conductor business cases to ensure that the overall asset expenses are accounted for. Table 3 outlines the volume of switches replaced because of the pole replacement and reconductoring program during the specified reporting period.

Actual Delivery Consequential Services Volume	2025/26	2026-27	2027-28	2028-29	2029-30	Total
With Pole Replacements	378	378	378	378	378	**1,890**
With Reconductoring	280	292	300	308	312	**1,492**

Table 3: Consequential Asset Volumes – Actual Delivery

5.1 Fuse Replacement

Fuses are mainly an expendable protection asset operates under a fault event. Normally the fuse cartridges are replaced once it operated. Table 4 explains the RIN categorisation of Fuse. In the RIN volume, only switch fuses are counted and the expendable cartridges are excluded.

RIN Fuse Detail	Explanation
Expenditure	Consists of Expenditure from Fuse Cartridges and Switch Fuse
Volume	Volume includes only Switch Fuses (Cartridges excluded)

Table 4: RIN Fuse Expenditure and Volume

Whenever a distribution transformer is replaced, HV and LV fuses are replaced as part of the replacement process. Therefore, the investment from Switch Fuses required to be transferred to distribution transformer business case as an additional investment to the transformer replacement.

The expendable cartridges expense remains with the switch business case and has not been included in the cost benefit analysis as the expense is unavoidable and necessary to replace a burnt fuse after a fault event, as per Table 5.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total $m
Defective Switch Fuse and Cartridges ($m)	9.2	8.4	8.4	8.4	8.4	42.8
Distribution Transformer Related Fuses ($m)#	24.1	25.2	25.5	25.6	25.8	126.2

Table 5: Business case Fuse Expenditure

- Expenditure included in Distribution transformer business case

6 IDENTIFIED NEED

6.1 Problem Statement

Ergon Energy reviewed its asset management practices with respect to switches in response to concerns that the replacement rate was tracking too high. Over recent years there has been an effort to improve the quality of the replacement data, the data gathered in the field and the data systems which utilise the Distribution Switch data. The improved replacement data captured has indicated an escalating replacement rate for switches. Review of the data has found that predominantly switches were frequently replaced consequentially when the defective pole and targeted reconductoring was undertaken in addition to a moderate defect rate. This business case covers only the defect replacement volume prudency.

6.2 Compliance

Ergon Energy's switch assets are subject to several legislative and regulatory standards:

- National Electricity Rules (NER)
- Electricity Act 1994 (Qld)
- Electrical Safety Act 2002 (Qld)
- Electrical Safety Regulation 2013 (Qld)
- Work Health & Safety Act 2014 (Qld)
- Work Health & Safety Regulation 2011 (Qld)

6.3 Counterfactual (Base Case Scenario and Proposed Program)

To provide a comparison of the potential alternatives to our actual delivery for our cost benefit analysis, we have set the counterfactual as our current defect rate volume.

6.3.1 Costs/Volume

Under the counterfactual scenario, the volume of switches replaced is based on 2022-23 defect volume. If Ergon Energy continued with the counterfactual option, the estimated expenditure is shown in the Table 6.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
$m, direct 2022-23	12.9	13	13.1	13.2	13.2	65.4
Volume	711	711	711	711	711	**3,555**

Table 6: Counterfactual Delivery for the period (2025/26-2029/30)

6.3.2 Risk Quantification

Figure 7 and Figure 8 provides the results of a quantitative forecast of emerging risk associated with Ergon's switch asset population failure due to condition related failure modes. This counterfactual risk is based on existing failure and defect rates and the calculated escalation forecast.

Risk costs rise moderately in the counterfactual due to financial risks and reliability of supply associated with switch failures. The cost of these risks increases marginally over the 20-year period shown, driven mainly if Ergon Energy maintained the same counterfactual rate going forward.

As the consequential replacement are forecasted to be increased in the next 5yrs with the increment in reconductor volume, based on the "REPEX guideline" the older switches will be targeted consequentially as part of the efficiency bundling. That will result in reduction in switch defect. Therefore, the expected defect rate will be 50% of the historical defect and has been consider in our investment forecast. The current forecast shows the failure is increasing but in conjunction with consequential replacement from pole and conductor programs the failures will be maintained within current service levels.

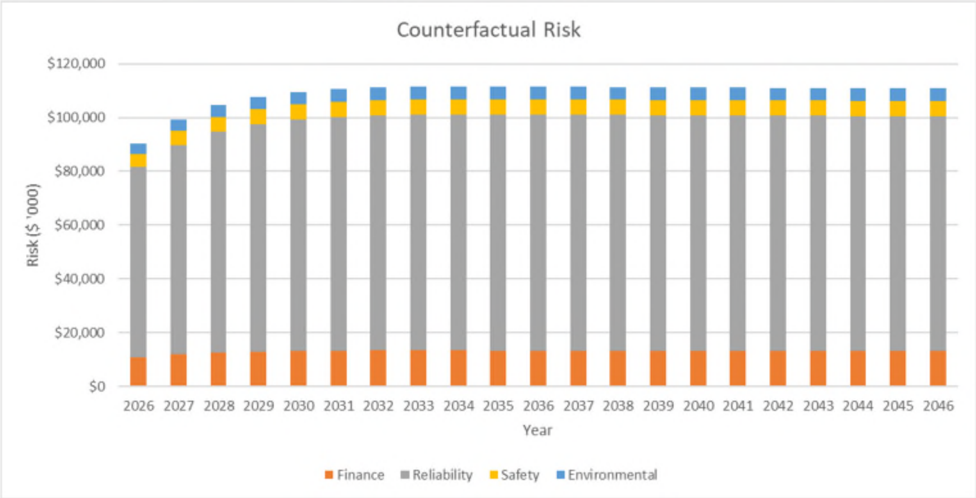

Figure 7: Counterfactual quantitative risk assessment

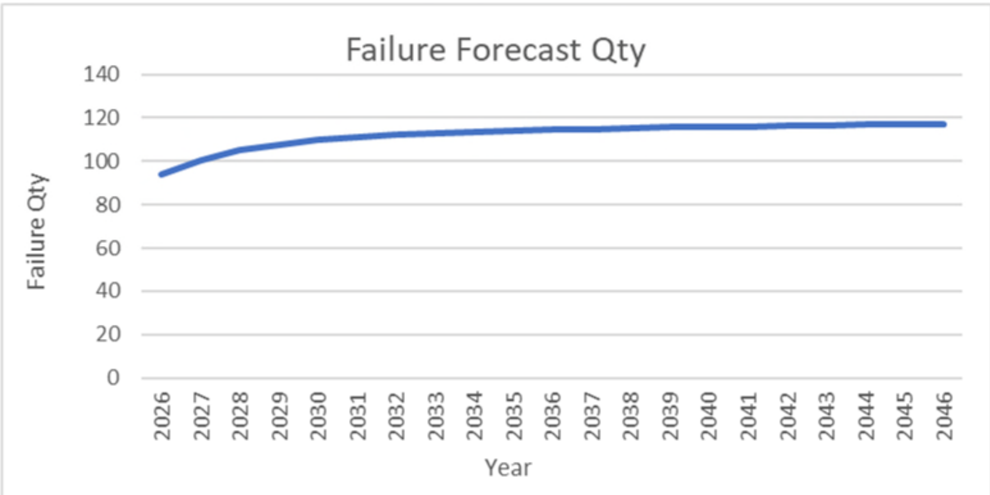

Figure 8: Switches Counterfactual Failure Forecast

7 OPTIONS ANALYSIS

In assessing the prudency of our proposed volumes, we have compared a range of interventions against the counterfactual to assess the options that would have maximised value to our customers. We have sought to identify a practicable range of technically feasible, alternative options that can satisfy the network requirements in a timely and efficient manner.

7.1 Option 1 – REPEX Model Cost Scenario

This option includes the replacement of switches based on REPEX model cost scenario with volumes estimated using switch expenditure allowance between 2025-30 divided by average actual unit cost. This estimated volume is around 60% of counterfactual.

7.2 Volumes

The volume summary under this option has been provided in Table 7.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Volume	374	374	374	374	374	**1,870**

Table 7: Intervention Volume - Option 1

7.3 Risks/Benefits

In this option, our modelling shows that the unassisted failures are projected to increase substantially as it is leaving around 40% of defect unattended which may result in unassisted failure. Furthermore, opting for this approach will result in a growing need for substantial investment in the near term due to the escalating rate of asset failures. This is primarily because 40% less defective switch replacement volume result in keeping increasingly more defective switches in active service, causing a flow on effect of investment requirements and poor asset performance.

7.4 Option 2 – REPEX Model Live Scenario

This option includes the replacement of switches based on REPEX model cost scenario with volumes estimated using switches expenditure allowance between 2025-30 divided by average actual unit cost. This estimated volume is around 35% of counterfactual.

The volume summary under this option has been provided in Table 8.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Volume	213	213	213	213	213	**1,065**

Table 8: Intervention Volume - Option 2

7.4.1 Risks/Benefits

In this option, our modelling shows that, similar to option 1, the unassisted failures are projected to increase substantially as it is leaving around 65% of defect unattended which may result in unassisted failure. Furthermore, similar to option 1 this approach will also result in a growing need for substantial investment in the near term due to the escalating rate of asset failures. This is primarily because 65% less defective switch replacement volume result in keeping increasingly more defective switches in active service, causing a flow on effect of investment requirements and poor asset performance.

7.5 Option 3 – Additional Targeted

This option includes additional replacement of 542 switches (age > 45 years old) proactively including corrective replacement of all identified defective assets (counterfactual).

7.5.1 Volumes

The volume summary under this option has been provided in Table 9.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Volume	1,143	1,143	1,143	1,143	1,143	**5,716**

Table 9: Intervention Volume - Option 3

7.5.2 Risks/Benefits

Under this approach, our modelling predicts that the occurrence of switch failures will be notably reduced in comparison to all other options including counterfactual option. However, this option requires more resources and investment compared to all the other options with significant cost impact on customers outweighs the advantages.

8 OUTCOMES OF OPTION ANALYSIS

8.1 Switch Failure Forecast

The switch failure forecast for all main options is shown in Figure 9, as stated, Option 1 and 2 are not suitable due to increasing failure rate caused by leaving portions of defective switches in service. Additional targeted option provides slightly better performance in terms of failure quantality compared to counterfactual option. However, considering the additional investments, additional required resources, and the insignificant reduction of the forecasted failure quality in Figure 9 clearly demonstrates the benefit of choosing the counterfactual option for the 2025-30 regulatory period.

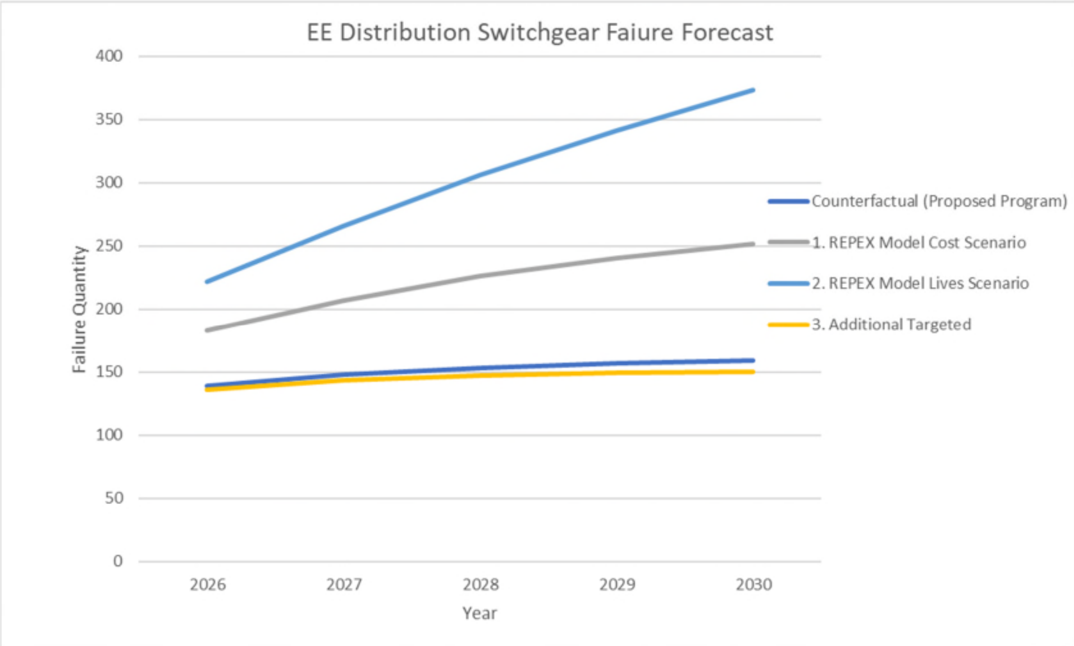

Figure 9: Failure Forecast

8.2 Economic Analysis

The NPV of cost benefit analysis of the options is summarised in Table 10 which demonstrates the following:

- All the options represented here shown a negative NPV against counterfactual except Option 3 - Additional Targeted.
- This is due to the reason the Options 1 and 2 are leaving majority of defect unattended.
- Option 3 is the only option provides a positive NPV against counterfactual and providing significant customer benefits among all other options. However, it also required significant additional investments as well. In addition to that required more resources to achieve the additional replacements.

Options	Rank	Net NPV	Intervention CAPEX NPV	Intervention Benefits NPV
Counterfactual (Proposed Program)	2	$0	$0	$0
1. REPEX Model Cost Scenario	3	-$145,864,028	$6,160,472	-$152,024,500
2. REPEX Model Lives Scenario	4	-$292,893,155	$16,892,176	-$309,785,331
3. Additional Targeted	1	$6,410,660	-$30,455,425	$36,866,084

Table 10: NPV Modelling Outcomes for All Options

Table 11 summarises the volume replacements for all options.

Switch Qty	2025/26	2026/27	2027/28	2028/29	2029/30
Counterfactual (Proposed Program)	711	711	711	711	711
1. REPEX Model Cost Scenario	374	374	374	374	374
2. REPEX Model Lives Scenario	213	213	213	213	213
3. Additional Targeted	1253	1253	1253	1253	1253

Table 11: Option volumes

Figure 10 illustrates the advantages of all options over their counterfactual confirms Counterfactual being the optimal option for the community.

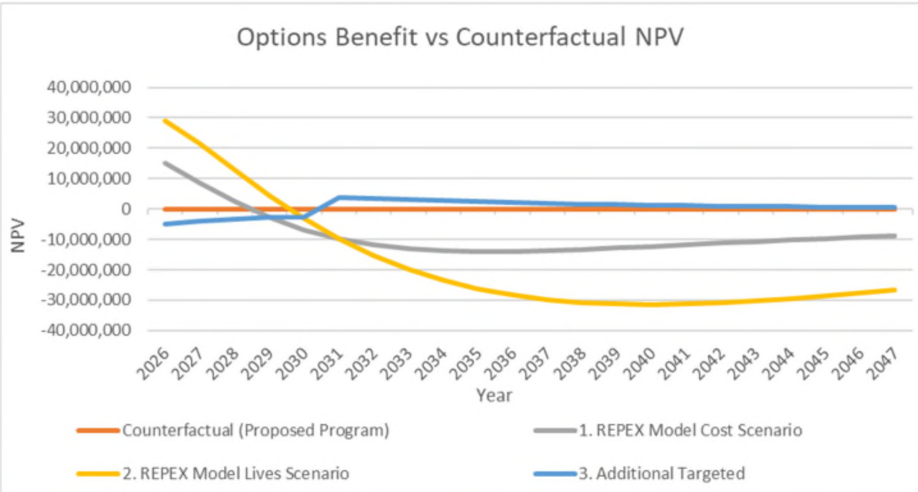

Figure 10: Benefits for all options

Any volume lower than counterfactual option provided the negative NPV based on the cost benefit analysis, reveals that counterfactual Option achieves the comparable gains among options and reaches towards most optimum solution. Therefore, counterfactual is the option which is highly likely to achieve network standard compliances and customer benefits, this is prudent to continue business as usual. Even though as per Option 3 additional targeted volume will also additional customer benefit, the substantial investment outweighs the benefit.

The analysis presented here in Table 12 compares the options to their respective counterfactual alternatives.

Criteria	Option 1 – REPEX Model Cost Scenario	Option 2 – REPEX Model Lives Scenario	Option 3 – Additional Targeted
Net NPV	-$146m	-$293m	$6m
Investment Risk	Low	Low	Med
Benefits	Low	Low	Med
Delivery Constraint	Low	Low	High
Detailed analysis – Advantage	• Aligns with Repex Model costs scenario. • Investment saving of $6.2m	• Aligns with Repex model live scenario. • Investment saving of $16.9m	• Additional $30.5m Customer Benefit • Transition towards asset performance improvement • Additional benefit of $36.9m
Detailed analysis – Disadvantage	• Leave significant number of defects unattended. • Increase unassisted failures. • Loss of $152m benefit	• Significantly low customer benefits. • Loss of $310m benefit • Leave significant number of defects unattended. • Increase unassisted failures.	• Required additional investment of $30.5m. • Required additional resources.

Table 12: Options Analysis Scorecard

9 SUMMARY

Ergon Energy Network's proposed plan is to move forward with the **counterfactual (Preferred)** volume for the regulatory period of 2025-2030. This proposed plan aligns with the current defect replacement volume and has been deemed prudent based on the risk monetisation outcome.

We have assessed and modelled three feasible options compared to the proposed counterfactual delivery forecast for the Reset RIN period from 2025-30.

Any reduction from our counterfactual volume delivers negative NPV benefit with increased risks for our community.

It is noted that the modelled result for counterfactual shows that switch failure rates are likely to maintain the current levels of service. Hence, we forecast that the current level of remediation programs as proposed option.

9.1 Sensitivity Analysis

To further test the effectiveness and prudency of the preferred option, several sensitivity analysis criteria have been applied, with ± 25% values, to compare modelled outcomes in different scenarios. The main sensitivity criteria are:

- Annual Risk cost
- Weighted Average Capital Cost (WACC)
- Probability of Failure (PoF)

In most of the sensitivity analysis outcomes, the Counterfactual (Preferred Option) has been demonstrated as the most prudent option.

10 RECOMMENDATION

The proposed counterfactual option is reflective of the commitment to provide maximum customer benefit at optimised customer price impacts. It reflects a tolerable risk position which balances the achievement of asset management objectives and customer service levels and ensures a level of investment which avoids future consequences based on the uncertainty associated with the capability new technologies may bring.

11 APPENDICES

11.1 Appendix 3: Reset RIN Data Reconciliation

	2025/26	2025/26	2025/26	2025/26	2025/26
	Expenditure	Expenditure	Expenditure	Expenditure	Expenditure
Grand Total	**46,274,519**	**46,672,147**	**46,937,232**	**47,202,318**	**47,334,860**
Fuse Total	33,379,299	33,663,810	33,853,483	34,043,157	34,137,994
Switch Total	12,895,220	13,008,337	13,083,749	13,159,161	13,196,866
Fuses Defect	9,231,740	8,424,633	8,386,699	8,424,633	8,367,731
Switches Defect	6,694,759	6,694,759	6,694,759	6,694,759	6,694,759
Consequential Switch Replacement					
Pole Defect	3,560,947	3,560,947	3,560,947	3,560,947	3,560,947
Reconductor Program	2,286,888	2,400,006	2,475,417	2,550,829	2,588,535
Conductor Defect Program	352,626	352,626	352,626	352,626	352,626
Consequential Replacement	**6,200,461**	**6,313,579**	**6,388,990**	**6,464,402**	**6,502,108**
Consequential Fuse Replacement					
Pole Defect	9,127,596	9,127,596	9,127,596	9,127,596	9,127,596
Conductor Defect Program	709,534	709,534	709,534	709,534	709,534
Reconductor Program	3,509,932	4,601,549	4,829,157	4,980,896	5,132,635
Distribution Transformer Program	10,800,498	10,800,498	10,800,498	10,800,498	10,800,498
Consequential Replacement	**24,147,559**	**25,239,176**	**25,466,785**	**25,618,524**	**25,770,263**

Table 13: Reset RIN reconciliation table – Expenditure in $ 2022-23

$, direct 2024-25	2025/26	2026/27	2027/28	2028/29	2029/30
Grand Total	**52,654,231**	**53,373,627**	**53,944,391**	**54,313,737**	**54,866,582**
Fuse Total	37,981,190	38,497,471	38,907,397	39,172,040	39,569,886
Switch Total	14,673,040	14,876,156	15,036,994	15,141,697	15,296,696
Fuses Defect	10,504,488	9,634,295	9,638,731	9,693,874	9,699,169
Switches Defect	7,617,743	7,656,034	7,694,205	7,703,380	7,760,000
Consequential Switch Replacement					
Pole Defect	4,051,883	4,072,250	4,092,553	4,097,433	4,127,550
Reconductor Program	2,602,174	2,744,614	2,844,967	2,935,132	3,000,411
Conductor Defect Program	401,241	403,258	405,269	405,752	408,734
Consequential Replacement	**7,055,298**	**7,220,122**	**7,342,789**	**7,438,317**	**7,536,695**
Consequential Fuse Replacement					
Pole Defect	10,385,987	10,438,194	10,490,235	10,502,744	10,579,940
Conductor Defect Program	807,355	811,413	815,459	816,431	822,432
Reconductor Program	3,993,834	5,262,268	5,550,092	5,731,309	5,949,318
Distribution Transformer Program	12,289,526	12,351,301	12,412,881	12,427,682	12,519,027
Consequential Replacement	**27,476,702**	**28,863,176**	**29,268,667**	**29,478,166**	**29,870,717**

Table 144: Reset RIN reconciliation table – Expenditure in $ 2024-25

	2025/26	2025/26	2025/26	2025/26	2025/26
	Replacement Qty	Replacement Qty	Replacement Qty	Replacement Qty	Replacement Qty
Grand Total					
Fuse Total	**2,537**	**2,646**	**2,668**	**2,683**	**2,698**
Switch Total	**1,370**	**1,382**	**1,390**	**1,398**	**1,402**
Fuses Defect	145	145	145	145	145
Switches Defect	711	711	711	711	711
Consequential Switch Replacement					
Pole Defect	378	378	378	378	378
Reconductor Program	243	255	263	271	275
Conductor Defect Program	37	37	37	37	37
Consequential Replacement	**659**	**671**	**679**	**687**	**691**
Consequential Fuse Replacement					
Pole Defect	904	904	904	904	904
Conductor Defect Program	70	70	70	70	70
Reconductor Program	348	456	478	493	508
Distribution Transformer Program	1,070	1,070	1,070	1,070	1,070
Consequential Replacement	**2,392**	**2,500**	**2,523**	**2,538**	**2,553**

Table 15: Reset RIN reconciliation table – Volumes