Distribution Switches Replacements

Business Case

19 January 2024

Part of Energy Queensland

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DOCUMENT VERSION

Version Number	Change Detail	Date	Updated by
Draft v0.1	Draft	10/11/2023	Senior Asset Strategy Engineer
Draft v0.2	Draft Submitted to Reg team	14/11/2023	Manager Asset Strategy
V1.0	Finalised	21/11/2023	Manager Asset Strategy

RELATED DOCUMENTS

Document Date	Document Name	Document Type
JAN 2024	Asset Management Plan – Switches & Ring Main Units	PDF
NOV 2023	Weibull Model Report – Switches v0.1	DOCX
NOV 2023	Switches Weibull modelling	Excel
NOV 2023	Switches risk modelling	Excel
JUN 2023	RIN 2.2 Compare 2021-22 (Rosetta)	Excel
NOV 2023	Energex 2022-23 - Category Analysis - RIN Response - Consolidated - 24 November 2023 – PUBLIC (16063386.1)	Excel
OCT 2023	Lines Defect Classification Manual	PDF
V3	Substation Defect Classification Manual	PDF
JUN 2023	Maintenance Acceptance Criteria (MAC) – Release 11	PDF
AUG 2023	Maintenance Activity Frequency (MAF) – Release 2	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 national disasters.xlsx (a compendium of various sources)	Excel
FEB 2021	Electrical Safety Code of Practice 2020 - Works	PDF
MAY 2023	Distribution Lines Refurbishment Guidelines – REPEX (Doc ID: 3034999)	PDF

1 SUMMARY

Title	EGX Switches Business Case AER 2025-30
DNSP	Energy Queensland (EQL) – Energex Ltd
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 Energex forecast capital expenditure over the regulatory period via a cost benefit analysis.
Identified need	☐ Legislation ☒ Regulatory compliance ☒ Reliability ☐ CECV ☒ Safety ☒ Environment ☒ Financial ☐ Other Energex is committed to adopting an economic, customer value-based approach when it comes to ensuring the safety and reliability of the network. To substantiate the advantages of this approach for the community and businesses over the modelling period, we have employed Net Present Value (NPV) modelling. This commitment is in line with our efforts to minimize the impact on customer prices. The purpose of this document is to outline the proposed volumes of replacement and expenditure associated with switches during the regulatory period 2025-30, in accordance with the lifecycle management strategies detailed in the Asset Management Plan. Energex replaces switches to ensure safety, reliability, environmental, and financial risks are managed in the best interest of consumers
Alternate options	Three different options were considered as follows over the counterfactual (Current defect Volume - Average 489 per year) replacements: • Option 1 - REPEX Model Cost Scenario – Average 429/yr • Option 2 - REPEX Model Lives Scenario – Average 49/yr • Option 3 - Additional Targeted – Average 892/yr.

<table>
<tr>
<td>Expenditure</td>
<td>
This business case relates only to switch replacement outside of substation.
<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>4.2</td><td>4.2</td><td>4.2</td><td>4.2</td><td>4.2</td><td>21.0</td></tr>
<tr><td>Consequential#</td><td>16.3</td><td>16.3</td><td>16.3</td><td>16.3</td><td>16.3</td><td>81.5</td></tr>
<tr><td>Switch Total</td><td>20.5</td><td>20.5</td><td>20.5</td><td>20.5</td><td>20.5</td><td>102.5</td></tr>
</table>
* Expenditure considered for this business case.
# Expenditure included in other investment programs (Pole Replacement, Overhead Conductor)
</td>
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<tr>
<td>Benefits</td>
<td>After a thorough evaluation of all available options, it has been determined that Energex 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>
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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 the asset performance, it became evident that the current level of defect will be maintained as the consequential replacements occurring under the defective pole replacement and targeted overhead reconductoring program are also expected to be continued to achieve the current level of service.

Energex 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 Southeast Queensland.

3.1 Asset Population

As per 2021-22 RIN data, Energex have a total of 112,818 Distribution Switches. An age profile of all distribution switch assets is shown in Figure 1.

Overhead Switches in the EQL network have been installed over several decades, both within substations and on the overhead network. The installed asset population consists of a variety of different switch makes and models.

Prior to the 1970s, vertically operated switches were installed at voltages lower than or equal to 66kV. Between 1970 and 1990, horizontally and vertically operated switches were installed. After 1990, horizontally operated copper rod switches formed the majority of the population and are now the current standard for isolators and air break switches.

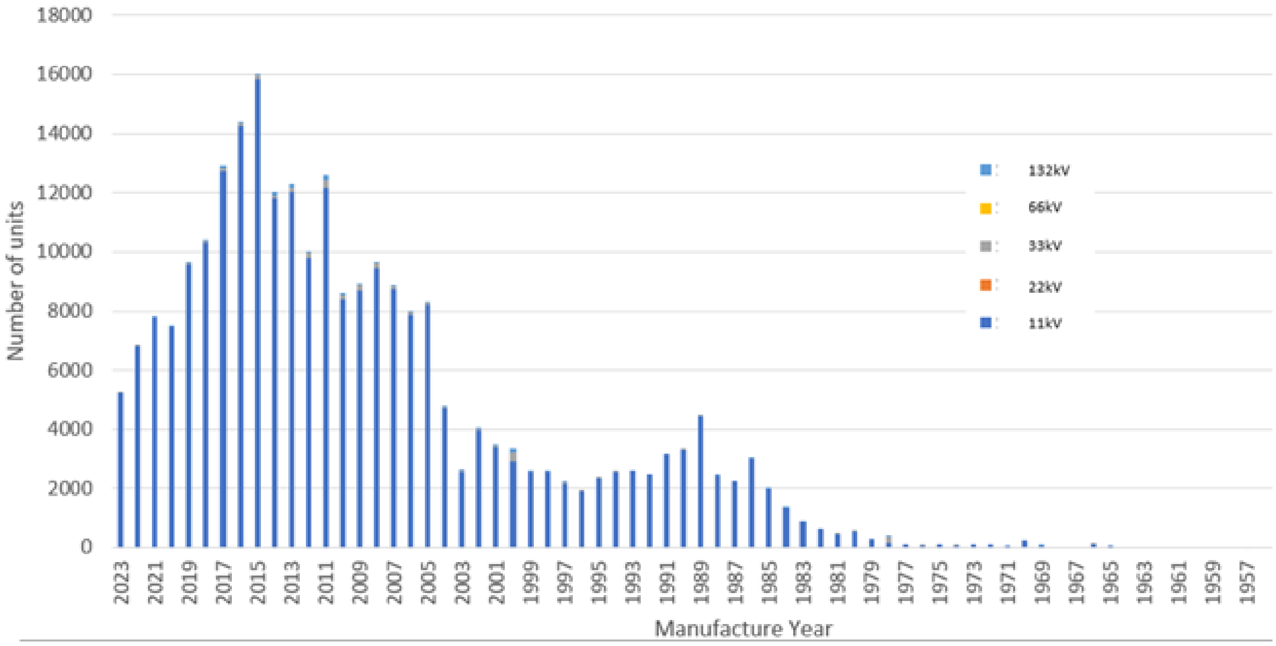

Figure 1: Age profile Switches (including Fuse Switches)

3.2 Asset Management Overview

Poletop switches are inspected periodically as required by Energex 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 or cable accessories, 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.

In recent years, reduced Failures and defects can be observed, this could be mainly due to the consequential replacements, evidently showing that our strategic decision is working as expected.

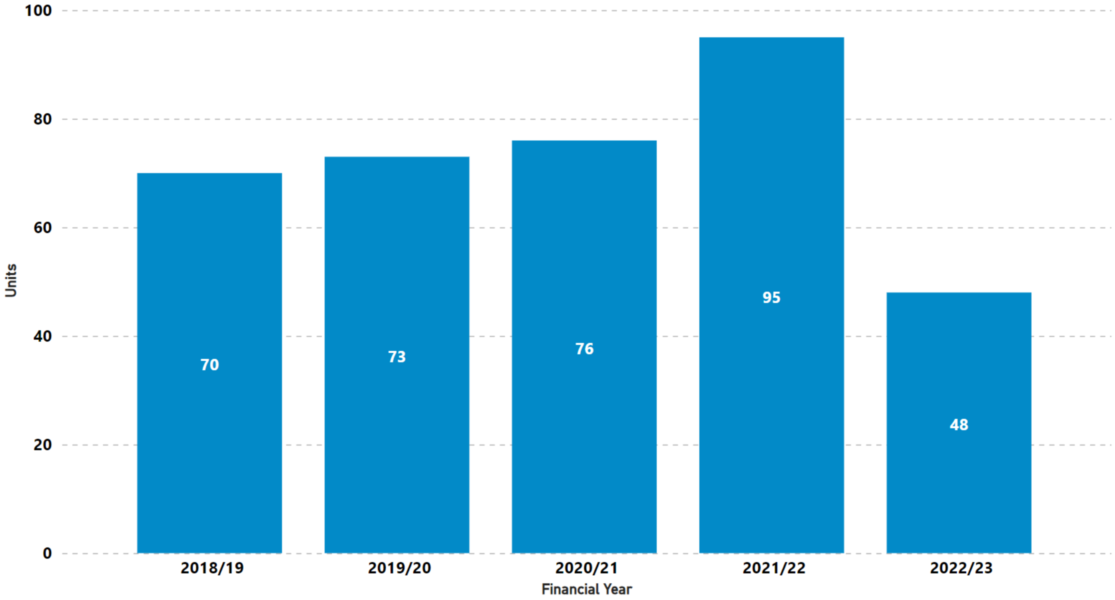

Figure 2: Switches Failure Volume

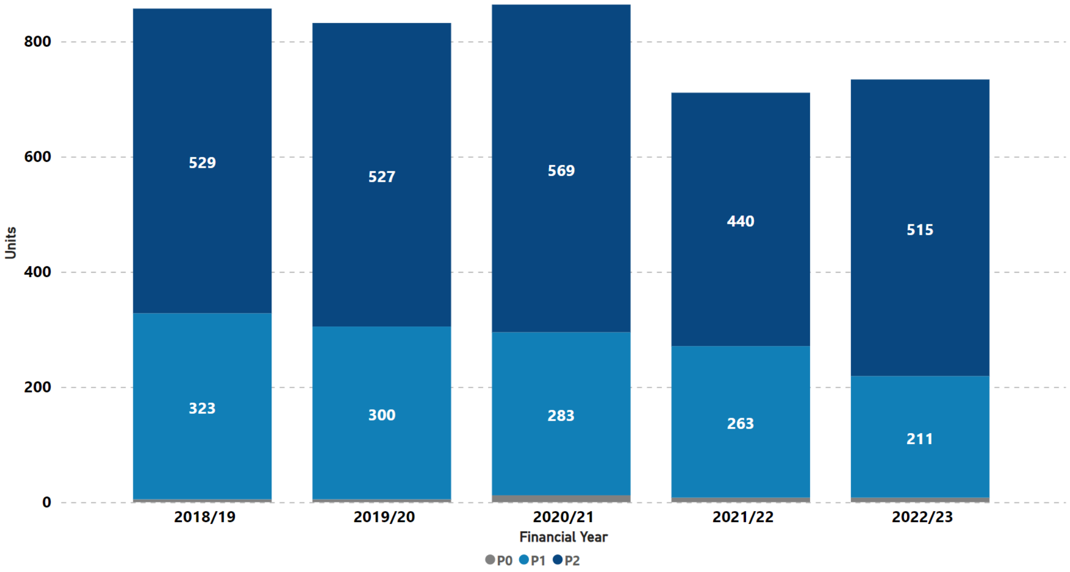

Figure 3: Switches Defect Volume

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

Energex 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.

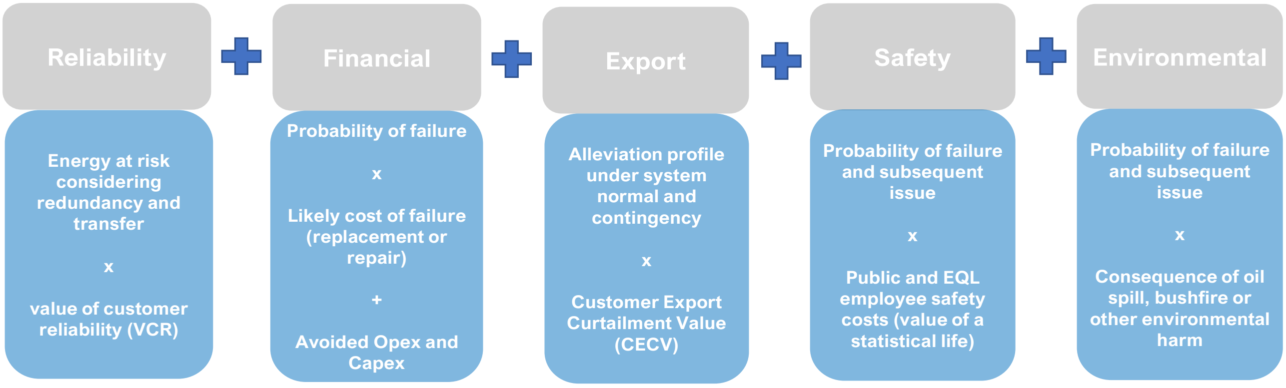

Figure 5: Risk Streams for Assets

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 are as per Table 2 and Figure 6.

Switch Type	Weibull Variables	Value
ABS	Beta β	1.7
	Eta η	26
GBS	Beta β	1.6
	Eta η	22
RMU	Beta β	2.1
	Eta η	16

Table 2: CDF Weibull Variables – Switches – All Type

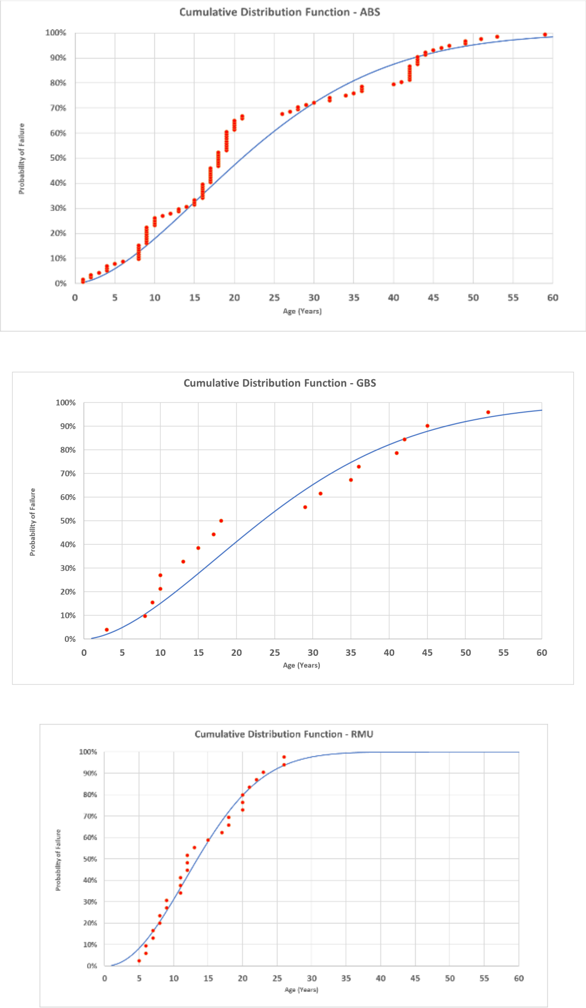

Figure 6: Weibull Cumulative Distribution Function

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, Energex has utilised a combination of historical performances and researched results. Energex 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, Energex 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 within 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 The 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 Energex, 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 1Table 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	705	705	705	705	705	**3,525**
With Reconductoring	1,183	1,183	1,183	1,183	1,183	**5,915**

Table 3: Consequential Asset Volumes – Actual Delivery

6 IDENTIFIED NEED

The identified need for this investment is driven by a positive cost/benefit analysis based on Value of Customer Reliability, Financial, Safety and Environmental benefits.

6.1 Problem Statement

Energex reviewed its asset management practices with respect to switches. The review has found that distribution switches were frequently replaced consequentially when the defective pole and targeted reconductoring was undertaken in addition to the moderate defect rate replacement. This business case covers only the defect replacement volume prudency.

6.2 Compliance

Energex'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)
- Energex Corporation Limited Authority No D01/99
- Energex Limited Authority No. D07/98.

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 Energex continued with the counterfactual option, the estimated expenditure is shown in the Table 4.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
$m, direct	4.2	4.2	4.2	4.2	4.2	21.0
Volume	489	489	489	489	489	**2,445**

Table 4: Counterfactual Delivery for the period (2025/26-2029/30)

6.3.2 Risk Quantification

Figure 7 provides the results of a quantitative forecast of emerging risk associated with Energex'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.

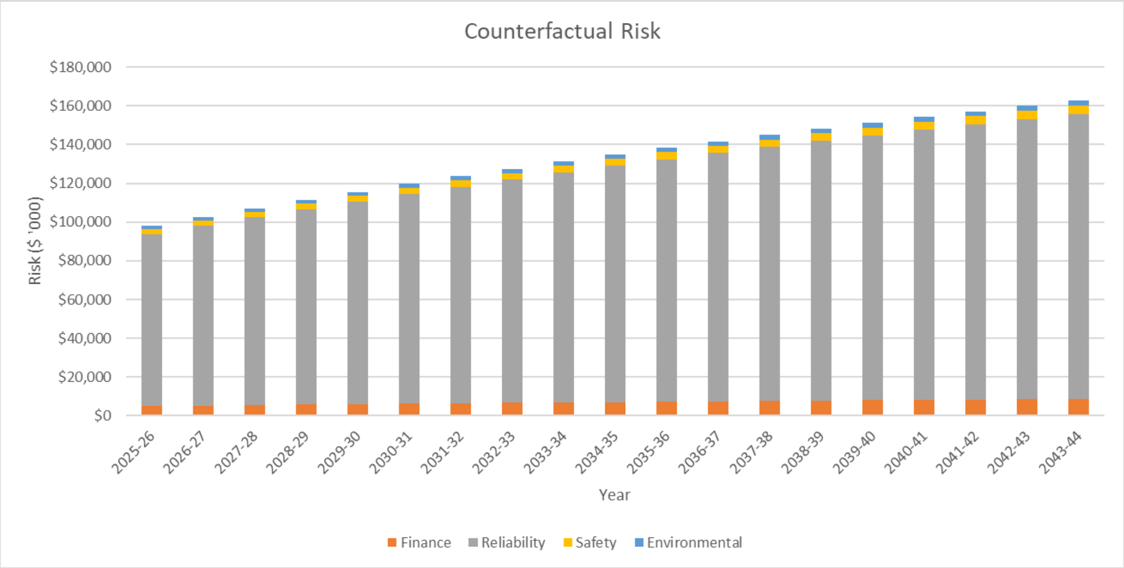

Figure 7: Counterfactual quantitative risk assessment

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

As the consequential replacement are forecasted to be maintained in the next 5yrs, based on the "REPEX guideline" the older switches will be targeted consequentially as part of the efficiency bundling. That has resulted in maintaining the switch performance. The current forecast shows the failure is increasing but in conjunction with consequential replacement from pole and conductor programs the failures are expected to be maintained within current service levels.

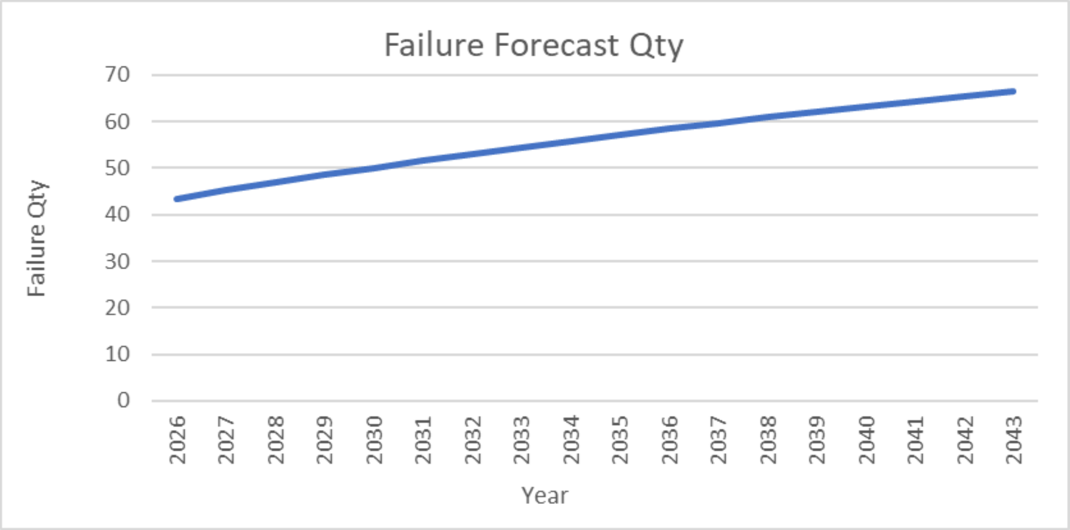

Figure 8: Switches Counterfactual Failure Forecast

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 90% of counterfactual.

7.1.1 Intervention Volume

The volume summary under this option has been provided in Table 5.

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Volume	429	429	429	429	429	**2145**

Table 5: Intervention Volume - Option 1

7.1.2 Risks/Benefits

In this option, our modelling shows that the unassisted failures are projected to increase only to some extent as it is leaving around only 10% of defect unattended which may result in unassisted failure. This option still delivers NPV negative due to loss of customer benefit compared to replacing 100% of identified defective asset (Counterfactual).

7.1.3 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 only 10% of counterfactual.

The volume summary under this option has been provided in Table 6.

7.1.4 Volumes

Year	2025-26	2026-27	2027-28	2028-29	2029-30	Total
Volume	49	49	49	49	49	**245**

Table 6: Intervention Volume - Option 2

7.1.5 Risks/Benefits

In this option, our modelling shows that the unassisted failures are projected to increase substantially as it is leaving around 90% 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 low defective switch replacement volume result in keeping increasingly more defective assets in active service, causing a flow on effect of investment requirements and poor asset performance.

7.2 Option 3 – Additional Targeted

This option includes additional replacement of greater than 45 years old assets proactively including corrective replacement of all identified defective assets (counterfactual).

7.2.1 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	892	892	892	892	892	**4,460**

Table 7: Intervention Volume - Option 3

7.2.2 Risks/Benefits

Under this approach, our modelling predicts that the occurrence of unassisted distribution switches will be reduced in comparison to not only the counterfactual option, but all other options as well. 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, and as stated, in option 2 Repex Lives Scenario where a portion of the defects left unattended leads to elevated failure. Option 3 being the best asset performance model requires additional investment offsetting the risk reduction and community benefits up to some extent. Option 1 and counterfactual maintains the current performance and delivers the balanced outcome.

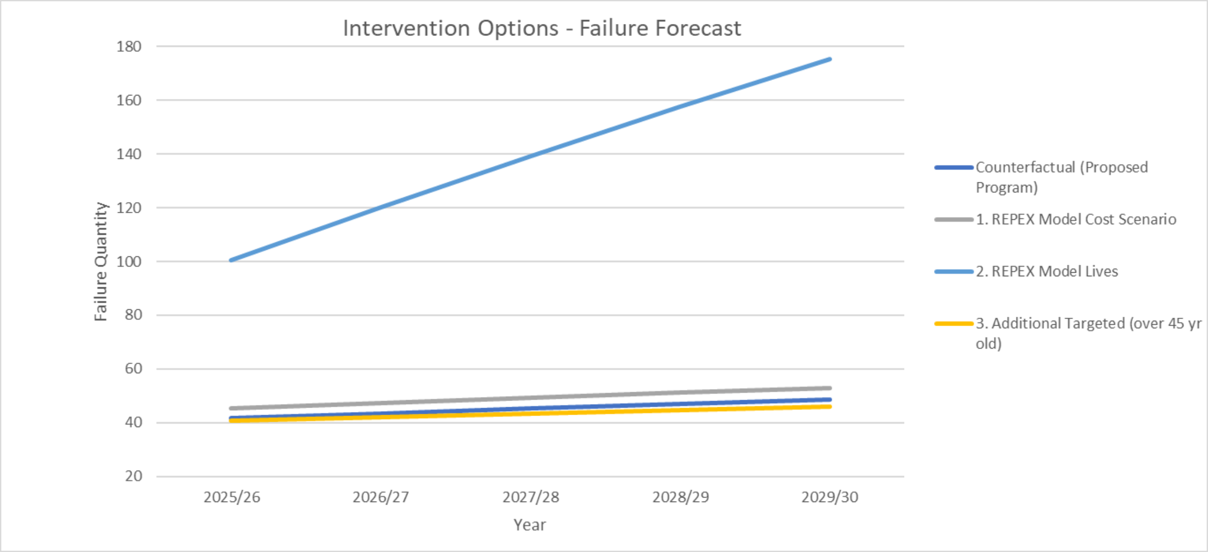

Figure 9: Failure Forecast

8.2 Economic Analysis

The NPV of cost benefit analysis of the options is summarised in Table 8 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 portion of the defective assets 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**	**-$13,915,240**	-$115,546	-$13,799,694
2. REPEX Model Lives	**4**	**-$142,153,387**	$9,631,125	-$151,784,512
3. Additional Targeted (over 45 yr old)	**1**	**$49,531,007**	-$7,906,539	$57,437,546

Table 8: NPV Modelling Outcomes for All Options

Table 9 summarises the volume replacements for all options.

Intervention Volume	2025/26	2026/27	2027/28	2028/29	2029/30
Counterfactual (Proposed Program)	489	489	489	489	489
1. REPEX Model Cost Scenario	429	429	429	429	429
2. REPEX Model Lives	49	49	49	49	49
3. Additional Targeted (over 45 yr old)	892	892	892	892	892

Table 9: Option volumes

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

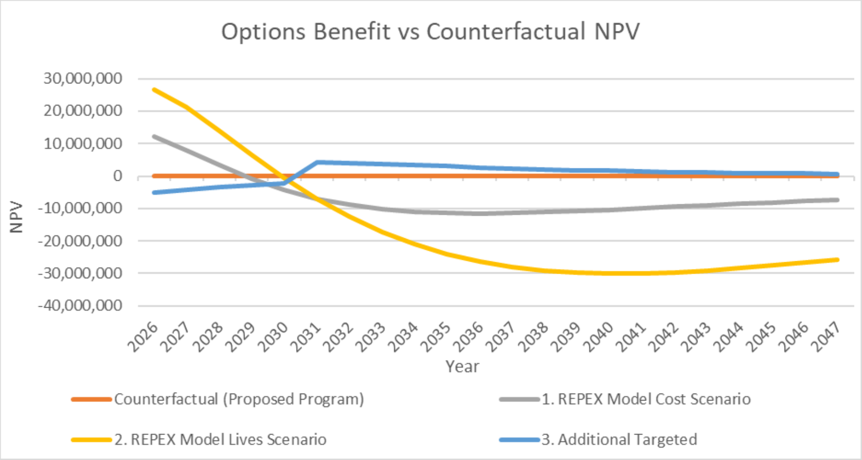

Figure 10: Benefits for all options

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, the counterfactual is the option which will achieve network standard compliance and high customer benefits. Therefore, it is prudent to continue with business as usual. Even though Option 3 will also add additional customer benefit, the substantial investment outweighs this.

The analysis presented here in Table 10 compares the options to their respective **counterfactual** (**preferred)** alternatives.

Criteria	Option 1 – REPEX Model Cost Scenario	Option 2 – REPEX Model Lives Scenario	Option 3 – Additional Targeted
Net NPV	-$14m	-$142m	$49m
Investment Risk	Low	Low	High
Benefits	Low	Low	High
Delivery Constraint	Low	Low	High
Detailed analysis – Advantage	• Volume aligns closer to counterfactual option. • Asset performance only moderately lower than counterfactual	• Do minimum scenario • Investment saving of $9.6m	• Additional $57m Customer Benefit • Transition towards asset performance improvement
Detailed analysis – Disadvantage	• Decline in asset performance if this option continues longer. • Leaving 10% of defect unattended • Negative NPV • Loss of $14m benefit	• Leaving 90% of defects unattended • Elevated failures • Negative NPV • Poor asset performance • Elevated safety and finance risk • Loss of $152m benefit for our customers. • Need for substantial investment in future	• Additional investment of $8m • High resource impact • Investment outweighs customer benefit

Table 10: Options Analysis Scorecard

9 SUMMARY

Energex 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 preferred option has claimed its prudency and effectiveness over other options and therefore is recommended to be approved.

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 APPENDIXES

11.1 Appendix 3: Reset RIN Data Reconciliation

	2025/26	2026/27	2027/28	2028/29	2029/30
Distribution Transformer Contributor	Replacement Expenditure	Replacement Expenditure	Replacement Expenditure	Replacement Expenditure	Replacement Expenditure
RIN	20,517,784	20,517,784	20,517,784	20,517,784	20,517,784
Dist Switches Replacement					
Dist Switches Defect	4,221,092	4,221,092	4,221,092	4,221,092	4,221,092
Targeted Replacement	0	0	0	0	0
Dist Switches Replacement Total	**4,221,092**	**4,221,092**	**4,221,092**	**4,221,092**	**4,221,092**
Consequential Dist Switches Replacement					
Pole Consequential Replacement	6,086,870	6,086,870	6,086,870	6,086,870	6,086,870
Conductor Consequential Replacement	10,209,822	10,209,822	10,209,822	10,209,822	10,209,822
Consequential Replacement	**16,296,692**	**16,296,692**	**16,296,692**	**16,296,692**	**16,296,692**

Table 11: Reset RIN reconciliation table – Expenditure $ in 2022-23

$, direct 2024-25	2025/26	2026/27	2027/28	2028/29	2029/30
	Expenditure	Expenditure	Expenditure	Expenditure	Expenditure
RIN	23,329,091	23,407,614	23,472,682	23,516,479	23,672,449
Dist Switches Replacement					
Dist Switches Defect	4,799,458	4,815,613	4,828,999	4,838,009	4,870,097
Targeted Replacement	0	0	0	0	0
Dist Switches Replacement Total	**4,799,458**	**4,815,613**	**4,828,999**	**4,838,009**	**4,870,097**
Consequential Dist Switches Replacement					
Pole Consequential Replacement	6,920,881	6,944,176	6,963,480	6,976,472	7,022,743
Conductor Consequential Replacement	11,608,751	11,647,825	11,680,203	11,701,997	11,779,609
Consequential Replacement	**18,529,633**	**18,592,001**	**18,643,683**	**18,678,469**	**18,802,352**
BC Total	**4,799,458**	**4,815,613**	**4,828,999**	**4,838,009**	**4,870,097**

Table 12: Reset RIN reconciliation table – Expenditure $ in 2024-25

	2025/26	2026/27	2027/28	2028/29	2029/30
Distribution Transformer Contributor	Replacement Qty	Replacement Qty	Replacement Qty	Replacement Qty	Replacement Qty
RIN	2,377	2,377	2,377	2,377	2,377
Dist Switches Replacement					
Dist Switches Defect	489	489	489	489	489
Targeted Replacement	0	0	0	0	0
Dist Switches Replacement Total	**489**	**489**	**489**	**489**	**489**
Consequential Dist Switches Replacement					
Pole Consequential Replacement	705	705	705	705	705
Conductor Consequential Replacement	1,183	1,183	1,183	1,183	1,183
Consequential Replacement	**1,888**	**1,888**	**1,888**	**1,888**	**1,888**

Table 13: Reset RIN reconciliation table – Volume.

12 GLOSSARY

Term	Meaning
AER	Australian Energy Regulator
AHI	Asset Health Index
ALARP	As Low As is Reasonably Practicable
Capex	Capital expenditure
CoF	Consequence of Failure
DNSP	Distribution Network Service Provider
EGX	Energex
kV	Kilovolt
kVA	Kilovolt ampere
kW	Kilowatt
kWh	Kilowatt hour
LoC	Likelihood of Consequence
LV	Low voltage
NER (or Rules)	National Electricity Rules
NPV	Net Present Value
PIR	Post Implementation Review
PoF	Probability of Failure
Previous regulatory control period or previous period	The regulatory control period commencing 1 July 2020 and ending 30 June 2025
PTRM	Post tax revenue model
PV	Photovoltaic (solar PV)
QCA	Queensland Competition Authority
R&D	Research and development
RAB	Regulatory asset base
RBA	Reserve Bank of Australia
Regulatory proposal	Energex's regulatory proposal for the next regulatory control period submitted under clause 6.8 of the NER
Repex	Replacement capital expenditure
RIN	Regulatory information notice
SCI	Statement of Corporate Intent
SFAIRP	So Far As Is Reasonably Practicable
VCR	Value of Customer Reliability