Revised Proposal

Attachment 5.13.M.5

High Voltage Underground Cable Reactive program CBA summary

January 2019

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High Voltage Underground Cable Reactive program CBA summary

Introduction

Ausgrid has reviewed the risks associated with high voltage underground cables by undertaking a quantitative risk assessment. This document covers the outcomes of cost benefit analysis and should be reviewed in conjunction with the cost benefit analysis (CBA) modelling methodology report[1].

Scope

This model covers the following RIN categories:

- UNDERGROUND CABLES - > 1 KV & < = 11 KV
- UNDERGROUND CABLES - > 22 KV & < = 33 KV

Analysis Outcome

For the high voltage underground cable asset category, there are no sub-set of assets with known risks which require individual analysis and treatment. Proactively testing all high voltage underground cables to ascertain their condition and to then prioritise replacement is not reasonably practicable due to the size of the asset population and constrained resource availability to perform this testing.

Ausgrid is proposing that the existing strategy of reactive replacement following failure continues for these assets during FY20 to FY24. The model output supports this strategy following replacement of approximately 18 km of cable during FY19.

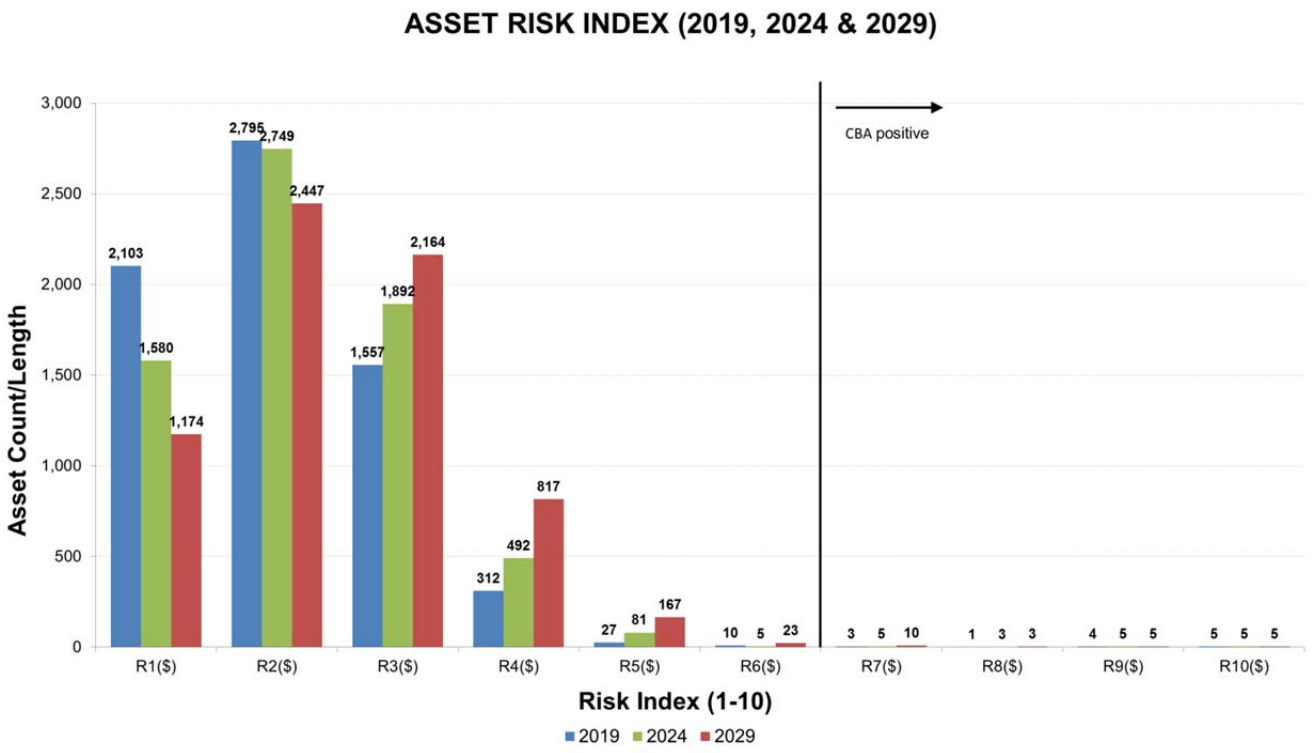
The analysis was completed using historical data up to and including FY18. The CBA model forecasts risk from FY19 onwards. The volumes included in FY19 are reflective of Ausgrid's forecast reactive program in this year.

Based on the analysis completed, the model output is forecasting 1,624 failures resulting in the requirement for reactive replacement by the end of FY24.

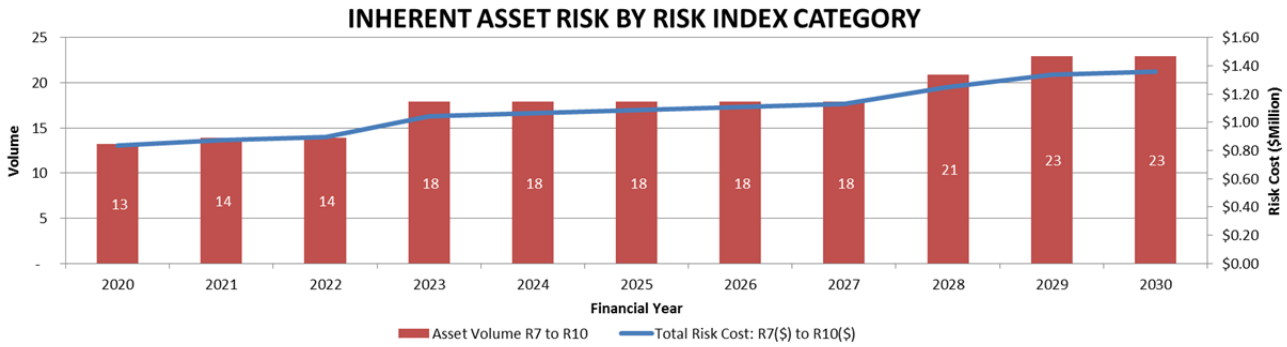
Risk Index

The normalised risk index below considers the probability of failure, consequence of failure and the annualised replacement cost.

[1] Attachment 5.13.M.0 – Repex program CBA modelling methodology



There are no high voltage underground cables which are cost benefit positive during FY20 to FY24 following replacement of 18 km during FY19.



Option One – Base case (reactive replacement)

Under a base case (reactive replacement) scenario, Ausgrid forecasts reactive replacement requirements during FY20 to FY24 based on 1,624 failures. The table below shows the volume of failures which will result in reactive replacement in the year that they are forecast to fail.

Financial Year	FY20	FY21	FY22	FY23	FY24
Volumes of failures	307	316	325	334	342

Option Two – Replace where cost benefit positive

Given the model shows no high voltage underground cables as cost benefit positive during FY20 to FY24, this option is not considered as supported.

Option Three – Replace all cost benefit positive by the end of the period

Given the model shows no high voltage underground cables as cost benefit positive during FY20 to FY24, this option is not considered as supported.

Data input

		Data Source
Population	7,271	GIS – Asset Register
Object Types	HV cable	GIS – Asset Register
Conditional & Functional Failures / Time Period	1,791 failures 6 years	SAP – Defect Records
Asset standard life	58.03 years	RAB life
WACC	3.90%	Regulated Rate

Planned Replacement Cost

A weighted average for the period per asset was used in this model.

Cost	Data Source
$30,824	Calculated average reactive replacement cost (FY19 real direct costs)

Crow-AMSAA parameters

The Crow-AMSAA parameters have been developed by applying asset age to failure correlation using Ausgrid historical data relating to failures and assets.

β_{good}	N/A	$\beta_{average}$	1.9785	β_{poor}	N/A
$\lambda_{average}$	6.73E-04				

Adjustments factors

Probability of Failure (PoF)	• Actual failure data • Age
Probability of Consequence (PoC)	• Nil

Model calculated failures

	2020	2021	2022	2023	2024
Failures	307	316	325	334	342

Sensitivity

Sensitivity analysis in regard to gross disproportionality factors was not undertaken due to the intent to continue with the existing reactive replacement strategy for these assets.

Modelled inherent incident consequences

Safety

Due to this model being for reactive replacement, analysis of safety probability of consequence factors including incident conversion rate and probability of severity was not undertaken.

Fire

Due to this model being for reactive replacement, analysis of fire probability of consequence factors including incident conversion rate and probability of severity was not undertaken.

Environment

Due to this model being for reactive replacement, analysis of environmental probability of consequence factors including incident conversion rate and probability of severity was not undertaken.

Loss of supply

Ausgrid's failure data has been reviewed to estimate the proportion of failures resulting in unserved energy and reasonable switching / restoration times.

Outage Type	HV	Data Source
Proportion of failures resulting in unserved energy	82%	SAP - defect data
VCR	$40.73/kWh	AEMO / AER
Average kWh lost per failure	3,197	Metering data
Switching time/Proportion load	4.07 hrs / 100%	OMS Data
Time without supply	3.34 hrs	Calculated

Average **loss of supply** consequence per asset: $104,922 per event.

Finance

		Data Source
Annual deferral benefit of reactive	$30,824	Estimated
Repair cost	$0	N/A
Proportion replaced	100%	SAP – Defect records
Weighted replacement/repair cost	**$30,824**	Calculated
Maintenance original asset per annum	$0	N/A
Maintenance replacement asset per annum	$0	N/A
Maintenance benefit per asset per annum	**$0**	Calculated

Average **financial** consequence/benefit per asset: $30,824 per event.

AVERAGE TOTAL CONSEQUENCE per asset: $135,746 (including POC x C($))