

## Contents

<a href="#">Inputs</a>	Tab I0
<a href="#">Calculations</a>	C0
<a href="#">Cashflow</a>	C1
<a href="#">CBA results</a>	R0
<a href="#">Cashflow results</a>	R1

## Cell colour key

### Header 1

### Header 2

### Table Header

Format	Example
Table Row Name	Text
Input Cell	
Calculation cell	
Parameter Cell	
Output Cell	

## Project description

This project is to replace Protection Scheme relay assets that have reached the end of their technical and economic lives. Different options are considered including - run to failure (requiring corrective maintenance action to replace the failed unit) and replacement plans (a capital project to undertake relay replacement before failure). This project is to replace 416 Protection Scheme relay assets that have reached the end of their technical and economic lives.

## Project options

<b>Base case</b>	Business as usual with no capital expenditure however we assume you will need to replaced 10 units each year which considered in corrective replacement costs
<b>Option 1</b>	The total population of relays requiring changeout is 416 (see protection system tab). It is assumed that a 1% annual failure rate will apply to the population. Corrective maintenance will be used to changeout failed units and routine maintenance costs are based on the average trendline annual cost. In this option a capital project to replace relays before failure is undertaken over a five year period in 2019-2023.
<b>Option 2</b>	Replace 366 relays in 2024-28, as by this time 50 relays have already been replaced corrective replacement (10 per year).

## Key modelling assumptions

Financial year runs from 1 July to 30 June.

Real 2018 \$ are used for all monetary values unless otherwise stated.

## Inputs to the model

Parameter/Input	Description	Source
Discount rate	Real pre-tax discount rate	ElectraNet estimate
Current financial year	Year to start analysis	When the capital investment is due to occur for the project
Time horizon	Length of time under consideration	Total project life including useful life and if the project occurred in the next regulatory period
Capital costs	Amount of capital investment in real terms for each project option	Estimated capital costs in the estimate from project center
Useful life	Length of time capital investments are expected to provide service	Useful life estimated from original economic justification on project center
Routine maintenance	Annual amount of estimated routine maintenance in real terms	Detailed Opex Assessment
Corrective maintenance	Amount of estimated corrective maintenance in real terms	Detailed Opex Assessment
Corrective Replacement Cost	Cost of replacing 10 protection system units as they fail	Detailed Opex Assessment
Outage cost	Amount additional MWh of unserved energy when analogue relays fail	Reduced Outage Time
Risk Cost Reduction	Value of risk associated with each of the different options	See detailed risk models



## R0 CBA Results

Sensitivities, results and rankings

### Input Summary

#### Parameter selection for sensitivity analysis

Capital cost

Scenario parameters		Capital cost scenario		
	Units	Low	Medium	High
Assumed scenario weighting	% weighting	33%	33%	33%
Discount rate	% real, pre-tax	6.00%	6.00%	6.00%
Capital cost	% of estimate	70%	100%	130%

#### Cost selection for sensitivity analysis

Corrective Replacement Cost

Scenario cost inputs		Corrective Replacement Cost scenario		
	Units	Low	Medium	High
Corrective Maintenance	% of estimate	100.0%	100.0%	100.0%
Routine Maintenance	% of estimate	100.0%	100.0%	100.0%
Corrective Replacement Cost	% of estimate	70.0%	100.0%	130.0%
Outage Cost	% of estimate	100.0%	100.0%	100.0%

#### Benefit selection for sensitivity analysis

Reduced outage time

Scenario benefit inputs		Reduced outage time scenario		
	Units	Low	Medium	High
Risk Cost Reduction	% of estimate	80.0%	80.0%	80.0%

### Cost Benefit Analysis Results (Quantitative)

#### Output summary Net present value of benefits

NPV results		Scenario			Weighted
Option	Units	Low	Medium	High	NPV
Option 1	2018 \$	15,212,289	11,101,193	6,990,096	11,101,193
Option 2	2018 \$	10,692,483	8,612,751	6,533,018	8,612,751

#### Output summary Ranking of options

Ranking of options		Scenario			Weighted
Option	Units	Low	Medium	High	ranking
Option 1	2018 \$	1	1	1	1
Option 2	2018 \$	2	2	2	2

### Other Considerations (Qualitative)

These assets are at the end of their technical life, resulting in an increased risk of failure which could lead to increased safety and reliability issues.

It is likely that if these assets are not replaced that a number will fail during the regulatory period or the next period resulting in corrective operational expenditure cost and the unplanned unavailability of parts of the network.