Introduction   **14034 Isolator Unit Asset Replacement 2019-23**

Contents

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

A project to replace 101 isolators that have reached the end of their technical and economic lives. The isolators identified for replacement are listed in the Isolators tab. This project considers several options including, running existing units to failure (in practice this means increasing corrective maintenance cost and decreasing reliability) or planned replacements.

Project options

Base case   Business as usual with no capital expenditure.

Option 1   101 isolators have been identified for replacement, aged between 46 and 62 years.
The works assumed for this project includes the replacement of these isolators where no other Capital Projects are scheduled to undertake replacement of the identified isolators in the 2019-2023 regulatory period. This replacement is to be completed in accordance with the Substation Design Manual and relevant standards.

Option 2   Replace isolators in the 2024-2028 regulatory period. However, 50 Isolators have already been replaced by emergency replacement therefore only 51 are required to be replaced.

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	Latest estimate v9 20/9/2016, Total Cost $10,415,360
Useful life	Length of time capital investments are expected to provide service	Useful life estimated from orginal economic justification on project center
Routine maintenance	Annual amount of estimated routine maintenance in real terms	Assume 1% of Capital Cost
Corrective maintenance	Amount of estimated corrective maintenance in real terms	Detailed Opex Assessment
Emergency replacement cost	Cost to replacement units as the units fail	Detailed Opex Assessment
Risk cost reduction	Value of risk associated with each of the different options.	See detailed risk models

I0 Inputs
User provided parameters and inputs to the model

Inputs

General parameter inputs

Parameter	Unit	Value	Source
Inflation rate	Percentage	2.00%	RBA
Discount rate (real, pre-tax): estimate	Percentage	6.00%	ElectraNet estimate
Discount rate (real, pre-tax): lower bound	Percentage	4.50%	ElectraNet estimate
First year of analysis	Year	2019	Current financial year
Base financial year for analysis	Year	2018	Base year
Time horizon	Years	20	ElectraNet

	Sensitivities	
Low	Medium	High
1.50%	2.00%	3.00%
4.50%	6.00%	8.50%

Capital cost

Sensitivities			Comment
Low	Medium	High	
70%	100%	130%	Standard sensitivities used

Capital cost inputs

Option	Asset	Amount	Start year	End year	Commission Year	Asset life
Option 1	Isolators 2019	2,207,368	2019	2019	2020	20
Option 1	Isolators 2020	2,207,368	2020	2020	2021	20
Option 1	Isolators 2021	2,207,368	2021	2021	2022	20
Option 1	Isolators 2022	2,207,368	2022	2022	2023	20
Option 1	Isolators 2023	2,207,368	2023	2023	2024	20
Option 2	Isolators 2024	1,114,611	2024	2024	2025	20
Option 2	Isolators 2025	1,114,611	2025	2025	2026	20
Option 2	Isolators 2026	1,114,611	2026	2026	2027	20
Option 2	Isolators 2027	1,114,611	2027	2027	2028	20
Option 2	Isolators 2028	1,114,611	2028	2028	2029	20

Costs inputs

Cost type	Cash/Non-cash	Low	Percentage Medium	High	Comment
Corrective Maintenance	Cash	70%	100%	130%	Standard sensitivities used
Routine Maintenance	Cash	70%	100%	130%	Lower sensitivities used
Emergency replacement	Cash	70%	100%	130%	

Financial year Corrective Maintenance	Units	2019 $	2020 $	2021 $	2022 $	2023 $	2024 $	2025 $	2026 $	2027 $	2028 $	2029 $	2030 $	2031 $	2032 $	2033 $	2034 $	2035 $	2036 $	2037 $	2038 $	Comment
Base case	2018 $	531,827	489,523	447,219	404,915	382,140	336,635	297,344	258,053	218,762	182,899	135,629	158,547	170,006	181,466	193,546	203,491	213,436	223,381	233,326	243,795	The large number of isolators being replaced have a variety of different ages. Therefore the base case maintenance is calculated from the median age of the isolators which is 52.5 years (Isolator Tab). The Base Case is being adjusted year by year due to the aging of the emergency replacement for the 10 isolators replaced each year until all of the 101 isolators have been replaced. Option 1 has lower maintenance costs as the units with the highest maintenance cost are being replaced first.
Option 1	2018 $	104,557	104,557	104,557	104,557	104,557	167,322	167,322	167,322	167,322	167,322	220,294	220,294	220,294	220,294	220,294	267,765	267,765	267,765	267,765	267,765	
Option 2	2018 $	531,827	489,523	447,219	427,646	382,140	104,557	110,772	116,986	123,200	129,415	167,322	172,567	177,812	183,057	188,301	220,294	224,995	229,695	234,395	239,095	

Financial year Routine Maintenance	Units	2019 $	2020 $	2021 $	2022 $	2023 $	2024 $	2025 $	2026 $	2027 $	2028 $	2029 $	2030 $	2031 $	2032 $	2033 $	2034 $	2035 $	2036 $	2037 $	2038 $	Comment
Base case	2018 $	30,368	27,494	24,621	21,747	21,070	17,836	14,797	11,758	8,719	6,087	2,318	3,163	3,585	4,007	4,449	4,928	5,407	5,887	6,366	6,868	The large number of isolators being replaced have a variety of different ages. Therefore the base case maintenance is calculated from the median age of the isolators which is 52.5 years (Isolator Tab). The Base Case is being adjusted year by year due to the aging of the emergency replacement for the 10 isolators replaced each year until all of the 101 isolators have been replaced. Option 1 has lower maintenance costs as the units with the highest maintenance cost are being replaced first.
Option 1	2018 $	1,345	1,345	1,345	1,345	1,345	3,311	3,311	3,311	3,311	3,311	5,609	5,609	5,609	5,609	5,609	8,153	8,153	8,153	8,153	8,153	
Option 2	2018 $	30,368	27,494	24,621	21,747	18,874	1,345	1,539	1,734	1,929	2,124	3,311	3,539	3,766	3,994	4,221	5,609	5,861	6,113	6,365	6,616	

Financial year Emergency replacement	Units	2019 $	2020 $	2021 $	2022 $	2023 $	2024 $	2025 $	2026 $	2027 $	2028 $	2029 $	2030 $	2031 $	2032 $	2033 $	2034 $	2035 $	2036 $	2037 $	2038 $	Comment
Base case	2018 $	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	1,298,000	0	0	0	0	0	0	0	0	0	0	Emergency reactive replacement of isolators as the base case assuming 10 fail each year of the 101 isolators idenitified for replacement with 11 being replaced in the final year.
Option 1	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Option 2	2018 $	1,180,000	1,180,000	1,180,000	1,180,000	1,180,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Benefit inputs

Benefit type	Cash/Non-cash	Low	Percentage Medium	High	Comment
Risk Cost Reduction	Cash	50%	80%	100%	Lower sensitivites applied

Financial year Risk Cost Reduction	Units	2019 $	2020 $	2021 $	2022 $	2023 $	2024 $	2025 $	2026 $	2027 $	2028 $	2029 $	2030 $	2031 $	2032 $	2033 $	2034 $	2035 $	2036 $	2037 $	2038 $	Comment
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	A conservative approach to risk has been undertaken as benefits from reducing the risk will not start until over half of the project has been undertaken.
Option 1	2018 $	0	0	0	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	
Option 2	2018 $	0	0	0	0	0	0	0	0	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	139,575	

R0 CBA Results
Sensitivities, results and rankings

Input Summary

Parameter selection for sensitivity analysis — Discount rate

Scenario parameters	Units	Discount rate scenario		
		Low	Medium	High
Assumed scenario weighting	% weighting	33%	33%	33%
Discount rate	% real, pre-tax	4.50%	6.00%	8.50%
Capital cost	% of estimate	100%	100%	100%

Cost selection for sensitivity analysis — Corrective Maintenance

Scenario cost inputs	Units	Corrective Maintenance scenario		
		Low	Medium	High
Corrective Maintenance	% of estimate	70.0%	100.0%	130.0%
Routine Maintenance	% of estimate	100.0%	100.0%	100.0%
Emergency replacement	% of estimate	100.0%	100.0%	100.0%

Benefit selection for sensitivity analysis — Risk Cost Reduction

Scenario benefit inputs	Units	Risk Cost Reduction scenario		
		Low	Medium	High
Risk Cost Reduction	% of estimate	50.0%	80.0%	100.0%

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 $	2,381,074	2,644,447	2,443,682	2,489,735
Option 2	2018 $	2,029,204	1,994,392	1,671,832	1,898,476

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