Introduction

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Key modelling assumptions

Financial year runs from 1 July to 30 June.

2018 dollars are used for all monetary values unless otherwise stated.

Project description

The existing single circuit 132 kV line from Cultana to Port Lincoln was built in 1967 and some components are reaching end of life . It requires significant ongoing expenditure to refurbish the line and restore it to the necessary performance standard. The refurbishment works are required in the following areas:

- Conductor replacement
- Insulator replacement
- Detailed inspection and sample testing

Costs of maintaining the existing line are significant and are of sufficient size to warrant consideration of other possible options to reinforce the transmission line going forward. This project assessment looks to inform the economic case for different reinforcement options.

Project options

Base case	The base case involves maintaining the current arrangements to the extent possible, and would involve maintaining the existing line and continued purchases of generation support. The two major costs would be 1) higher repairs and maintenance costs and 2) generation support. The base case also involves increased risk of faults as the line approaches the end if its useful life.
Option 1	Live line reconductoring of the existing single circuit 132kV line. This option would involve higher line reconductoring costs but removes the need for generation support during line works.
Option 2	Option 2 is the deferred version of Option 1, where capital works on the lines are deferred for 5 years.
Option 3	Build a double circuit 132 kV transmission line for the entire length of the Eyre Peninsula transmission line on the new easement. In addition, there will be substation works for Cultana, Port Lincoln, and Yadnaire.
Option 4	Option 4 is the deferred version of Option 3, where capital works on the lines are deferred for 5 years

Inputs to the model

Parameter/Input	Description	Source
Discount rate	Rate used to discount future costs and benefits to account for the time value of money	ElectraNet Estimate
Base financial year for analysis	The base year which cost and benefit inputs are denominated	ElectraNet Estimate
Time horizon	Number of years the analysis	ElectraNet Estimate
Capex: transmission line	Costs for build of transmission line and cost for reconductoring transmission	ElectraNet Estimate
Capex: transmission line capex timing	Timing of transmission line capex expenditure	ElectraNet Estimate
Caepx: ElectraNet project delivery costs	Capitalised cost for ElectraNet to manage and deliver the project	ElectraNet Estimate
Capex: generation support costs during construction (capitalised generation costs)	Cost of generation support required during construction or reconductoring of lines	ElectraNet Estimate
Capex: substation capital expenditure	Cost of substation works related to options involving double circuit lines	ElectraNet Estimate

Capex: Substation capital expenditure timing	Timing of substation capex expenditure	ElectraNet Estimate
Capex: islanding project capital expenditure	Cost of islanding project for options involving single circuit lines	ElectraNet Estimate
Opex: generation support	Cost of maintaining generation support availability at Port Lincoln	ElectraNet estimates
Opex: routine maintenance costs	Annual routine maintenance costs	ElectraNet Estimate
Opex: corrective maintenance backlog	Cost of corrective maintenance backlog	ElectraNet Estimate
Opex: Generation support costs required during faults repair and restoration	Cost of generation support during faults and fault restoration	ElectraNet Estimate
Unserved energy	Annual value of unserved energy per year if load is not met	AEMO for VCR assumption ElectraNet estimate on Eyre Peninsula upgrade for load, two events, and 30 min event duration assumptions used
Reduced constraints on windfarms	Annual value of extra dispatch available by reducing constraints on windfarms	ElectraNet estimate Average pool price and renewable energy certificate price
Reduced transmission losses	Annual value of a reduction in transmission losses	Average pool price
Value of generation lost avoided	Annual value of avoided generation lost	ElectraNet estimate on Eyre Peninsula upgrade for loads and number of faults Average pool price and renewable energy certificate price
Number of faults	Number of faults assumed for a single circuit transmission line per year	AEMO
Risk cost reduction	Annual value of avoided risk	Risk cost

I0 Inputs

User provided parameters and inputs to the model

Inputs

General parameter inputs

Parameter	Unit	Value	Source
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	First year that capex is incurred
Base financial year for analysis	Year	2018	Base year
Time horizon	Years	20	ElectraNet
Average pool price	$/MWh	70	ElectraNet
Renewable energy certificate price	$/MWh	80	ElectraNet

Sensitivities		
Low	Medium	High
4.50%	6.00%	8.50%

Transmission line	F1810	F1811	Percentage	Source
2021-2023 replacement	52	66	44%	
2026-2028 replacement	91	60	56%	
Total line length	143	126	100%	

Capital cost

Type	Unit	Medium	Medium	Medium	Comment
132kV DC line costs	$/km	600,000	600,000	600,000	Range based on quotes from contractors
Non line capital cost sensitivity	%	70%	100%	130%	Standard sensitivities

Option	Asset	Amount	Start year	End year	Year commission	Useful life
Option 1	Live reconducted lines	58,542,742	2021	2022	2023	27
Option 1	Gen support	10,500,000	2021	2022	2023	27
Option 1	EN internal costs	4,600,000	2021	2022	2023	27
Option 2	Live reconducted lines	58,542,742	2026	2027	2028	27
Option 2	Gen support	10,500,000	2026	2027	2028	27
Option 2	EN internal costs	4,600,000	2026	2027	2028	27
Option 3	132kV transmission line DC	161,400,000	2021	2022	2023	50
Option 3	Gen support	2,151,000	2022	2022	2023	50
Option 3	EN internal costs	6,456,000	2021	2022	2023	50
Option 3	Port Lincoln substation	3,000,000	2021	2022	2023	50
Option 3	Cultana substation	5,000,000	2021	2022	2023	50
Option 3	Yadnarie substation	10,000,000	2021	2022	2023	50
Option 4	132kV transmission line DC	161,400,000	2026	2027	2028	50
Option 4	Gen support	2,151,000	2027	2027	2028	50
Option 4	EN internal costs	6,456,000	2026	2027	2028	50
Option 4	Port Lincoln substation	3,000,000	2026	2027	2028	50
Option 4	Cultana substation	5,000,000	2026	2027	2028	50
Option 4	Yadnarie substation	10,000,000	2026	2027	2028	50

Operating and maintenance costs inputs

Sensitivities				
Type	Low	Medium	High	Comment
Generation support	9,000,000	9,000,000	9,000,000	Low and medium generation support contract costs based on ElectraNet Estimates
Routine maintenance	70%	100%	130%	Standard sensitivities used
Corrective maintenance	70%	100%	130%	Standard sensitivities used
Security and compliance	70%	100%	130%	Standard sensitivities used

Financial year		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Generation support	**Units**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**		
Base case	2018 $	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	Gen support applies every year	Although costs are allocated until
Option 1	2018 $	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	Gen support applies every year	2049 in the calculation sheet only
Option 2	2018 $	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	Gen support applies every year	20 years are taken into account as
Option 3	2018 $	9,000,000	9,000,000	9,000,000	9,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Gen support stops after line has been commissioned	per the time horizon
Option 4	2018 $	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	9,000,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Gen support stops after line has been commissioned	

Financial year		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Routine maintenance	**Units**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**		
Base case	2018 $	268,055	268,055	268,055	268,055	268,055	268,055	268,055	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	436,110	Routine maintenance for all options based on ElectraNet estimate	Although costs are allocated until
Option 1	2018 $	268,055	268,055	268,055	268,055	104,027	104,027	104,027	104,027	104,027	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055		2049 in the calculation sheet only
Option 2	2018 $	268,055	268,055	268,055	268,055	268,055	268,055	268,055	436,110	436,110	104,027	104,027	104,027	104,027	104,027	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055	188,055		20 years are taken into account as
Option 3	2018 $	268,055	268,055	268,055	268,055	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		per the time horizon
Option 4	2018 $	268,055	268,055	268,055	268,055	268,055	268,055	268,055	436,110	436,110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Financial year		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Corrective maintenance - blacklog	**Units**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**		
Base case	2018 $	1,140,000	1,140,000	1,140,000	1,140,000	1,140,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Backlog corrective maintenance based on ElectraNet estimate	
Option 1	2018 $	400,000	400,000	400,000	400,000	400,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Option 2	2018 $	400,000	400,000	400,000	400,000	400,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Option 3	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Option 4	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Financial year		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Generation support - faults	**Units**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**	**$**		
Base case	2018 $	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	Gen support for faults for all options based on ElectraNet estimates	Although costs are allocated until
Option 1	2018 $	430,000	430,000	430,000	430,000	215,000	215,000	215,000	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	215,000	215,000	215,000	215,000	215,000	215,000	215,000		2049 in the calculation sheet only
Option 2	2018 $	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	215,000	215,000	215,000	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	107,500	215,000	215,000	215,000	215,000	215,000	215,000	215,000		20 years are taken into account as
Option 3	2018 $	430,000	430,000	430,000	430,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		per the time horizon
Option 4	2018 $	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	430,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

Unserved energy (USE)

VCR	$/MWh	Comment
South Australia VCR	35,898	AEMO's 2016 review of SA ETC for ESCOSA

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

MWh unserved	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	Unserved energy applies every year for single circuit	Although costs are allocated until
Option 1	2018 $	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	Unserved energy applies every year for single circuit	2049 in the calculation sheet only
Option 2	2018 $	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	Unserved energy applies every year for single circuit	20 years are taken into account as
Option 3	2018 $	966,450	966,450	966,450	966,450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Unserved energy stops when DC line has been conmissioned	per the time horizon
Option 4	2018 $	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	966,450	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Unserved energy stops when DC line has been conmissioned	

Other benefits

Reduced constraints on windfarms	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Only double circuit line options reduce constraints on windfarms	Although costs are allocated until
Option 1	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		2049 in the calculation sheet only
Option 2	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All other options do not accure a reduced windfarm constraint benefit	20 years are taken into account as
Option 3	2018 $	0	0	0	0	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800		per the time horizon
Option 4	2018 $	0	0	0	0	0	0	0	0	0	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800	1,576,800		

Reduced transmission losses	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Only double circuit line options reduce transmission losses.	Although costs are allocated until
Option 1	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All other options do not accure a reduced transmission loss benefit	2049 in the calculation sheet only
Option 2	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		20 years are taken into account as
Option 3	2018 $	0	0	0	0	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575		per the time horizon
Option 4	2018 $	0	0	0	0	0	0	0	0	0	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575	400,575		

Value of generation lost avoided	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Only double circuit line options reduce transmission losses.	Although costs are allocated until
Option 1	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	All other options do not accure a reduced transmission loss benefit	2049 in the calculation sheet only
Option 2	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		20 years are taken into account as
Option 3	2018 $	0	0	0	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640		per the time horizon
Option 4	2018 $	0	0	0	0	0	0	0	0	0	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640	92,640		

Risk cost reduction benefit - F1811 (EC.14145)	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Only the base case does not accrue reduced risk costs	Although costs are allocated until
Option 1	2018 $	0	0	0	0	4,480,192	5,265,111	6,233,741	7,394,917	8,756,781	10,326,913	12,112,424	14,120,027	16,356,094	18,826,695	21,537,640	24,494,500	27,702,637	31,167,223	34,893,255	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	Reduced risk costs for other options are based on spreadsheets	2049 in the calculation sheet only
Option 2	2018 $	0	0	0	0	0	0	0	0	0	10,326,913	12,112,424	14,120,027	16,356,094	18,826,695	21,537,640	24,494,500	27,702,637	31,167,223	34,893,255	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	provided	20 years are taken into account as
Option 3	2018 $	0	0	0	0	4,480,192	5,265,111	6,233,741	7,394,917	8,756,781	10,326,913	12,112,424	14,120,027	16,356,094	18,826,695	21,537,640	24,494,500	27,702,637	31,167,223	34,893,255	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571		per the time horizon
Option 4	2018 $	0	0	0	0	0	0	0	0	0	10,326,913	12,112,424	14,120,027	16,356,094	18,826,695	21,537,640	24,494,500	27,702,637	31,167,223	34,893,255	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571	38,885,571		

Risk cost reduction benefit - F1810 (EC.14137)	Units	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	Comment	
Base case	2018 $	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Only the base case does not accrue reduced risk costs	Although costs are allocated until 2049 in the calculation sheet only 20 years are taken into account as per the time horizon
Option 1	2018 $	0	0	0	0	6,084,146	7,562,423	9,341,454	11,429,209	13,833,004	16,559,614	19,615,358	23,006,165	26,737,631	30,815,056	35,243,481	40,027,714	45,172,356	50,681,823	56,560,356	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	Reduced risk costs for other options are based on spreadsheets provided	
Option 2	2018 $	0	0	0	0	0	0	0	0	0	16,559,614	19,615,358	23,006,165	26,737,631	30,815,056	35,243,481	40,027,714	45,172,356	50,681,823	56,560,356	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045		
Option 3	2018 $	0	0	0	0	6,084,146	7,562,423	9,341,454	11,429,209	13,833,004	16,559,614	19,615,358	23,006,165	26,737,631	30,815,056	35,243,481	40,027,714	45,172,356	50,681,823	56,560,356	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045		
Option 4	2018 $	0	0	0	0	0	0	0	0	0	16,559,614	19,615,358	23,006,165	26,737,631	30,815,056	35,243,481	40,027,714	45,172,356	50,681,823	56,560,356	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045	62,812,045		

R0 Results

Sensitivities, results and rankings

Input Summary

Parameter/input selection for sensitivity analysis		Discount rate		
Scenario parameters and inputs		**Discount rate scenario**		
	Units	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%
Routine maintenance	% of estimate	100%	100%	100%
Corrective maintenance	% of estimate	100%	100%	100%
Security and compliance	% of estimate	100%	100%	100%
VCR	% of estimate	100%	100%	100%

Cost Benefit Analysis Results (Quantitative)

Net present value of benefits

NPV results for Discount rate scenarios		Scenario			
Option	**Units**	**Low**	**Medium**	**High**	**Weighted NPV**
Option 1	2018 $	325,570,323	253,021,346	166,866,178	248,485,949
Option 2	2018 $	285,606,494	220,410,802	144,367,793	216,795,030
Option 3	2018 $	383,429,318	288,526,249	177,041,103	282,998,890
Option 4	2018 $	320,570,267	240,832,657	149,686,351	237,029,758

Output summary Ranking of options

Ranking of options under Discount rate scenarios	Scenario			
Option	**Low**	**Medium**	**High**	**Weighted NPV**
Option 1	2	2	2	2
Option 2	4	4	4	4
Option 3	1	1	1	1
Option 4	3	3	3	3

		Base input	**Base value**	**Active**	**Estimate**
132kV DC line costs	$/km	600,000	1.00	1.00	600,000
Generator support contract	$ per year	9,000,000	1.00	1.00	9,000,000
Risk cost percentage	%	80.00%	1.00	1.00	80.00%
Discount rate	%	6.00%	1.00	1.00	6.00%