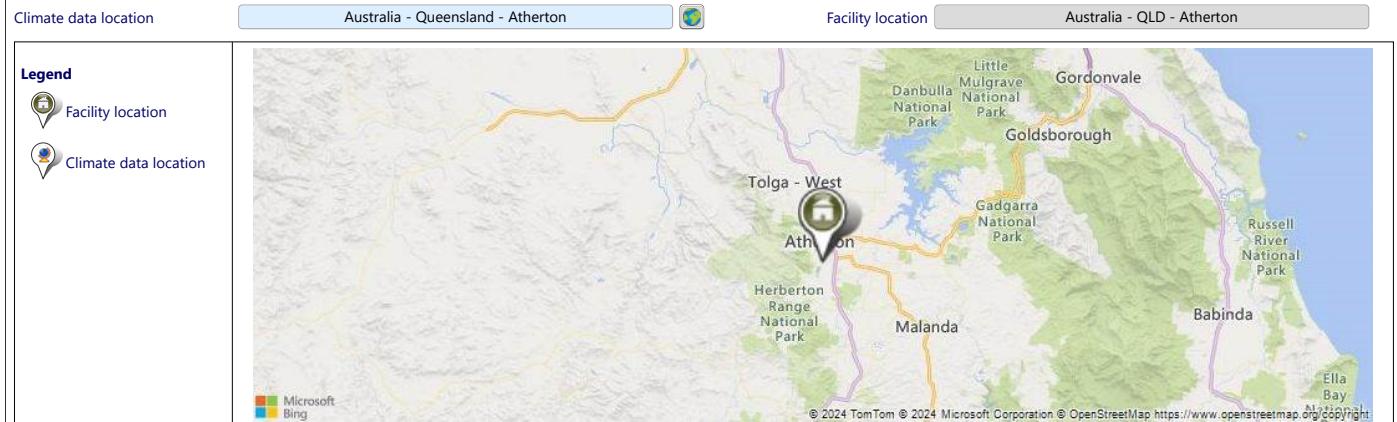


Site reference conditions

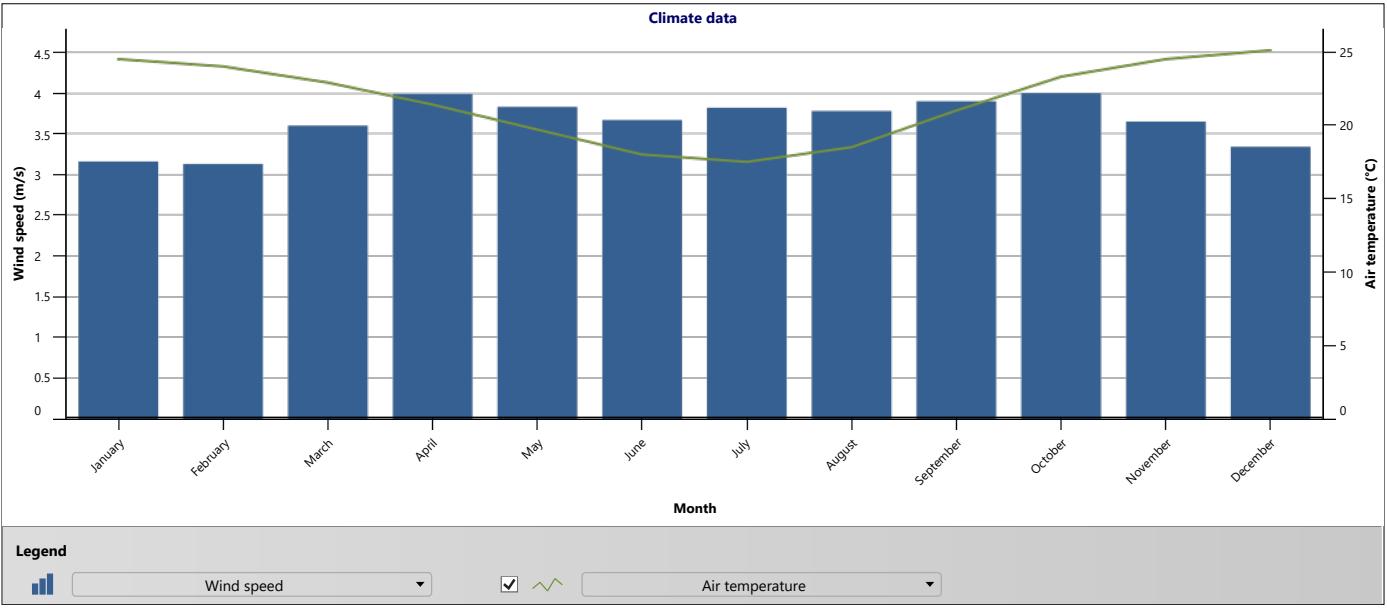


	Unit	Climate data location	Facility location	Source
Latitude		-17.3	-17.3	
Longitude		145.5	145.5	
Climate zone		2A - Hot - Humid		NASA
Elevation	m	556	767	NASA - Map
Heating design temperature	°C	15.7		NASA
Cooling design temperature	°C	28.6		NASA
Earth temperature amplitude	°C	9.1		NASA

Month	Air temperature	Relative humidity	Precipitation	Daily solar radiation - horizontal	Atmospheric pressure	Wind speed	Earth temperature	Heating degree-days 18 °C	Cooling degree-days 10 °C
	°C	%	mm	kWh/m²/d	kPa	m/s	°C	°C-d	°C-d
January	24.5	79.5%	292.33	6.12	94.6	3.2	25.3	0	450
February	24.0	85.3%	342.16	5.48	94.6	3.1	24.5	0	392
March	22.9	85.6%	262.88	5.38	94.8	3.6	23.3	0	400
April	21.4	84.7%	145.20	4.85	95.0	4.0	21.8	0	342
May	19.7	82.9%	82.46	4.41	95.1	3.8	20.1	0	301
June	18.0	79.4%	48.00	4.30	95.2	3.7	18.5	0	240
July	17.5	76.1%	40.92	4.59	95.3	3.8	18.0	16	233
August	18.5	70.7%	30.38	5.27	95.3	3.8	19.4	0	264
September	21.0	63.9%	25.20	6.31	95.2	3.9	22.2	0	330
October	23.3	62.0%	47.74	6.88	95.1	4.0	24.8	0	412
November	24.5	65.4%	104.40	6.84	94.8	3.7	26.0	0	435
December	25.1	70.8%	175.15	6.52	94.7	3.3	26.2	0	468
Annual	21.7	75.5%	1,596.82	5.58	95.0	3.7	22.5	16	4,266
Source	NASA	NASA	NASA	NASA	NASA	NASA	NASA	NASA	NASA

Measured at

m ▾ 10 0



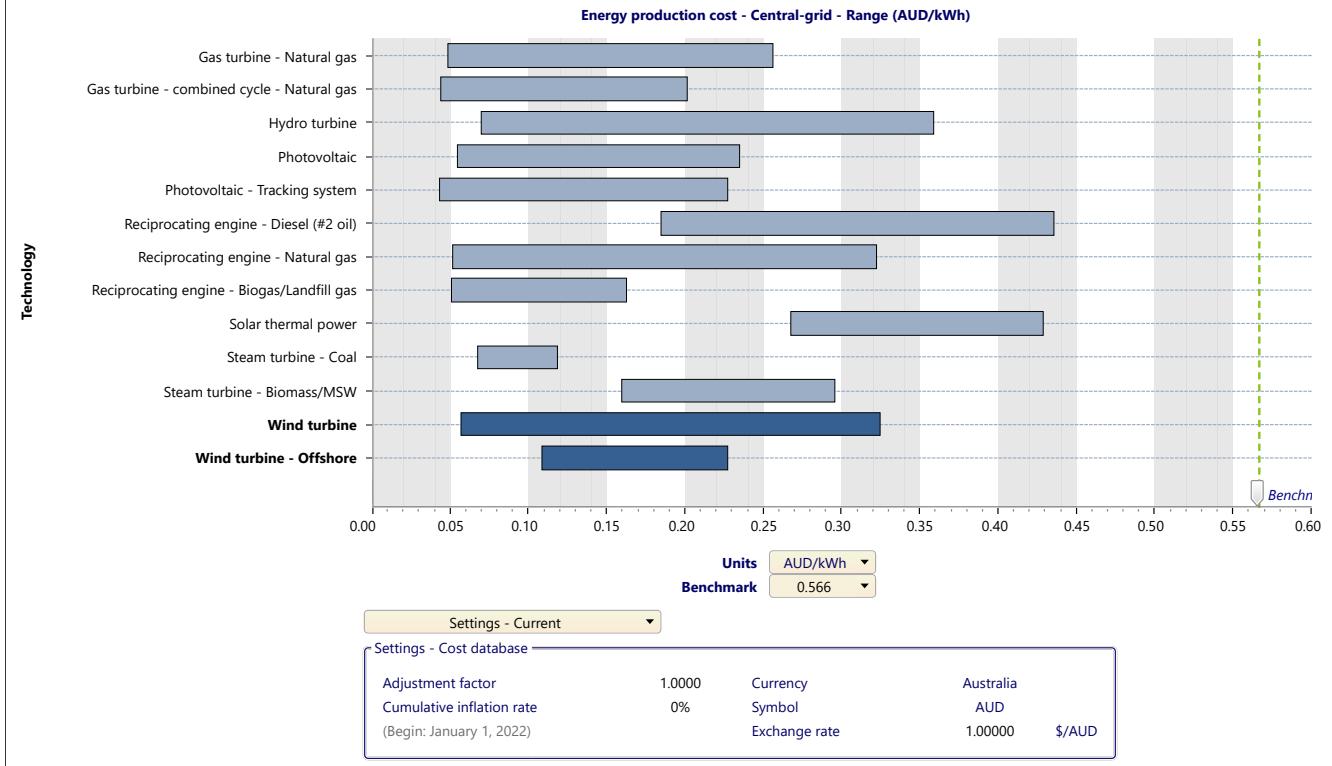
Facility information

Facility type	Power plant
Type	Wind turbine
Description	12 kW
Prepared for	Prepared for
Prepared by	Prepared by
Facility name	Archetype
Address	Address
City/Municipality	Atherton
Province/State	QLD
Country	Australia



Photo | Image - Kruger

Benchmark - Power plants



Note: Typical cost values in Canadian \$ as of January 1, 2022.
Purchasing power parity (Exchange rate) approximately 1.25 CAD = 1 USD.

Power plant - 12 kW - Wind turbine

Fuels & schedules

- Electricity and fuels

Technology

- Power

12MW wind Farm

Summary

- Include system?
- Comparison

Wind

Description: 12MW wind Farm

Note:

Level

Level 1 Level 2 Level 3

Options

eLearning RETScreen Connect

Wind - Level 2

Resource assessment

Climate Data

Australia - Queensland - Atherton

Wind speed	3.7
Wind speed - annual	6.8
Measured at	50
Wind shear exponent	0.14
Air temperature - annual	21.6863
Atmospheric pressure - annual	94.9697

Wind turbine

Power capacity per turbine	MW	2
Manufacturer	Vestas	
Model	VESTAS V66-2.0 MW - 67m	
Number of turbines	MW	6
Power capacity	MW	12
Hub height	m	67
Rotor diameter per turbine	m	66
Swept area per turbine	m ²	3,421.19
Energy curve data	Custom	
Shape factor		1.85

Power and energy curves

Data

Wind speed m/s	Power curve data kW	Energy curve data MWh
0	0	
1	0	
2	0	
3	0	324
4	33.4	914
5	94.3	1,834
6	178	3,001
7	294	4,284
8	451	5,569
9	655	6,777
10	901	7,862
11	1,169	8,795
12	1,433	9,564
13	1,667	10,164
14	1,843	10,604
15	1,943	10,896
16	1,985	
17	1,997	
18	2,000	
19	2,000	
20	2,000	
21	2,000	
22	2,000	
23	2,000	
24	2,000	
25	2,000	
26	2,000	
27	2,000	
28	2,000	
29	2,000	
30	2,000	

Power and energy curves

Legend

Energy Power

Losses

Array losses	%	0%
Airfoil losses	%	2%
Miscellaneous losses	%	6%
Availability	%	98%

Summary

Capacity factor	%	20.7%
Initial costs	AUD/kW	6,400
O&M costs (savings)	AUD/kW-year	48
Electricity export rate	AUD/kWh	0.10
Electricity exported to grid	MWh	21,801
Electricity export revenue	AUD	2,180,099

Other information

	Per turbine	
Unadjusted energy production	MWh	4,393
Pressure coefficient		0.938
Temperature coefficient		0.977
Gross energy production	MWh	4,025
Losses coefficient		0.9
Specific yield	kWh/m ²	1,062

Initial costs (credits)	Unit	Quantity	Unit cost	Amount
Initial cost			AUD	76,800,000
(Show data				
User-defined	cost		AUD	-
+				
Total initial costs			AUD	76,800,000
Annual costs (credits)	Unit	Quantity	Unit cost	Amount
O&M costs (savings)	project		AUD	576,000
(Show data				
User-defined	cost		AUD	-
+				
Total annual costs			AUD	576,000
Annual savings	Unit	Quantity	Unit cost	Amount
User-defined	cost		AUD	-
+				
Total annual savings			AUD	-

Emission analysis

Base case electricity system (Baseline)		GHG emission factor (excl. T&D)	T&D losses	GHG emission factor
Country - region	Fuel type	tCO ₂ /MWh	%	tCO ₂ /MWh
Australia	All types	0.709	7.0%	0.762
Electricity exported to grid	MWh	21,801	T&D losses	7.0%

GHG emissions

Base case	tCO ₂	16,620
Proposed case	tCO ₂	1,163
Gross annual GHG emission reduction	tCO ₂	15,457
		93%

GHG emissions (tCO₂)

Case	GHG Emissions (tCO ₂)
Base case	16,620
Proposed case	1,163

Legend

Gross annual GHG emission reduction (93%)

15,457 tCO₂ is equivalent to 2,831

Cars & light trucks not used

Carbon shadow price | GHG reduction revenue

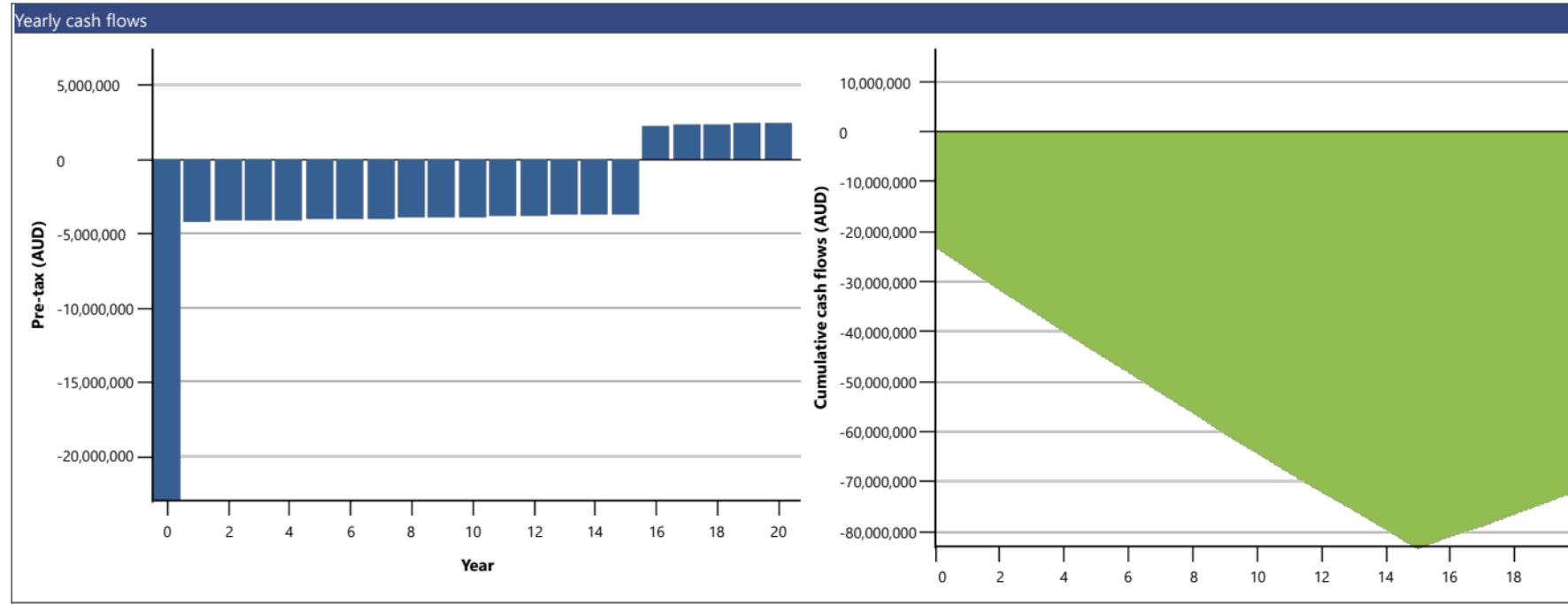
Carbon shadow price	AUD/tCO ₂
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Carbon offsets

Remaining GHG emission reduction required	tCO ₂
	1,163

Financial parameters		
General		
Fuel cost escalation rate		2%
Inflation rate	%	2%
Discount rate	%	9%
Reinvestment rate	%	9%
Project life	yr	20
Finance		
Incentives and grants	AUD	
Debt ratio	%	70%
Debt	AUD	53,760,000
Equity	AUD	23,040,000
Debt interest rate	%	7%
Debt term	yr	15
Debt payments	AUD/yr	5,902,559
Income tax analysis		
Annual savings and revenue		
Electricity export revenue		
Electricity exported to grid	kWh	21,800,985
Electricity export rate	AUD/kWh	0.10
Electricity export revenue	AUD	2,180,099
Electricity export escalation rate	%	2%
GHG reduction savings		
Gross GHG reduction	tCO ₂ /yr	15,457
Gross GHG reduction - 20 yrs	tCO ₂	309,138
GHG reduction savings	AUD	0
Other revenue (cost)		
Clean Energy (CE) production revenue		

Costs Savings Revenue		
Initial costs		
Initial cost	100%	AUD 76,800,000
Total initial costs	100%	AUD 76,800,000
Yearly cash flows - Year 1		
Annual costs and debt payments		
O&M costs (savings)	AUD	576,000
Debt payments - 15 yrs	AUD	5,902,559
Total annual costs	AUD	6,478,559
Annual savings and revenue		
Electricity export revenue	AUD	2,180,099
GHG reduction savings	AUD	0
CE production revenue	AUD	0
Total annual savings and revenue	AUD	2,180,099
Net yearly cash flow - Year 1	AUD	-4,298,461
Financial viability		
Pre-tax IRR - equity	%	Negative
Pre-tax MIRR - equity	%	-6.8%
Pre-tax IRR - assets	%	Negative
Pre-tax MIRR - assets	%	-9.9%
Simple payback	yr	47.9
Equity payback	yr	> project
Net Present Value (NPV)	AUD	-53,442,041
Annual life cycle savings	AUD/yr	-5,854,387
Benefit-Cost (B-C) ratio		-1.3
Debt service coverage		0.28
GHG reduction cost	AUD/tCO ₂	423
Energy production cost	AUD/kWh	0.386



Sensitivity analysis

Perform analysis on

Net Present Value (NPV)

Sensitivity range

25%

Threshold

0

AUD

- Remove analysis

Initial costs

AUD

-

+

Electricity export rate

AUD/MWh

75.00	-25.0%
87.50	-12.5%
100.00	0.0%
112.50	12.5%
125.00	25.0%

57,600,000	67,200,000	76,800,000	86,400,000	96,000,000
-25.0%	-12.5%	0.0%	12.5%	25.0%
-41,623,479	-50,450,816	-59,278,152	-68,105,488	-76,932,824
-38,705,424	-47,532,760	-56,360,097	-65,187,433	-74,014,769
-35,787,369	-44,614,705	-53,442,041	-62,269,377	-71,096,714
-32,869,314	-41,696,650	-50,523,986	-59,351,322	-68,178,658
-29,951,258	-38,778,595	-47,605,931	-56,433,267	-65,260,603

-

+

- Remove analysis

Initial costs

AUD

-

+

O&M

AUD

432,000	-25.0%
504,000	-12.5%
576,000	0.0%
648,000	12.5%
720,000	25.0%

57,600,000	67,200,000	76,800,000	86,400,000	96,000,000
-25.0%	-12.5%	0.0%	12.5%	25.0%
-34,245,420	-43,072,757	-51,900,093	-60,727,429	-69,554,765
-35,016,395	-43,843,731	-52,671,067	-61,498,403	-70,325,739
-35,787,369	-44,614,705	-53,442,041	-62,269,377	-71,096,714
-36,558,343	-45,385,679	-54,213,016	-63,040,352	-71,867,688
-37,329,318	-46,156,654	-54,983,990	-63,811,326	-72,638,662

-

+

- Remove analysis

Debt interest rate

%

-

+

Debt ratio

%

53%	-25.0%
61%	-12.5%
70%	0.0%
79%	12.5%
88%	25.0%

5.25%	6.13%	7.00%	7.88%	8.75%
-25.0%	-12.5%	0.0%	12.5%	25.0%
-51,146,607	-53,040,814	-54,987,369	-56,984,453	-59,030,189
-49,733,816	-51,943,725	-54,214,705	-56,544,637	-58,931,328
-48,321,026	-50,846,635	-53,442,041	-56,104,820	-58,832,467
-46,908,235	-49,749,545	-52,669,377	-55,665,004	-58,733,607
-45,495,444	-48,652,456	-51,896,714	-55,225,187	-58,634,746

-

+

- Remove analysis

Debt interest rate

%

-

+

Debt term

yr

11	-25.0%
13	-12.5%
15	0.0%
17	12.5%
19	25.0%

5.25%	6.13%	7.00%	7.88%	8.75%
-25.0%	-12.5%	0.0%	12.5%	25.0%
-50,487,426	-52,547,183	-54,651,582	-56,799,528	-58,989,900
-49,358,694	-51,661,909	-54,022,334	-56,438,296	-58,908,067
-48,321,026	-50,846,635	-53,442,041	-56,104,820	-58,832,467
-47,367,575	-50,096,658	-52,907,819	-55,797,701	-58,762,840
-46,491,968	-49,407,513	-52,416,856	-55,515,520	-58,698,905

-

+

+ Add analysis

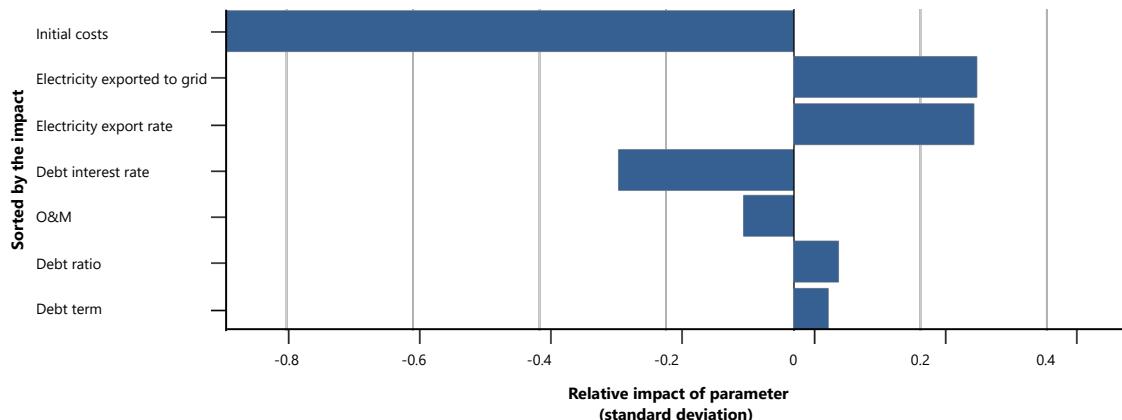
Risk analysis

Perform analysis on
Number of combinations
Random seed

Net Present Value (NPV)
500
No

Parameter	Unit	Value	Range (+/-)	Minimum	Maximum
Initial costs	AUD	76,800,000	25%	57,600,000	96,000,000
O&M	AUD	576,000	25%	432,000	720,000
Electricity exported to grid	MWh	21,800.99	25%	16,350.74	27,251.23
Electricity export rate	AUD/MWh	100.00	25%	75.00	125.00
Debt ratio	%	70.0%	25%	52.5%	87.5%
Debt interest rate	%	7.00%	25%	5.25%	8.75%
Debt term	yr	15	25%	11	19

Impact - Net Present Value (NPV)



Median AUD -53,546,510
Level of risk % 10%
Minimum within level of confidence AUD -64,741,076
Maximum within level of confidence AUD -43,458,594

Distribution - Net Present Value (NPV)

