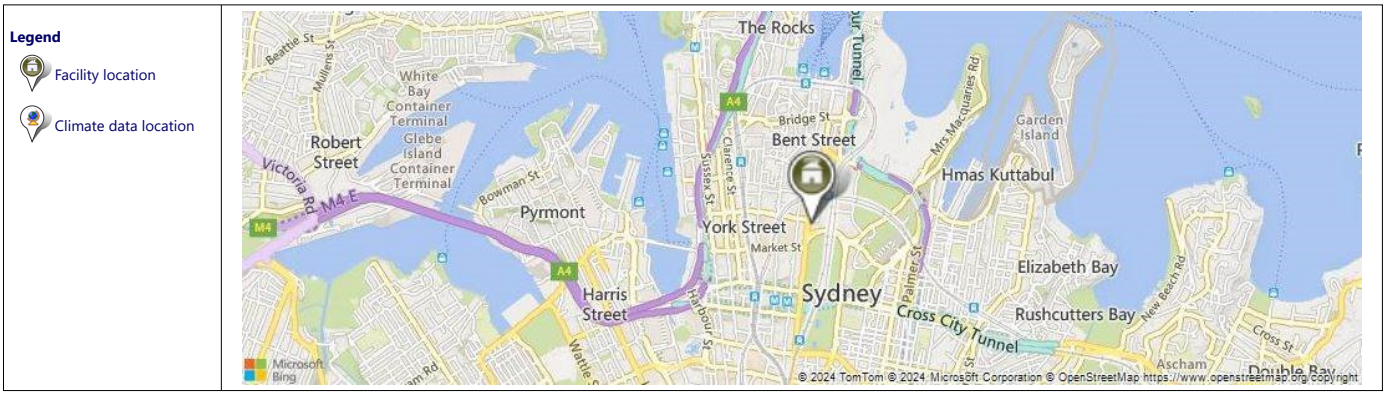
Site reference conditions

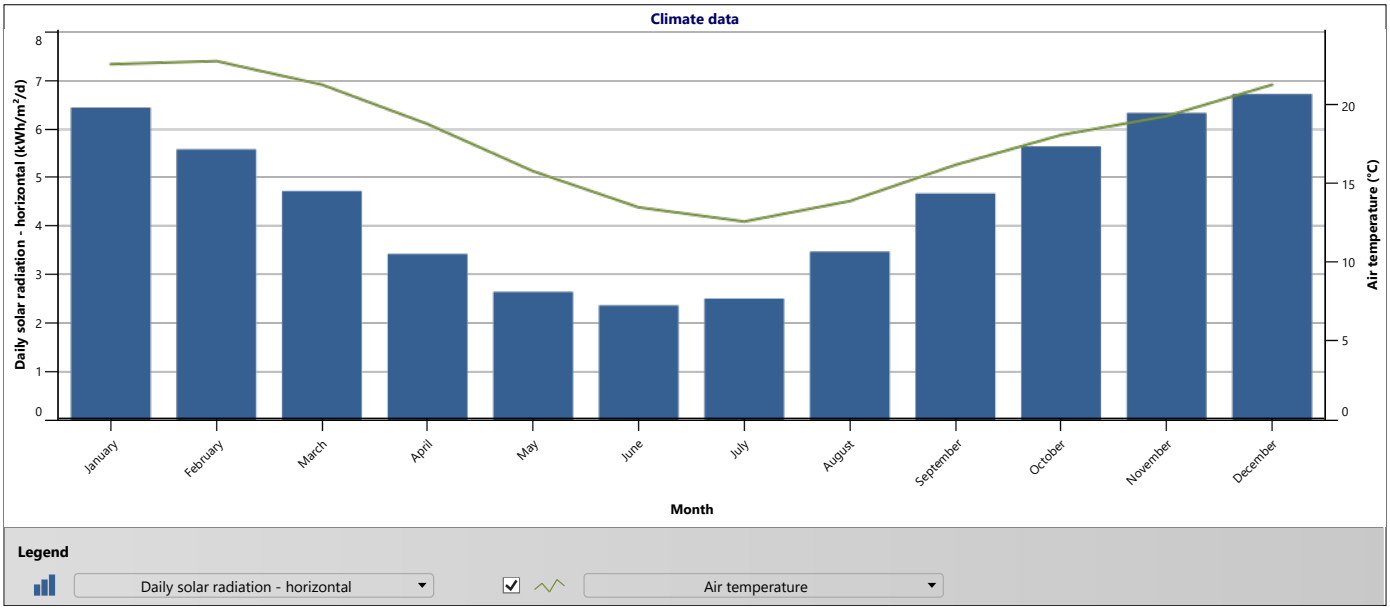
Climate data location: Australia - New South Wales - Sydney

Facility location: Australia - NSW - Sydney



	Unit	Climate data location	Facility location	Source
Latitude		-33.8	-33.9	
Longitude		151.2	151.2	
Climate zone		3A - Warm - Humid		Ground+NASA
Elevation	m	40	64	Ground – Map
Heating design temperature	°C	8.0		Ground
Cooling design temperature	°C	28.8		Ground
Earth temperature amplitude	°C	7.4		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	22.6	71.3%	94.86	6.44	101.3	6.2	23.2	0	391
February	22.8	72.8%	129.08	5.58	101.4	7.2	23.0	0	358
March	21.3	71.5%	93.62	4.72	101.6	6.7	21.7	0	350
April	18.8	70.3%	99.90	3.42	101.8	6.2	19.7	0	264
May	15.8	71.9%	77.81	2.64	101.8	2.6	17.2	68	180
June	13.5	69.5%	87.90	2.36	101.9	4.1	14.9	135	105
July	12.6	67.5%	60.14	2.50	101.8	3.1	13.9	167	81
August	13.9	61.7%	66.96	3.47	101.7	4.6	14.4	127	121
September	16.2	62.1%	55.50	4.67	101.7	3.6	16.3	54	186
October	18.1	64.2%	65.10	5.64	101.5	6.7	18.2	0	251
November	19.3	67.5%	97.20	6.33	101.3	6.7	20.0	0	279
December	21.3	68.8%	77.50	6.72	101.2	6.7	21.9	0	350
Annual	**18.0**	**68.2%**	**1,005.57**	**4.54**	**101.6**	**5.3**	**18.7**	**552**	**2,916**
Source	Ground	Ground	NASA	Ground	Ground	Ground	NASA	Ground	Ground
Measured at					m	10	0		



Facility information

Facility type	Individual measure
Type	Solar water heater
Description	Industrial - Hot water
Prepared for	Waleed
Prepared by	Mr.Umer
Facility name	Archetype
Address	*Address*
City/Municipality	Sydney
Province/State	NSW
Country	Australia

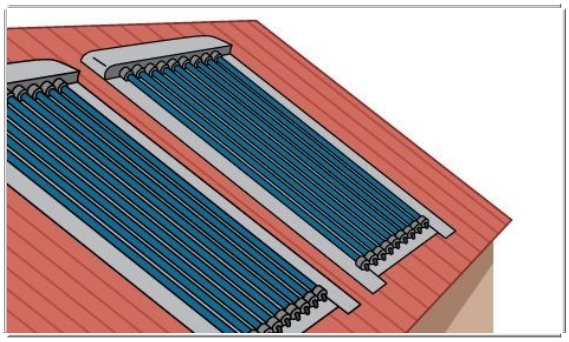


Photo | Image - RETScreen

Individual measure - Industrial - Hot water - Solar water heater

- **Fuels & schedules**
  - Electricity and fuels
  - Schedules
- **Equipment**
  - Heating
    - Heating system
- **End-use**
  - Hot water
    - Hot water
- **Optimize supply**
  - Heating
    - Solar water heater - DHW
- **Summary**
  - Include measure?
  - Comparison

Solar water heater

Description: Solar water heater - DHW

Note:

Options: eLearning, RETScreen Connect

Solar water heater

Load characteristics

Hot water		Hot water
Temperature	°C	55
Heating	kWh	3,283

Resource assessment

Solar tracking mode		Fixed
Slope	°	30
Azimuth	°	180

Show data

Month	Percent of month used - base case %	Percent of month used - proposed case %	Daily solar radiation - horizontal kWh/m²/d	Daily solar radiation - tilted kWh/m²/d	Heating delivered kWh
January	100%	100%	6.44	5.96	270.136
February	100%	100%	5.58	5.51	240.897
March	100%	100%	4.72	5.10	266.180
April	100%	100%	3.42	4.12	242.244
May	100%	100%	2.64	3.63	235.956
June	100%	100%	2.36	3.54	222.717
July	100%	100%	2.50	3.61	228.773
August	100%	100%	3.47	4.54	258.108
September	100%	100%	4.67	5.33	265.261
October	100%	100%	5.64	5.75	279.837
November	100%	100%	6.33	5.95	269.588
December	100%	100%	6.72	6.10	275.410
Annual	**100%**	**100%**	**4.54**	**4.92**	**3,055.107**

Annual solar radiation - horizontal	MWh/m²	1.66
Annual solar radiation - tilted	MWh/m²	1.80

Solar water heater

Type		Glazed
Manufacturer		Solahart Industries
Model		Solahart L
Gross area per solar collector	m²	1.983
Aperture area per solar collector	m²	1.867
Fr (tau alpha) coefficient		0.625
Fr UL coefficient	(W/m²)/°C	7.47
Temperature coefficient for Fr UL	(W/m²)/°C²	0
Number of collectors - suggested		2
Number of collectors		5
Solar collector area	m²	9.9
Capacity	kW	6.5
Miscellaneous losses	%	4%

Balance of system & miscellaneous

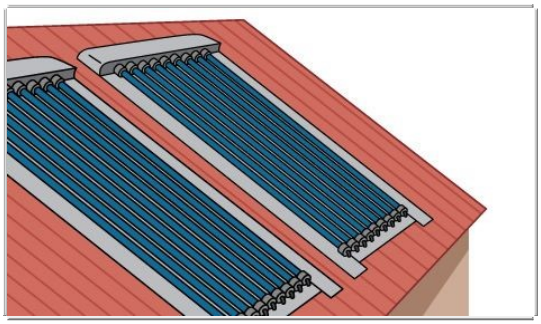
Storage	yes/no	Yes
Storage capacity / solar collector area	L/m²	32.1
Storage capacity	L	300
Heat exchanger	yes/no	No
Miscellaneous losses	%	3%
Pump power / solar collector area	W/m²	0
Electricity rate	AUD/kWh	0.10
Initial costs	AUD/m²-apertu	500
Incremental initial costs - total	AUD	4,668
O&M costs (savings)	AUD	

Summary

Electricity - pump	kWh	0
Energy saved	kWh	3,055
Solar fraction	%	93%

Image

Select... Size... Keep aspect ratio Remove



Note - Heating - Solar water heater - DHW

Segoe UI 12

Initial costs (credits)	Unit	Quantity	Unit cost		Amount
Incremental initial costs				AUD	5,668
Show data					
User-defined	cost			AUD	-
Total initial costs				**AUD**	**5,668**

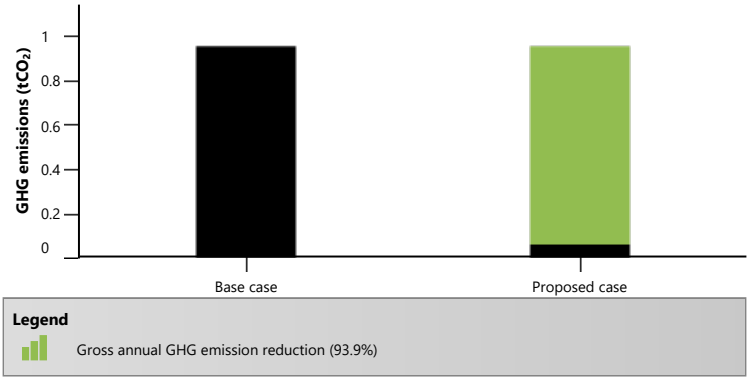
Annual costs (credits)	Unit	Quantity	Unit cost		Amount
O&M costs (savings)	project			AUD	0
Show data					
Fuel cost - proposed case				AUD	9.21
User-defined	cost			AUD	-
Total annual costs				**AUD**	**9.21**

Annual savings	Unit	Quantity	Unit cost		Amount
Fuel cost - base case				AUD	150
User-defined	cost			AUD	-
Total annual savings				**AUD**	**150**

Emission analysis

GHG emissions

Base case	tCO_2	0.96	
Proposed case	tCO_2	0.06	
Gross annual GHG emission reduction	tCO_2	0.9	93.9%



0.9 tCO_2 is equivalent to 0.16

Cars & light trucks not used

Carbon shadow price | GHG reduction revenue

Carbon shadow price | AUD/tCO_2 |

Carbon offsets

Remaining GHG emission reduction required	tCO_2		0.06

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	3,967
Equity	AUD	1,700
Debt interest rate	%	7%
Debt term	yr	15
Debt payments	AUD/yr	436

Income tax analysis ☐

Annual savings and revenue

GHG reduction savings

Gross GHG reduction	tCO_2/yr	1
Gross GHG reduction - 20 yrs	tCO_2	18
GHG reduction savings	AUD	0

Other revenue (cost) ☐

Costs | Savings | Revenue

Initial costs

Incremental initial costs	100%	AUD	5,668
Total initial costs	**100%**	AUD	**5,668**

Yearly cash flows - Year 1

Annual costs and debt payments

O&M costs (savings)	AUD	0
Fuel cost - proposed case	AUD	9
Debt payments - 15 yrs	AUD	436
Total annual costs	**AUD**	**445**

Annual savings and revenue

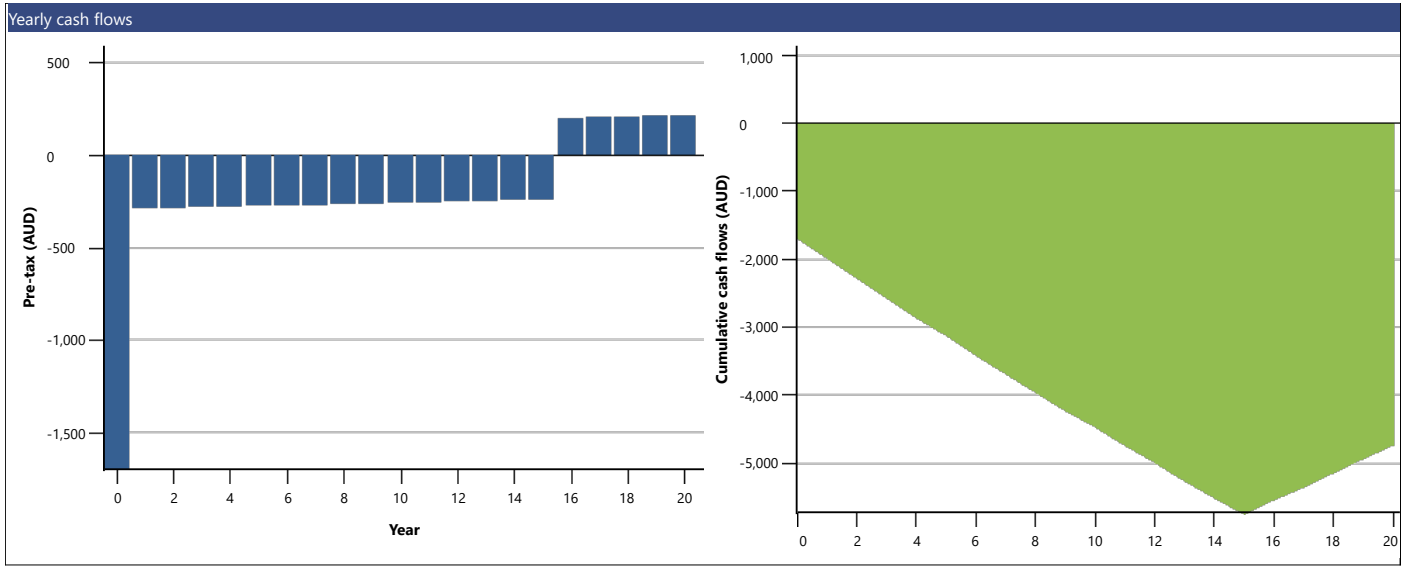
Fuel cost - base case	AUD	150
GHG reduction savings	AUD	0
Total annual savings and revenue	**AUD**	**150**
Net yearly cash flow - Year 1	**AUD**	**-295**

Financial viability

Pre-tax IRR - equity	%	-15.2%
Pre-tax MIRR - equity	%	-5.7%
Pre-tax IRR - assets	%	Negative
Pre-tax MIRR - assets	%	-9%
Simple payback	yr	40.2
Equity payback	yr	> project
Net Present Value (NPV)	AUD	-3,701
Annual life cycle savings	AUD/yr	-405
Benefit-Cost (B-C) ratio		-1.2
Debt service coverage		0.33
GHG reduction cost	AUD/tCO_2	508

Yearly cash flows

Year #	Pre-tax AUD	Cumulative AUD
0	-1,700	-1,700
1	-292	-1,992
2	-289	-2,281
3	-286	-2,567
4	-283	-2,849
5	-280	-3,129
6	-277	-3,406
7	-274	-3,679
8	-270	-3,950
9	-267	-4,217
10	-264	-4,480
11	-260	-4,740
12	-257	-4,997
13	-253	-5,250
14	-249	-5,500
15	-246	-5,745
16	194	-5,552
17	198	-5,354
18	202	-5,153
19	206	-4,947
20	210	-4,737


Yearly cash flows
500
0
-500
-1,000
-1,500
Pre-tax (AUD)
0
2
4
6
8
10
12
14
16
18
20
Year
1,000
0
-1,000
-2,000
-3,000
-4,000
-5,000
Cumulative cash flows (AUD)
0
2
4
6
8
10
12
14
16
18
20

Sensitivity analysis

Perform analysis on	Net Present Value (NPV)
Sensitivity range	25%
Threshold	0 AUD

- Remove analysis

Fuel cost - base case		Initial costs: 4,251	4,959	5,668	6,376	7,084 AUD
AUD		-25.0%	-12.5%	0.0%	12.5%	25.0%
113	-25.0%	-2,800	-3,452	-4,103	-4,754	-5,406
132	-12.5%	-2,599	-3,250	-3,902	-4,553	-5,205
150	0.0%	-2,398	-3,049	**-3,701**	-4,352	-5,003
169	12.5%	-2,197	-2,848	-3,499	-4,151	-4,802
188	25.0%	-1,995	-2,647	-3,298	-3,950	-4,601

- Remove analysis

Fuel cost - proposed case		Initial costs: 4,251	4,959	5,668	6,376	7,084 AUD
AUD		-25.0%	-12.5%	0.0%	12.5%	25.0%
7	-25.0%	-2,373	-3,025	-3,676	-4,327	-4,979
8	-12.5%	-2,385	-3,037	-3,688	-4,340	-4,991
9	0.0%	-2,398	-3,049	**-3,701**	-4,352	-5,003
10	12.5%	-2,410	-3,062	-3,713	-4,364	-5,016
12	25.0%	-2,422	-3,074	-3,725	-4,377	-5,028

- Remove analysis

Debt ratio		Debt interest rate: 5.25%	6.13%	7.00%	7.88%	8.75% %
%		-25.0%	-12.5%	0.0%	12.5%	25.0%
53%	-25.0%	-3,531	-3,671	-3,815	-3,962	-4,113
61%	-12.5%	-3,427	-3,590	-3,758	-3,930	-4,106
70%	0.0%	-3,323	-3,509	**-3,701**	-3,897	-4,098
79%	12.5%	-3,218	-3,428	-3,644	-3,865	-4,091
88%	25.0%	-3,114	-3,347	-3,587	-3,832	-4,084

- Remove analysis

Debt term		Debt interest rate: 5.25%	6.13%	7.00%	7.88%	8.75% %
yr		-25.0%	-12.5%	0.0%	12.5%	25.0%
11	-25.0%	-3,483	-3,635	-3,790	-3,948	-4,110
13	-12.5%	-3,399	-3,569	-3,743	-3,922	-4,104
15	0.0%	-3,323	-3,509	**-3,701**	-3,897	-4,098
17	12.5%	-3,252	-3,454	-3,661	-3,874	-4,093
19	25.0%	-3,188	-3,403	-3,625	-3,854	-4,089

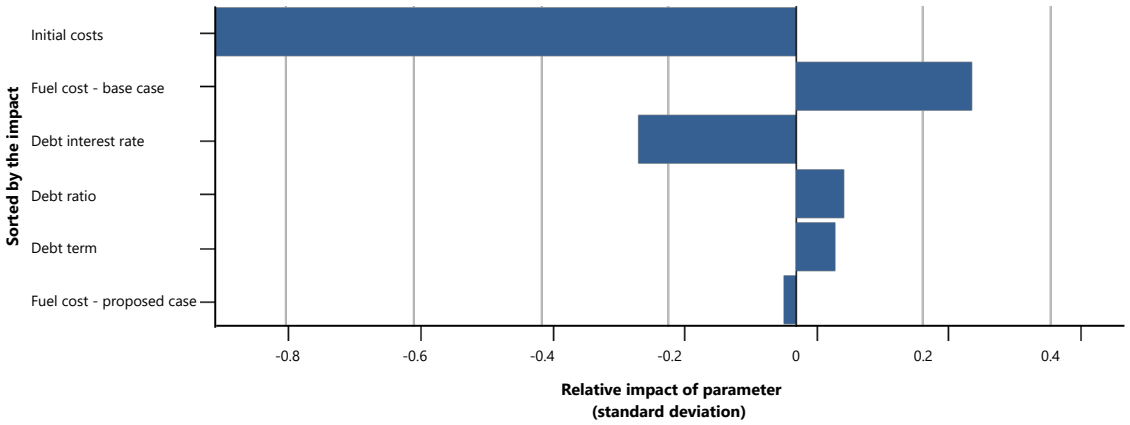
+ Add analysis

Risk analysis

Perform analysis on	Net Present Value (NPV)
Number of combinations	500
Random seed	No

Parameter	Unit	Value	Range (+/-)	Minimum	Maximum
Initial costs	AUD	5,668	25%	4,251	7,084
Fuel cost - proposed case	AUD	9	25%	7	12
Fuel cost - base case	AUD	150	25%	113	188
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	-3,716
Level of risk	%	10%
Minimum within level of confidence	AUD	-4,462
Maximum within level of confidence	AUD	-2,965

Distribution - Net Present Value (NPV)