

PVsyst - Simulation report

Grid-Connected System

Project: Goulburn Community Solar Farm

Variant: 1354kW Fixed Tilt RC Panels 24deg

Unlimited sheds

System power: 1351 kWp

Goulburn - Australia

Author

Smart Commercial Solar (Australia)



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VC3, Simulation date:
31/01/24 11:57
with v7.4.5

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Project summary

Geographical Site

Goulburn
Australia

Situation

Latitude -34.75 °S
Longitude 149.72 °E
Altitude 636 m
Time zone UTC+10

Project settings

Albedo 0.20

Meteo data

Goulburn
Meteonorm 8.1 (1990-2007), Sat=100% - Synthetic

System summary

Grid-Connected System

PV Field Orientation

Sheds
Tilt 24 °
Azimuth 0 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 2370 units
Pnom total 1351 kWp

Inverters

Nb. of units 1 unit
Pnom total 1818 kWac
Pnom ratio 0.743

Results summary

Produced Energy 2321586 kWh/year Specific production 1719 kWh/kWp/year Perf. Ratio PR 83.28 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Sheds	
Tilt	24 °
Azimuth	0 °

Unlimited sheds

Sheds configuration

Nb. of sheds	15 units
Unlimited sheds	

Sizes

Sheds spacing	8.00 m
Collector width	4.79 m
Ground Cov. Ratio (GCR)	59.9 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Shading limit angle

Limit profile angle	28.5 °
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Models used

Transposition	Perez
Diffuse	Perez, Meteonom
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

Bifacial system

Model	2D Calculation unlimited sheds
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Bifacial model geometry

Sheds spacing	8.00 m
Sheds width	4.83 m
Limit profile angle	28.7 °
GCR	60.4 %
Height above ground	1.50 m

Bifacial model definitions

Ground albedo	0.10
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-NEG19RC-570
(Original PVsyst database)	

Unit Nom. Power	570 Wp
Number of PV modules	2370 units
Nominal (STC)	1351 kWp
Modules	79 string x 30 In series

At operating cond. (50°C)

Pmpp	1248 kWp
U mpp	1067 V
I mpp	1170 A

Total PV power

Nominal (STC)	1351 kWp
Total	2370 modules
Module area	6407 m²

Inverter

Manufacturer	ABB
Model	PVS980-58-1818kVA-I
(Custom parameters definition)	

Unit Nom. Power	1818 kWac
Number of inverters	1 unit
Total power	1818 kWac
Operating voltage	850-1500 V
Max. power (=>35°C)	2000 kWac
Pnom ratio (DC:AC)	0.74

Total inverter power

Total power	1818 kWac
Max. power	2000 kWac
Number of inverters	1 unit
Pnom ratio	0.74



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Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 20.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 15 mΩ

Loss Fraction 1.5 % at STC

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.2 %

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

System losses

Unavailability of the system

Time fraction 2.0 %
7.3 days,
3 periods

Auxiliaries loss

constant (fans) 5.00 kW

0.0 kW from Power thresh.

Night aux. cons. 5.00 kW



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Main results

System Production

Produced Energy

2321586 kWh/year

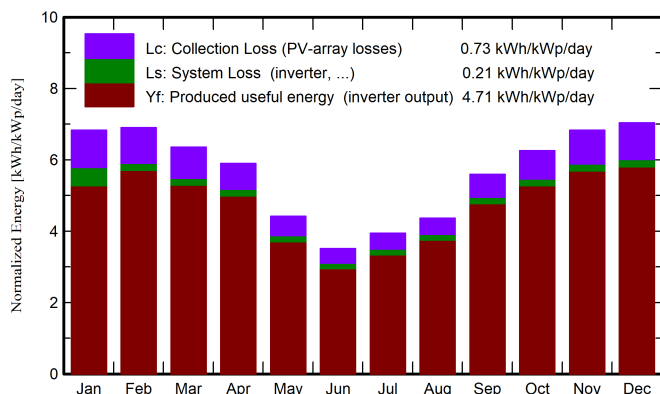
Specific production

1719 kWh/kWp/year

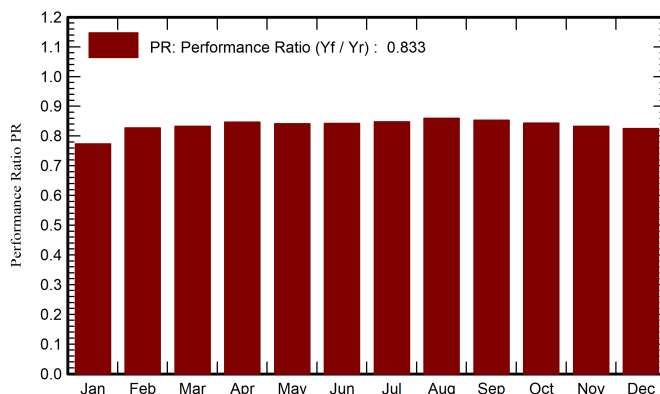
Perf. Ratio PR

83.28 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	219.5	74.01	20.83	211.8	197.1	242536	221198	0.773
February	185.7	69.78	19.29	193.2	180.2	223368	215839	0.827
March	172.1	55.49	16.72	197.2	184.5	229707	221670	0.832
April	134.4	32.95	12.45	177.0	166.5	209917	202370	0.847
May	94.5	30.73	8.15	136.9	126.3	162455	155465	0.841
June	70.5	26.72	5.92	105.3	96.6	126048	119768	0.842
July	82.1	26.75	5.33	122.2	112.5	146589	139847	0.847
August	102.5	39.58	6.23	135.3	126.0	164168	157143	0.860
September	140.0	42.53	9.45	167.7	157.6	201009	193445	0.854
October	181.7	69.20	12.78	193.8	180.6	229131	221012	0.844
November	208.5	70.03	16.00	204.9	190.8	238689	230523	0.833
December	230.9	69.58	18.83	218.3	203.5	251824	243307	0.825
Year	1822.5	607.34	12.63	2063.5	1922.3	2425441	2321586	0.833

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



Project: Goulburn Community Solar Farm

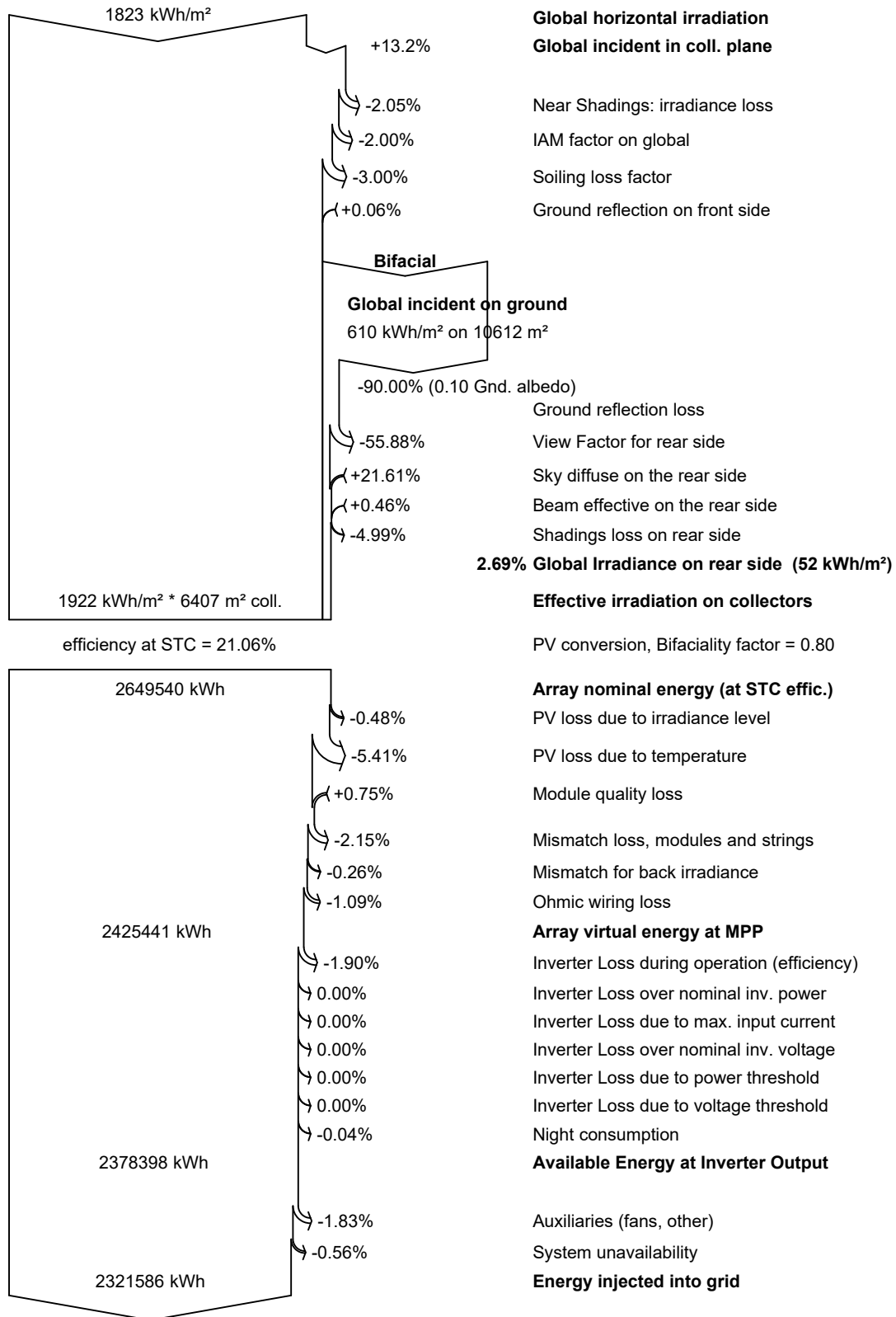
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Loss diagram





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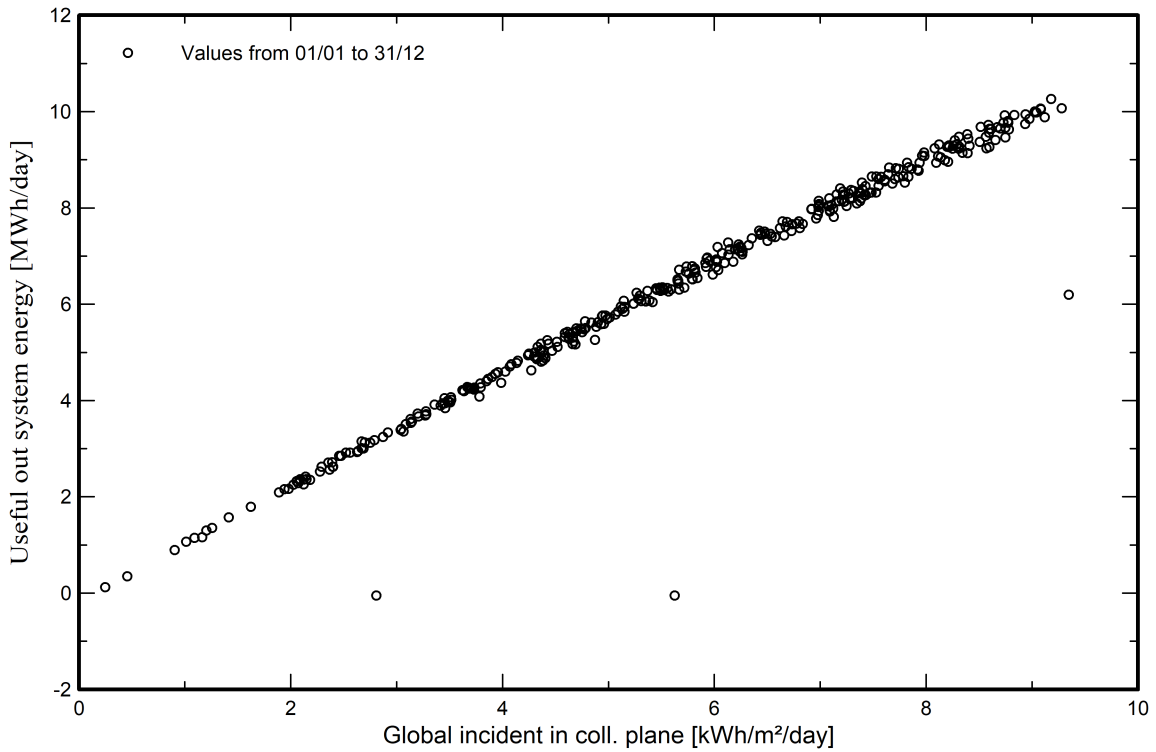
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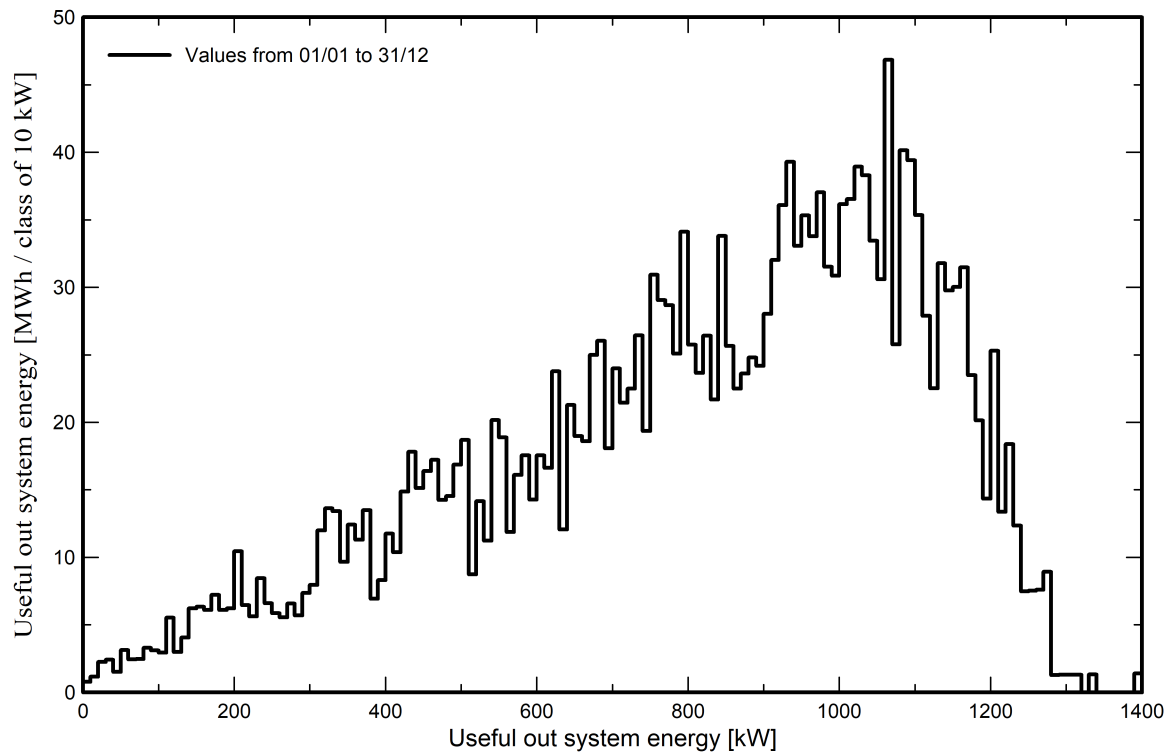
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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





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P50 - P90 evaluation

Meteo data

Source Meteonorm 8.1 (1990-2007), Sat=100%
Kind Monthly averages
Synthetic - Multi-year average
Year-to-year variability(Variance) 5.3 %

Specified Deviation

Climate change 0.0 %

Global variability (meteo + system)

Variability (Quadratic sum) 5.6 %

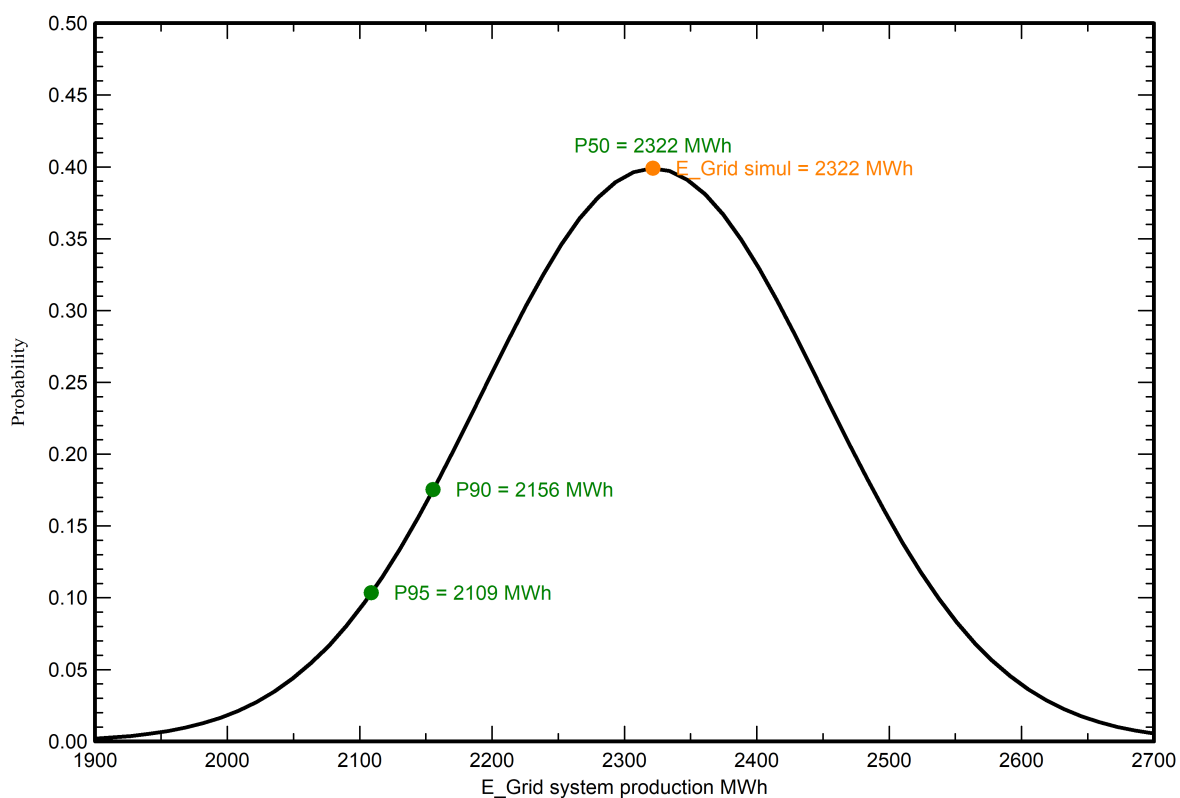
Simulation and parameters uncertainties

PV module modelling/parameters 1.0 %
Inverter efficiency uncertainty 0.5 %
Soiling and mismatch uncertainties 1.0 %
Degradation uncertainty 1.0 %

Annual production probability

Variability 129 MWh
P50 2322 MWh
P90 2156 MWh
P95 2109 MWh

Probability distribution

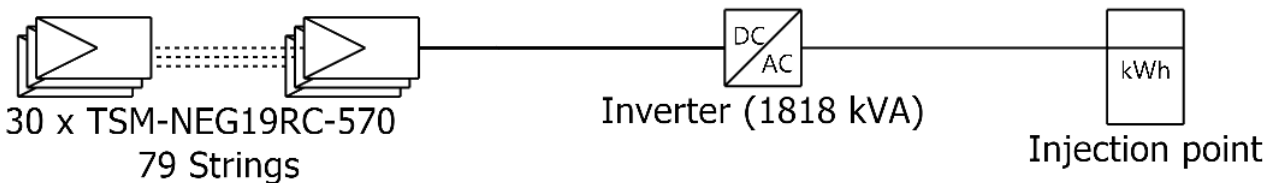




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Single-line diagram



PV module	TSM-NEG19RC-570
Inverter	PVS980-58-1818kVA-I
String	30 x TSM-NEG19RC-570

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CO₂ Emission Balance

Total: 48725.3 tCO₂

Generated emissions

Total: 2459.54 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 58991.5 tCO₂

System production: 2321.59 MWh/yr

Grid Lifecycle Emissions: 847 gCO₂/kWh

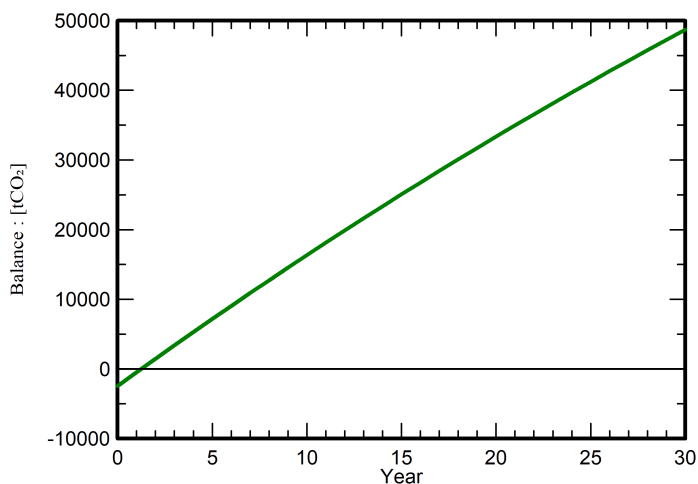
Source: IEA List

Country: Australia

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[kgCO ₂]
Modules	1638 kgCO ₂ /kWp	1416 kWp	2318646
Supports	5.65 kgCO ₂ /kg	24840 kg	140333
Inverters	560 kgCO ₂ /	1.00	560