

PVsyst - Simulation report

Grid-Connected System

Project: Goulburn Community Solar Farm

Variant: 1354kW Fixed Tilt RC Panels

Unlimited sheds

System power: 1351 kWp

Goulburn - Australia

Author

Smart Commercial Solar (Australia)



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PVsyst V7.4.5

VC2, Simulation date:
13/12/23 20:54
with v7.4.4

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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 12 °
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 2249352 kWh/year Specific production 1665 kWh/kWp/year Perf. Ratio PR 84.21 %

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Main results	5
Loss diagram	6
Predef. graphs	7
P50 - P90 evaluation	8
Single-line diagram	9
CO ₂ Emission Balance	10



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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Sheds	
Tilt	12 °
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	16.9 °
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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

Bifacial model geometry

Sheds spacing	8.00 m
Sheds width	4.83 m
Limit profile angle	17.0 °
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

2249352 kWh/year

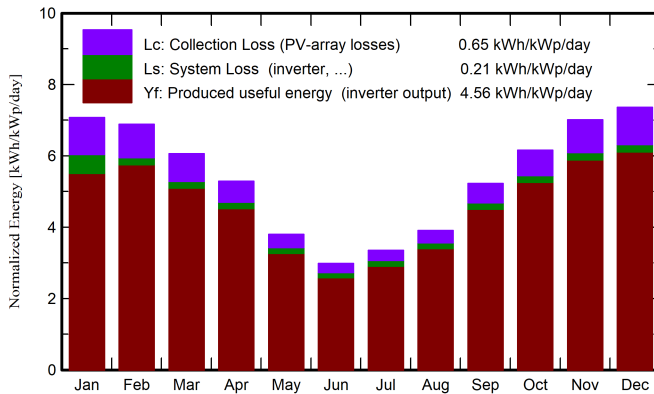
Specific production

1665 kWh/kWp/year

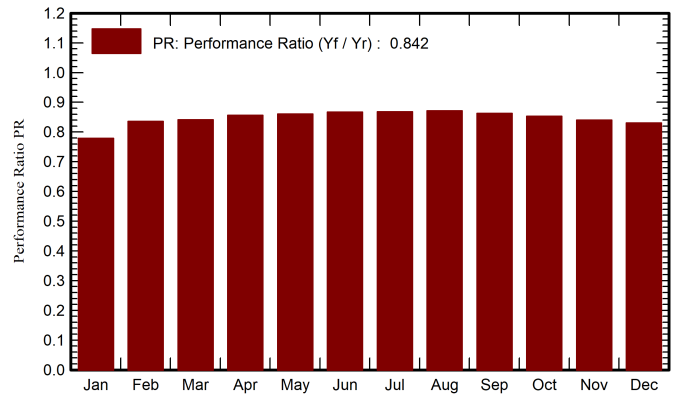
Perf. Ratio PR

84.21 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m²	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	ratio
January	219.5	74.01	20.83	219.3	206.8	252963	230760	0.779
February	185.7	69.78	19.29	192.8	182.0	225192	217648	0.836
March	172.1	55.49	16.72	188.0	177.3	221651	213751	0.842
April	134.4	32.95	12.45	158.6	149.5	190717	183482	0.856
May	94.5	30.73	8.15	117.8	110.0	143590	136906	0.860
June	70.5	26.72	5.92	89.5	83.8	110864	104819	0.867
July	82.1	26.75	5.33	104.0	97.2	128501	122042	0.869
August	102.5	39.58	6.23	121.0	113.4	149182	142397	0.871
September	140.0	42.53	9.45	156.7	148.0	189963	182585	0.863
October	181.7	69.20	12.78	191.0	180.1	228394	220301	0.854
November	208.5	70.03	16.00	210.3	198.3	246955	238677	0.840
December	230.9	69.58	18.83	228.2	215.5	264687	255984	0.830
Year	1822.5	607.34	12.63	1977.3	1861.9	2352658	2249352	0.842

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



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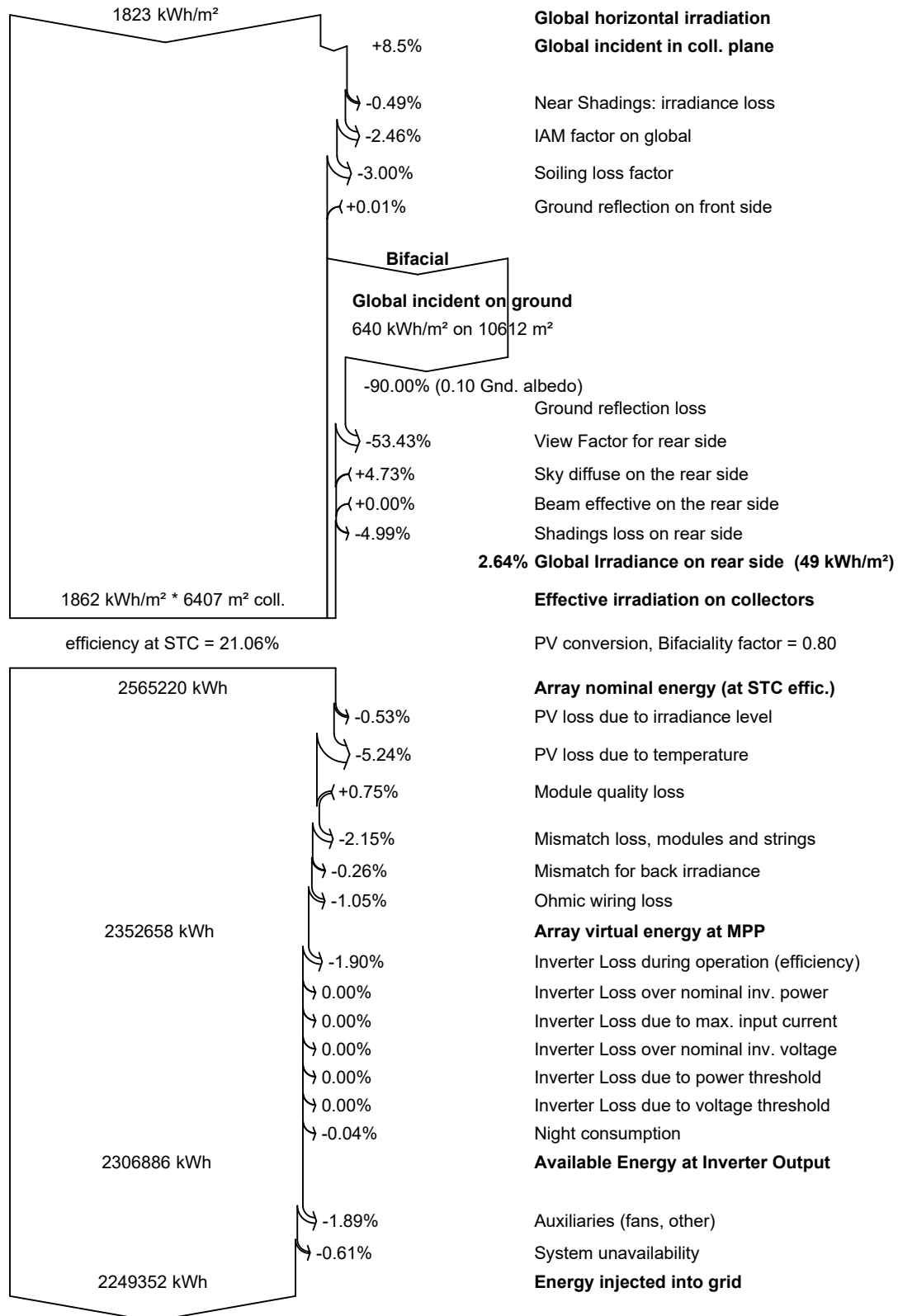
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Loss diagram





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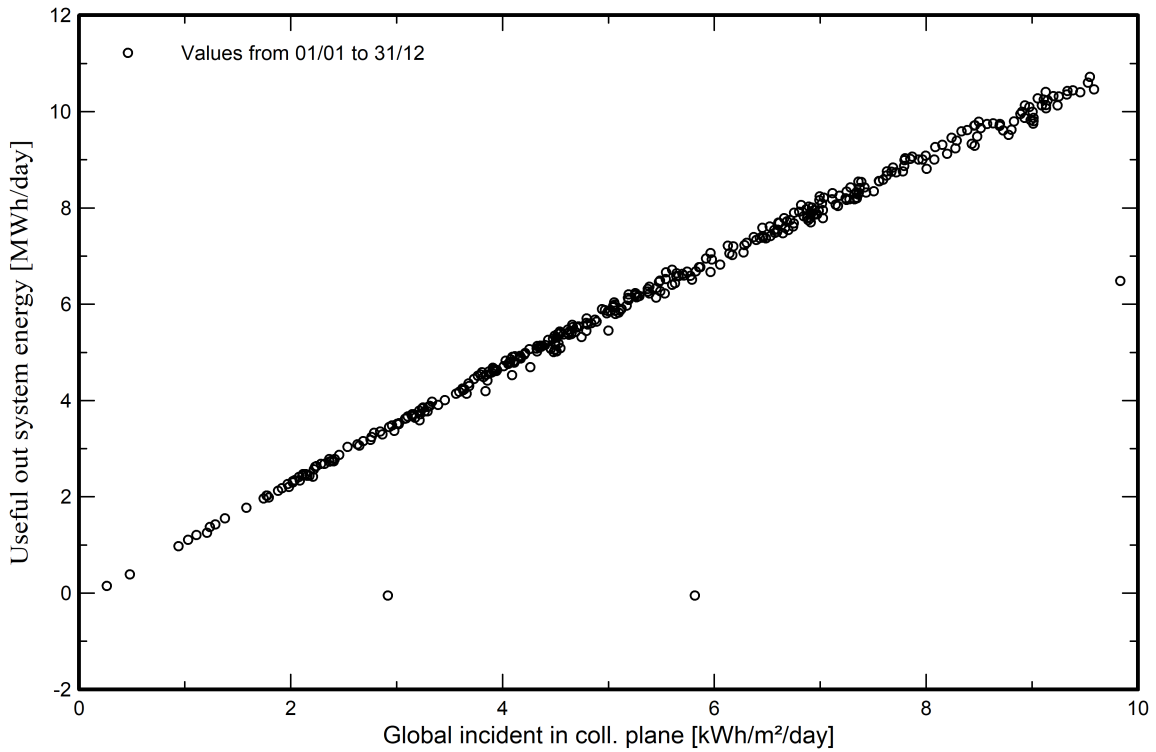
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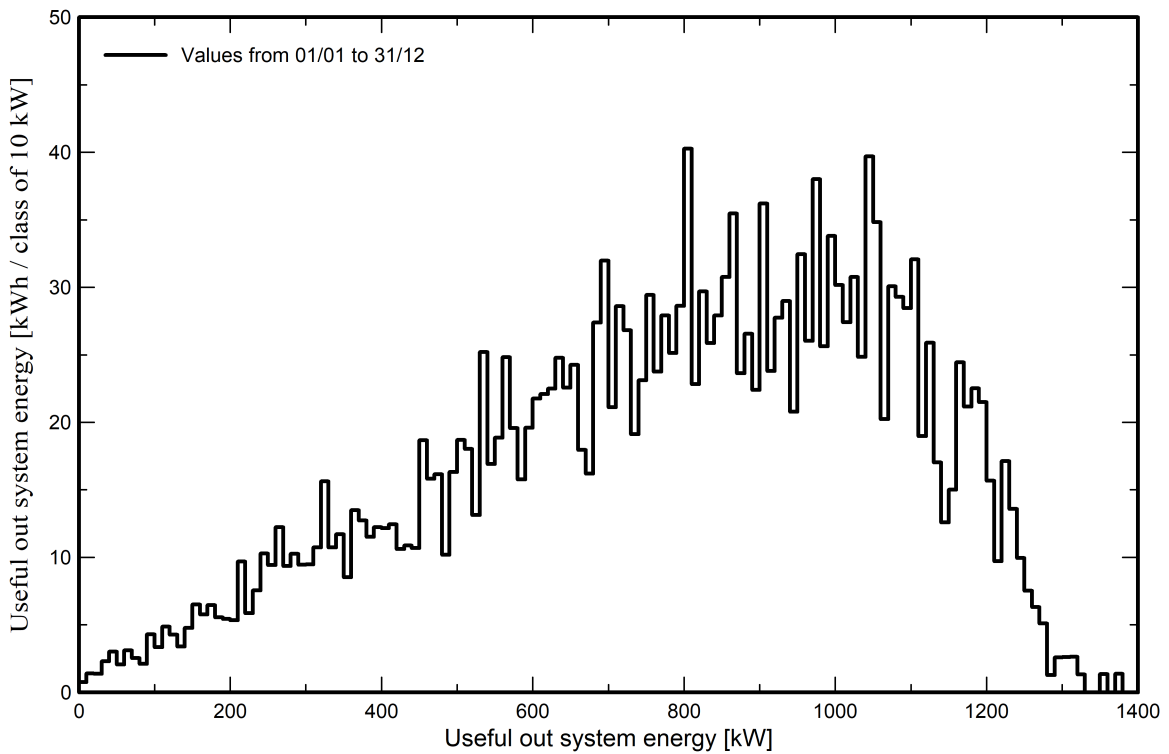
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Predef. graphs

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 %

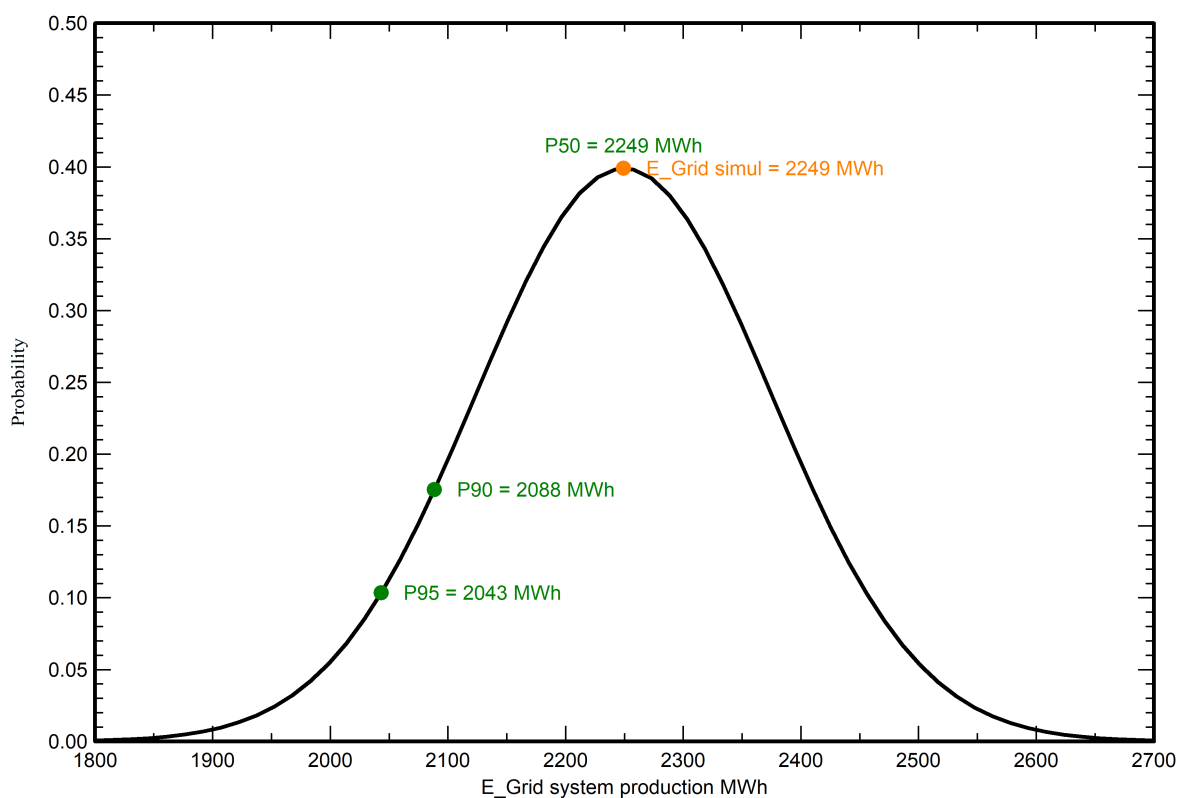
Simulation and parameters uncertainties

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 125 MWh
P50 2249 MWh
P90 2088 MWh
P95 2043 MWh

Probability distribution





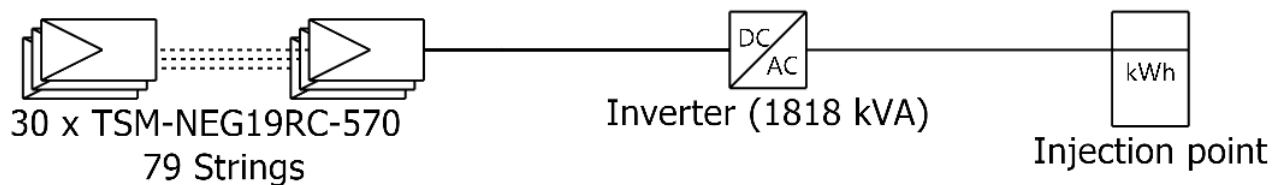
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Single-line diagram



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

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31/01/24



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CO₂ Emission Balance

Total: 47132.8 tCO₂

Generated emissions

Total: 2459.54 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 57156.0 tCO₂

System production: 2249.35 MWh/yr

Grid Lifecycle Emissions: 847 gCO₂/kWh

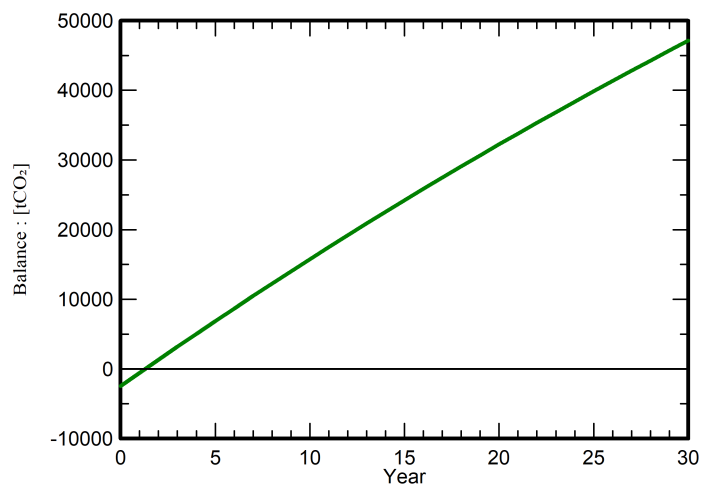
Source: IEA List

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