

PVsyst - Simulation report

Grid-Connected System

Project: Kirloskar

Variant: Bnkble 2.14MW

No 3D scene defined, no shadings

System power: 2159 kWp

Ranjangaon Ganpati - India

Author

Boond Engineering & Development Pvt. Ltd. (India)



Project: Kirloskar

Variant: Bnkble 2.14MW

PVsyst V7.4.5

VC0, Simulation date:
05/01/24 17:18
with v7.4.5

Boond Engineering & Development Pvt. Ltd. (India)

Project summary

Geographical Site

Ranjangaon Ganpati

India

Situation

Latitude 18.77 °N

Longitude 74.26 °E

Altitude 657 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Meteo data

Ranjangaon Ganpati

PVGIS api TMY

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Fixed plane

Tilt/Azimuth 25 / 0 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

3247 units

Pnom total

2159 kWp

Inverters

Nb. of units

13.1 units

Pnom total

1635 kWac

Pnom ratio

1.320

Results summary

Produced Energy 3942706 kWh/year Specific production 1826 kWh/kWp/year Perf. Ratio PR 81.54 %

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



PVsyst V7.4.5

VC0, Simulation date:
05/01/24 17:18
with v7.4.5

Boond Engineering & Development Pvt. Ltd. (India)

General parameters

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 25 / 0 °

Sheds configuration

No 3D scene defined

Models used

Transposition	Perez
Diffuse	Imported
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-DEG21C-20-665Wp Vertex
(Original PVsyst database)	

Unit Nom. Power	665 Wp
Number of PV modules	3247 units
Nominal (STC)	2159 kWp

Array #1 - PV Array

Number of PV modules	2247 units
Nominal (STC)	1494 kWp
Modules	107 string x 21 In series

At operating cond. (50°C)

Pmpp	1369 kWp
U mpp	730 V
I mpp	1877 A

Array #2 - Sub-array #2

Number of PV modules	1000 units
Nominal (STC)	665 kWp
Modules	50 string x 20 In series

At operating cond. (50°C)

Pmpp	609 kWp
U mpp	695 V
I mpp	877 A

Total PV power

Nominal (STC)	2159 kWp
Total	3247 modules
Module area	10086 m ²

Inverter

Manufacturer	Sungrow
Model	SG125CX-P2
(Original PVsyst database)	

Unit Nom. Power	125 kWac
Number of inverters	13.1 units
Total power	1635 kWac

Number of inverters	107 * MPPT 8% 8.9 units
Total power	1115 kWac

Operating voltage	180-1000 V
Pnom ratio (DC:AC)	1.34
No power sharing between MPPTs	

Number of inverters	50 * MPPT 8% 4.2 units
Total power	521 kWac

Operating voltage	180-1000 V
Pnom ratio (DC:AC)	1.28
No power sharing between MPPTs	

Total inverter power

Total power	1635 kWac
Nb. of inverters	14 units
0.9 unused	
Pnom ratio	1.32
No power sharing	

Array losses

Thermal Loss factor

Module temperature according to irradiance	
Uc (const)	20.0 W/m ² K
Uv (wind)	0.0 W/m ² K/m/s

Module Quality Loss

Loss Fraction	-0.4 %
---------------	--------

Module mismatch losses

Loss Fraction	2.0 % at MPP
---------------	--------------



Array losses

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, $n(\text{glass})=1.526$, $n(\text{AR})=1.290$

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

DC wiring losses

Global wiring resistance 4.3 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 6.4 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 13 mΩ
Loss Fraction 1.5 % at STC



PVsyst V7.4.5

VC0, Simulation date:
05/01/24 17:18
with v7.4.5

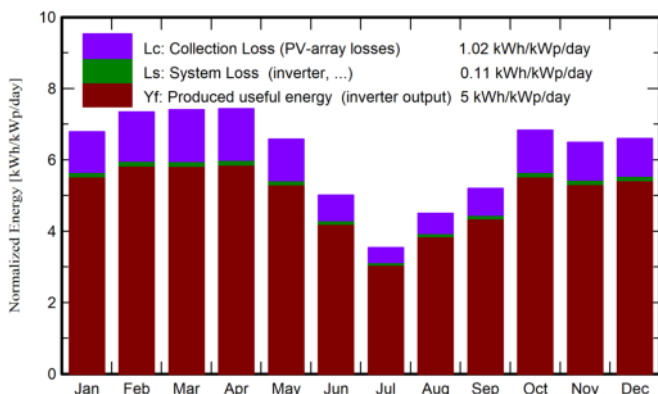
Boond Engineering & Development Pvt. Ltd. (India)

Main results

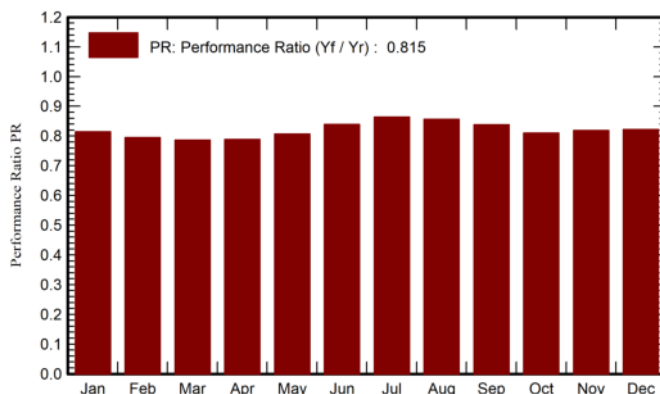
System Production

Produced Energy (P50) 3942706 kWh/year	Specific production (P50) 1826 kWh/kWp/year	Perf. Ratio PR	81.54 %
Produced Energy (P90) 3786880 kWh/year	Specific production (P90) 1754 kWh/kWp/year		
Produced Energy (P75) 3860780 kWh/year	Specific production (P75) 1788 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

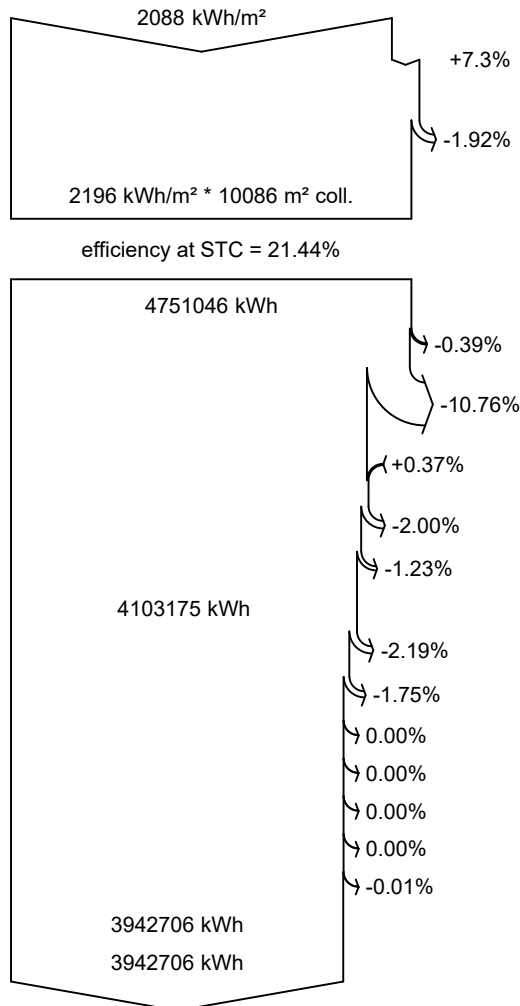
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	162.0	45.36	21.84	210.4	207.7	378506	369971	0.814
February	171.2	44.78	22.59	205.5	202.6	361171	352861	0.795
March	212.9	56.28	26.20	229.7	225.5	398765	389743	0.786
April	229.7	58.01	29.30	223.1	218.3	388309	379751	0.788
May	227.7	67.66	30.07	204.0	199.0	363242	355240	0.807
June	170.0	85.56	26.87	150.4	146.5	278634	272453	0.839
July	121.2	87.50	23.28	109.8	106.4	209314	204719	0.864
August	147.4	91.81	23.89	139.5	136.0	263646	257865	0.856
September	152.3	74.79	23.67	156.0	152.6	288694	282248	0.838
October	184.1	59.66	24.74	211.8	208.4	378807	370347	0.810
November	155.1	53.11	25.65	194.8	191.7	352364	344531	0.819
December	154.3	46.96	21.60	204.5	201.7	371415	362978	0.822
Year	2088.0	771.47	24.98	2239.5	2196.5	4032867	3942706	0.815

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



Loss diagram



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

Module array mismatch loss

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

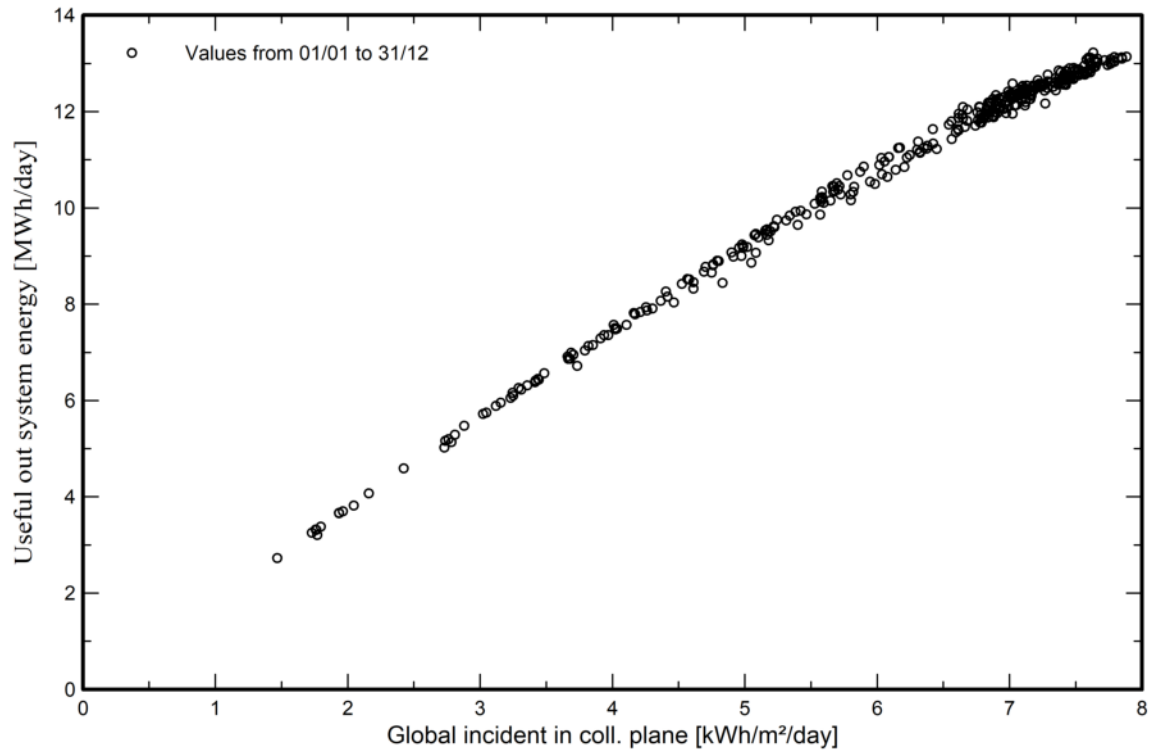
Available Energy at Inverter Output

Energy injected into grid

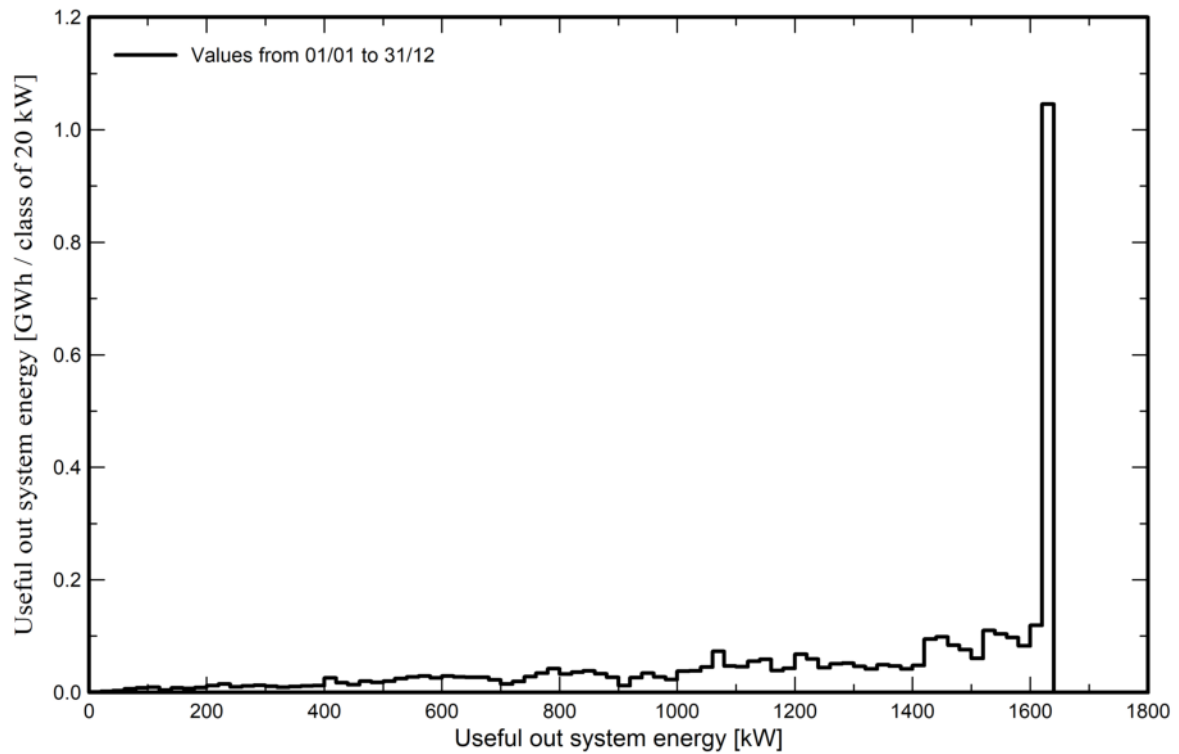


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





PVsyst V7.4.5

VC0, Simulation date:
05/01/24 17:18
with v7.4.5

Boond Engineering & Devlopment Pvt. Ltd. (India)

P50 - P90 evaluation

Meteo data

Source PVGIS api TMY
Kind TMY, multi-year
Year-to-year variability(Variance) 2.5 %

Specified Deviation

Climate change 0.0 %

Global variability (meteo + system)

Variability (Quadratic sum) 3.1 %

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 122 MWh
P50 3943 MWh
P90 3787 MWh
P75 3861 MWh

Probability distribution

