

PVsyst - Simulation report

Grid-Connected System

Project: 4 MWp NH 3, Tighara, Madhya Pradesh 476444

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 4001 kWp

Nūrābād - India

Author

Oriana power private limited (India)



Project: 4 MWp NH 3, Tighara, Madhya Pradesh 476444

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PVsyst V7.4.5

VC0, Simulation date:
08/17/24 18:51
with v7.4.5

Oriana power private limited (India)

Project summary

Geographical Site

Nūrābād

India

Situation

Latitude 26.40 °N

Longitude 78.07 °E

Altitude 176 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Meteo data

Nūrābād

Meteonorm 8.1 (1996-2015), Sat=100% - Synthetic

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Fixed plane

Tilt/Azimuth 20 / 0 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

7020 units

Pnom total

4001 kWp

Inverters

Nb. of units

10.5 units

Pnom total

3098 kWac

Pnom ratio

1.292

Results summary

Produced Energy	5948398 kWh/year	Specific production	1487 kWh/kWp/year	Perf. Ratio PR	82.62 %
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General parameters

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 20 / 0 °

Sheds configuration

No 3D scene defined

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Free Horizon

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer

GOLDI SUN PRIVATE LIMITED

Model

GS10-T144-GF-570

(Custom parameters definition)

Unit Nom. Power

570 Wp

Number of PV modules

7020 units

Nominal (STC)

4001 kWp

Modules

260 string x 27 In series

At operating cond. (50°C)

Pmpp

3697 kWp

U mpp

1053 V

I mpp

3511 A

Total PV power

Nominal (STC)

4001 kWp

Total

7020 modules

Module area

18134 m²

Inverter

Manufacturer

Sungrow

Model

SG320HX-20A

(Custom parameters definition)

Unit Nom. Power

295 kWac

Number of inverters

126 * MPPT 8% 10.5 units

Total power

3098 kWac

Operating voltage

500-1500 V

Max. power (=>30°C)

352 kWac

Pnom ratio (DC:AC)

1.29

No power sharing between MPPTs

Total inverter power

Total power

3098 kWac

Nb. of inverters

11 units

Pnom ratio

0.5 unused

1.29

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const)

29.0 W/m²K

Uv (wind)

0.0 W/m²K/m/s

DC wiring losses

Global array res.

4.9 mΩ

Loss Fraction

1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction 0.4 %

Module mismatch losses

Loss Fraction 0.5 % at MPP

Strings Mismatch loss

Loss Fraction 0.5 %

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.992	0.964	0.919	0.815	0.572	0.000

System losses

Unavailability of the system

Time fraction 1.0 %

3.7 days,

3 periods

Auxiliaries loss

constant (fans)

5.00 kW

0.0 kW from Power thresh.



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AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 1.50 % at STC

Inverter: SG320HX-20A

Wire section (10 Inv.) Alu 10 x 3 x 185 mm²
Average wires length 150 m

MV line up to Injection

MV Voltage 66 kV
Wires Alu 3 x 35 mm²
Length 200 m
Loss Fraction 0.02 % at STC

AC losses in transformers

MV transfo

Medium voltage 66 kV

Transformer from Datasheets

Nominal power 3100 kVA
Iron Loss (24/24 Connexion) 3.10 kVA
Iron loss fraction 0.10 % of PNom
Copper loss 31.00 kVA
Copper loss fraction 1.00 % at PNom
Coils equivalent resistance 3 x 2.06 mΩ

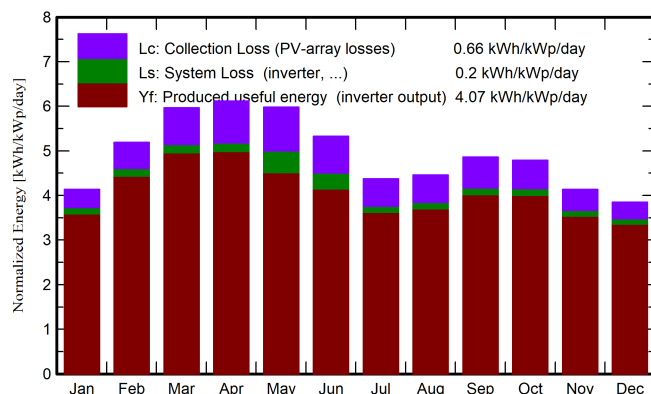


Main results

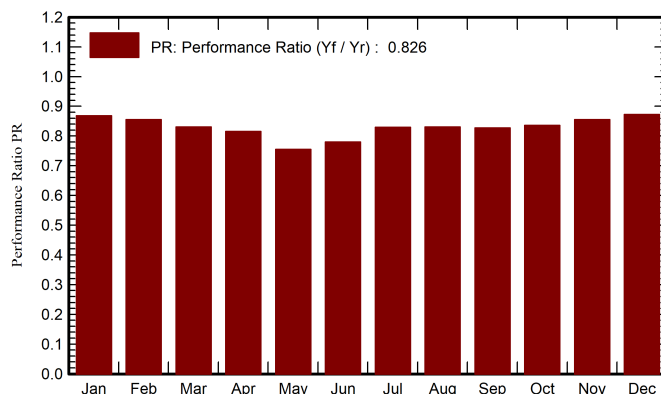
System Production

Produced Energy (P50) 5948398 kWh/year	Specific production (P50) 1487 kWh/kWp/year	Perf. Ratio PR	82.62 %
Produced Energy (P90) 5810890 kWh/year	Specific production (P90) 1452 kWh/kWp/year		
Produced Energy (P75) 5876103 kWh/year	Specific production (P75) 1469 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

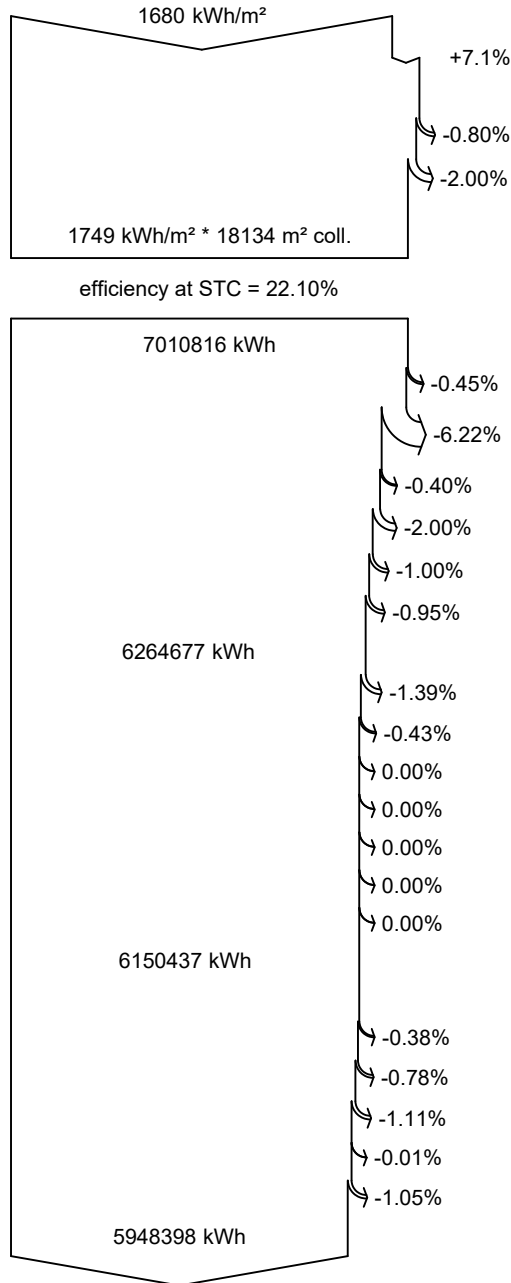
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	102.0	44.46	14.10	128.3	125.0	463164	445833	0.868
February	122.3	55.25	18.40	145.5	141.6	516245	497562	0.855
March	167.2	72.44	24.92	185.1	180.1	638618	615217	0.831
April	179.3	88.36	30.32	183.6	178.5	622196	599323	0.816
May	191.0	97.87	34.51	185.3	180.0	621348	560446	0.756
June	168.9	95.74	33.52	159.9	155.3	541810	498733	0.779
July	141.7	94.51	30.72	135.6	131.5	467184	450125	0.830
August	139.6	88.08	29.43	138.3	134.2	477328	459603	0.831
September	138.2	73.90	28.63	145.8	141.7	501181	482476	0.827
October	131.5	73.36	26.27	148.6	144.6	516160	497376	0.836
November	103.0	57.00	20.31	124.1	120.7	440542	424823	0.856
December	95.5	53.04	15.43	119.4	116.2	432189	416881	0.873
Year	1680.3	894.00	25.58	1799.4	1749.3	6237965	5948398	0.826

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

Soiling loss factor

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

LID - Light induced degradation

Mismatch loss, modules and strings

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

Auxiliaries (fans, other)

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

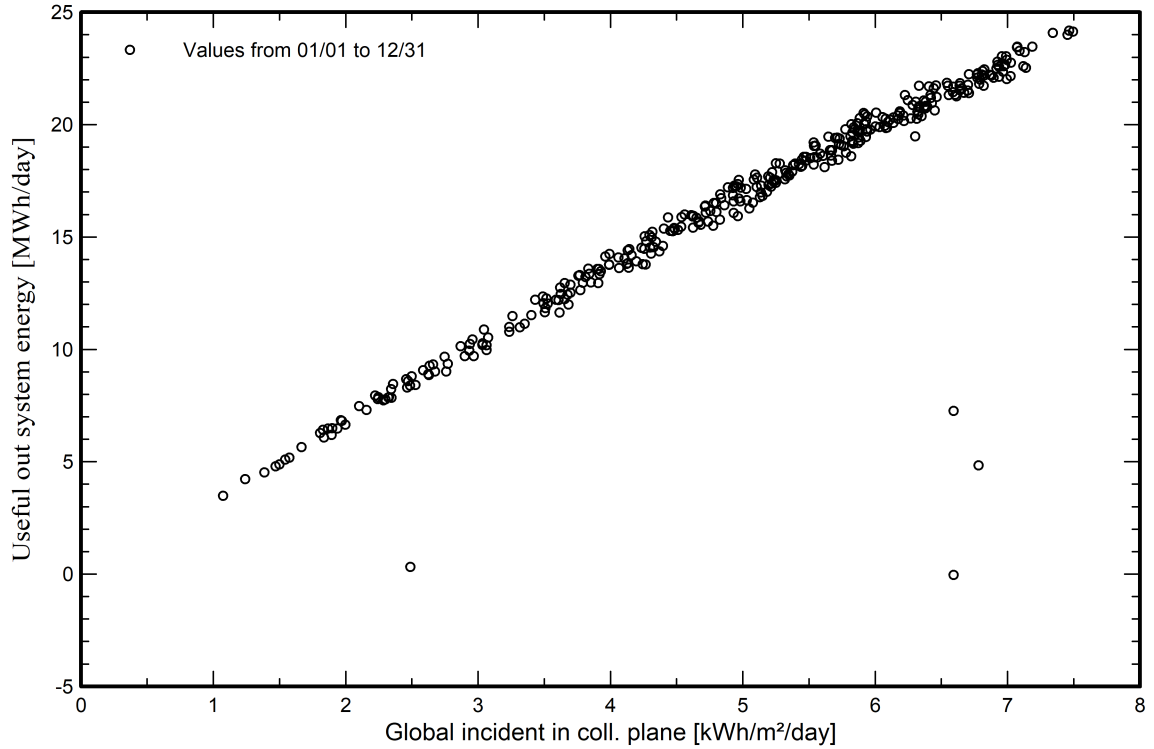
System unavailability

Energy injected into grid

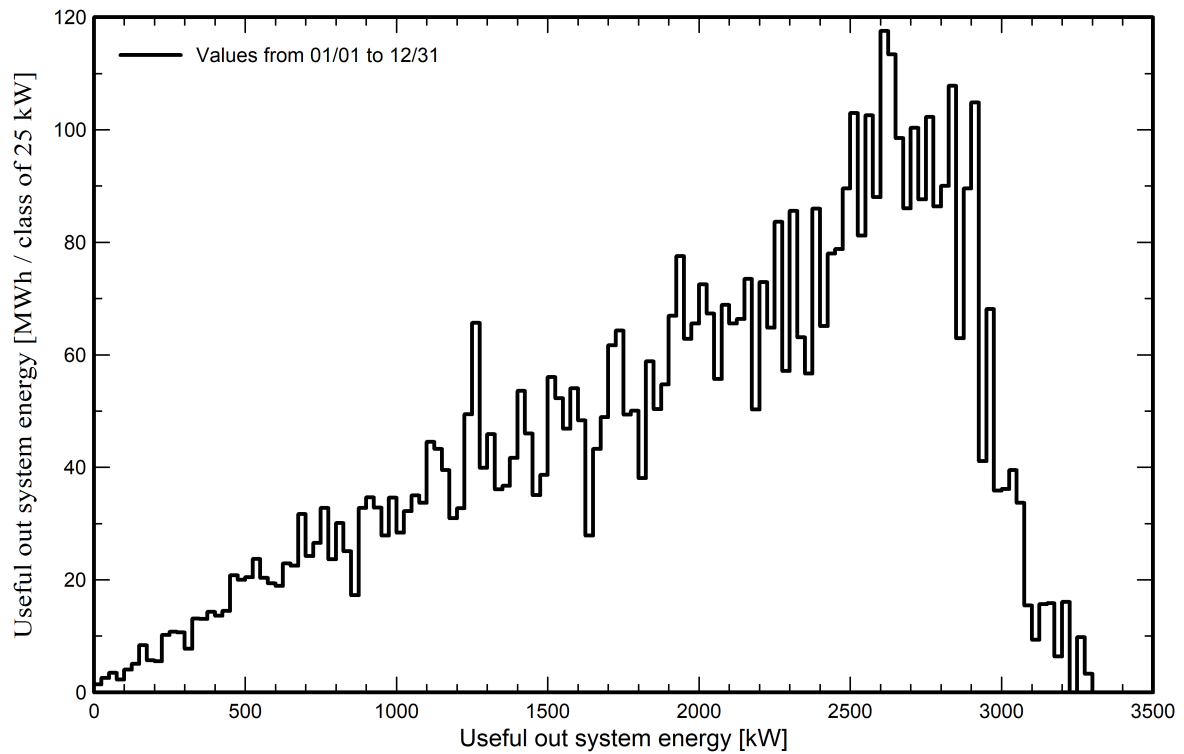


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





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P50 - P90 evaluation

Meteo data

Source Meteonorm 8.1 (1996-2015), Sat=100%
Kind Monthly averages
Synthetic - Multi-year average
Year-to-year variability(Variance) 0.0 %

Specified Deviation

Climate change 0.0 %

Global variability (meteo + system)

Variability (Quadratic sum) 1.8 %

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 107 MWh
P50 5948 MWh
P90 5811 MWh
P75 5876 MWh

Probability distribution

