

# PVsyst - Simulation report

## Grid-Connected System

Project: 1 MW Solar PV project

Variant: New simulation variant

Sheds on ground

System power: 1001 kWp

Umbarmale - India



# Project: 1 MW Solar PV project

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## PVsyst V7.4.5

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with v7.4.5

### Project summary

#### Geographical Site

Umbarmale

India

#### Situation

Latitude 17.72 °N

Longitude 74.37 °E

Altitude 818 m

Time zone UTC+5.5

#### Project settings

Albedo 0.20

#### Meteo data

Umbarmale

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

### System summary

#### Grid-Connected System

#### PV Field Orientation

Fixed plane

Tilt/Azimuth 23 / 0 °

#### Sheds on ground

#### Near Shadings

Linear shadings : Fast (table)

#### User's needs

Unlimited load (grid)

#### System information

#### PV Array

Nb. of modules

3335 units

Pnom total

1001 kWp

#### Inverters

Nb. of units

16 units

Pnom total

800 kWac

Pnom ratio

1.251

### Results summary

Produced Energy	1631807 kWh/year	Specific production	1631 kWh/kWp/year	Perf. Ratio PR	81.70 %
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# Project: 1 MW Solar PV project

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### General parameters

#### Grid-Connected System

#### PV Field Orientation

##### Orientation

Fixed plane  
Tilt/Azimuth 23 / 0 °

#### Horizon

Free Horizon

#### Sheds on ground

##### Sheds configuration

Nb. of sheds 160 units

##### Sizes

Sheds spacing 5.00 m  
Collector width 3.02 m  
Ground Cov. Ratio (GCR) 60.3 %  
Top inactive band 0.02 m  
Bottom inactive band 0.02 m

##### Shading limit angle

Limit profile angle 28.3 °

#### Near Shadings

Linear shadings : Fast (table)

##### Models used

Transposition Perez  
Diffuse Perez, Meteonom  
Circumsolar separate

#### User's needs

Unlimited load (grid)

### PV Array Characteristics

#### PV module

Manufacturer

Model

(Original PVsyst database)

Unit Nom. Power 300 Wp  
Number of PV modules 3335 units  
Nominal (STC) 1001 kWp  
Modules 145 string x 23 In series

#### At operating cond. (50°C)

Pmpp 904 kWp  
U mpp 667 V  
I mpp 1355 A

#### Total PV power

Nominal (STC) 1001 kWp  
Total 3335 modules  
Module area 5485 m²  
Cell area 4888 m²

#### Inverter

Manufacturer

Model

(Original PVsyst database)

Unit Nom. Power 50.0 kWac  
Number of inverters 16 units  
Total power 800 kWac  
Operating voltage 160-1000 V  
Max. power (=>40°C) 55.0 kWac  
Pnom ratio (DC:AC) 1.25  
Power sharing within this inverter

#### Total inverter power

Total power 800 kWac  
Max. power 880 kWac  
Number of inverters 16 units  
Pnom ratio 1.25

### Array losses

#### Thermal Loss factor

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

#### Module mismatch losses

Loss Fraction 2.0 % at MPP

#### IAM loss factor

Incidence effect (IAM): User defined profile

#### DC wiring losses

Global array res. 8.3 mΩ  
Loss Fraction 1.5 % at STC

#### Strings Mismatch loss

Loss Fraction 0.2 %

#### Module Quality Loss

Loss Fraction -0.4 %

10°	20°	30°	40°	50°	60°	70°	80°	90°
1.000	1.000	1.000	0.990	0.990	0.970	0.920	0.760	0.000

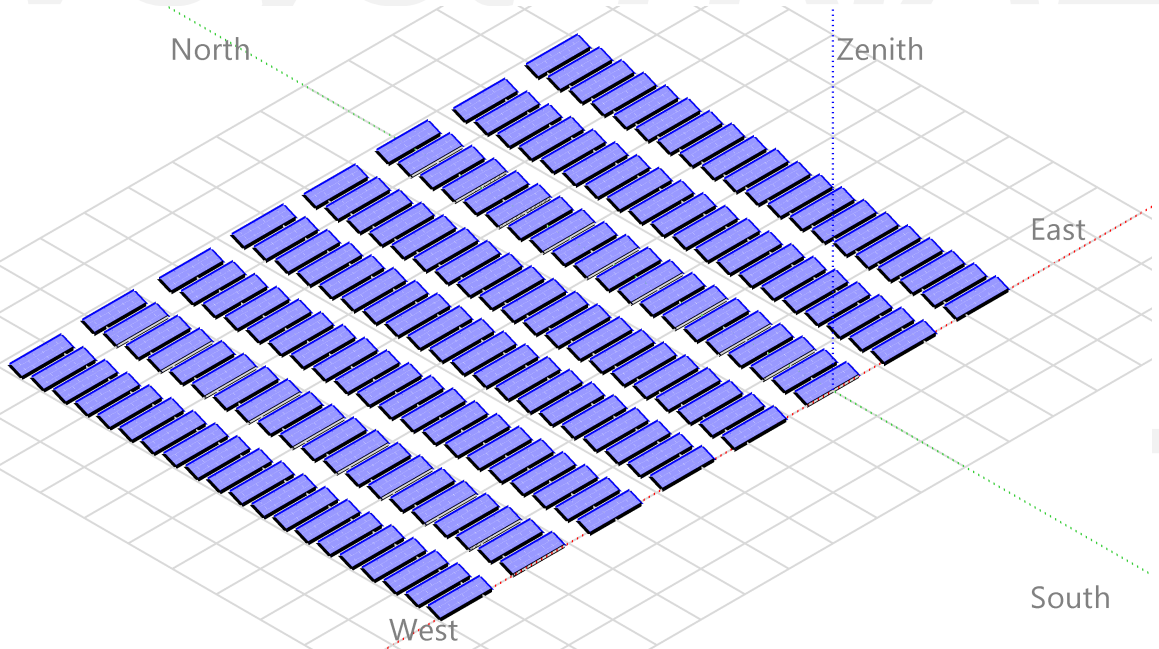


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**Near shadings parameter**

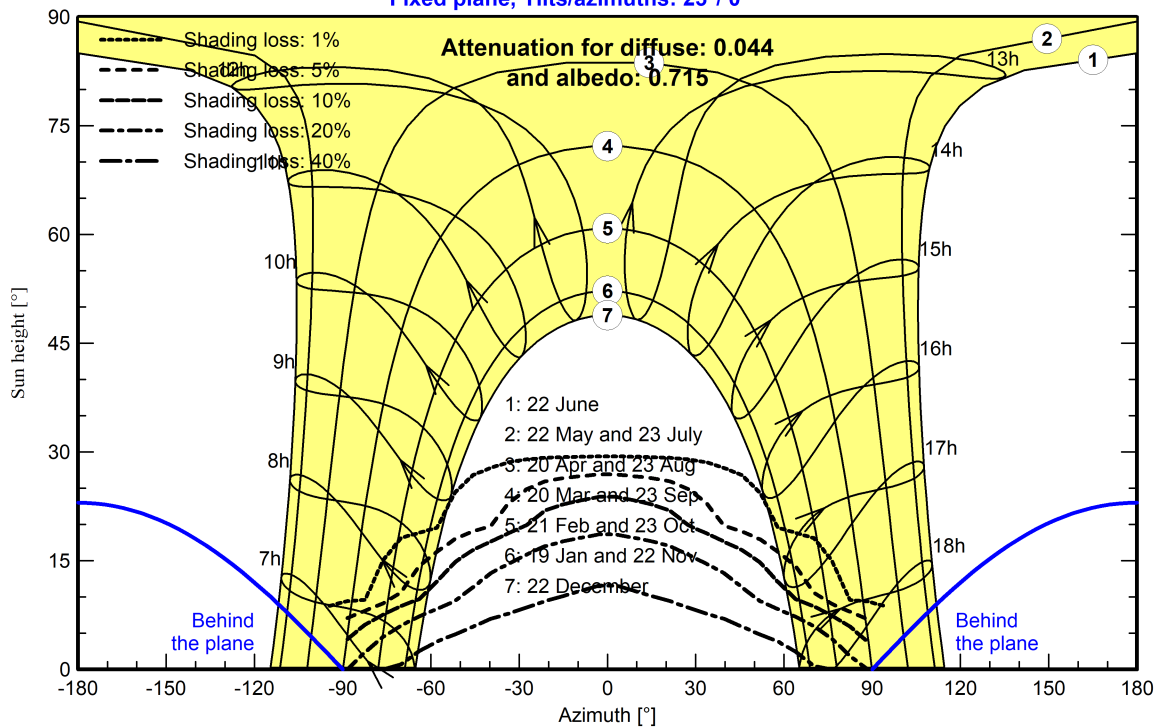
**Perspective of the PV-field and surrounding shading scene**



**Iso-shadings diagram**

**Orientation #1**

Fixed plane, Tilts/azimuths: 23°/ 0°





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### Main results

#### System Production

Produced Energy 1631807 kWh/year

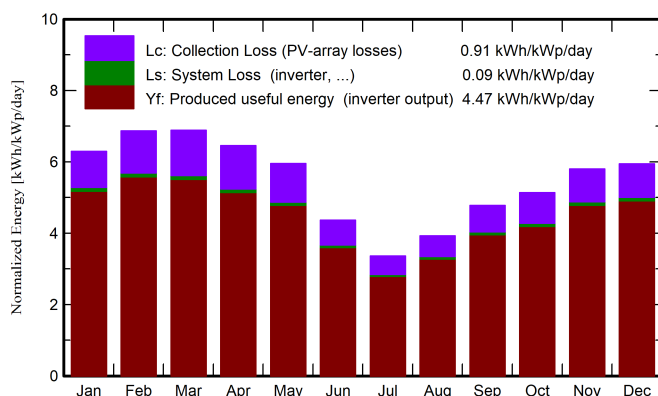
Specific production

1631 kWh/kWp/year

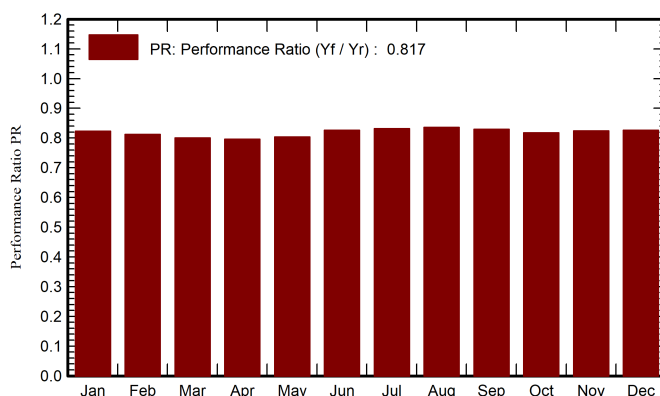
Perf. Ratio PR

81.70 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



### Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	kWh	kWh	ratio
January	155.5	45.15	20.26	195.1	190.1	163885	160574	0.823
February	163.3	47.49	23.20	192.3	188.1	159524	156347	0.812
March	199.3	64.21	26.71	213.4	208.1	174293	170857	0.800
April	198.7	72.96	29.20	193.7	188.3	157406	154334	0.796
May	202.4	82.77	29.62	184.5	178.2	151238	148304	0.804
June	146.4	81.42	25.84	130.8	125.1	110378	108127	0.826
July	114.3	74.64	24.64	104.0	98.9	88477	86554	0.831
August	129.2	82.28	23.80	121.8	116.3	103974	101810	0.836
September	140.9	72.51	23.88	143.3	138.1	121367	118892	0.829
October	144.2	66.96	24.32	159.1	154.2	132883	130191	0.818
November	143.3	50.52	22.18	174.1	169.5	146491	143532	0.824
December	143.5	42.20	20.25	184.2	179.4	155458	152284	0.826
Year	1881.0	783.13	24.49	1996.3	1934.3	1665375	1631807	0.817

#### 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

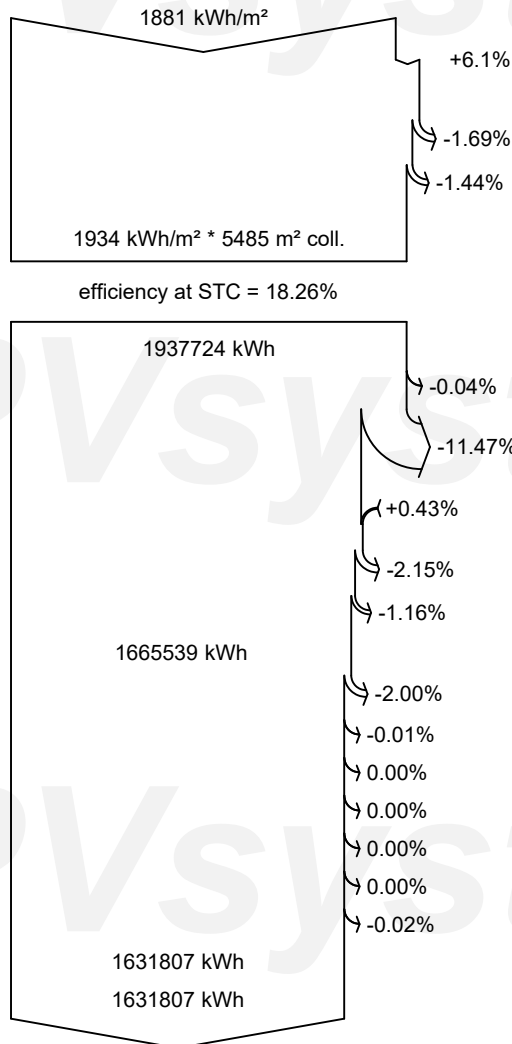
PR Performance Ratio



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**Loss diagram**



**Global horizontal irradiation**

**Global incident in coll. plane**

Near Shadings: irradiance loss

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

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**

**Energy injected into grid**

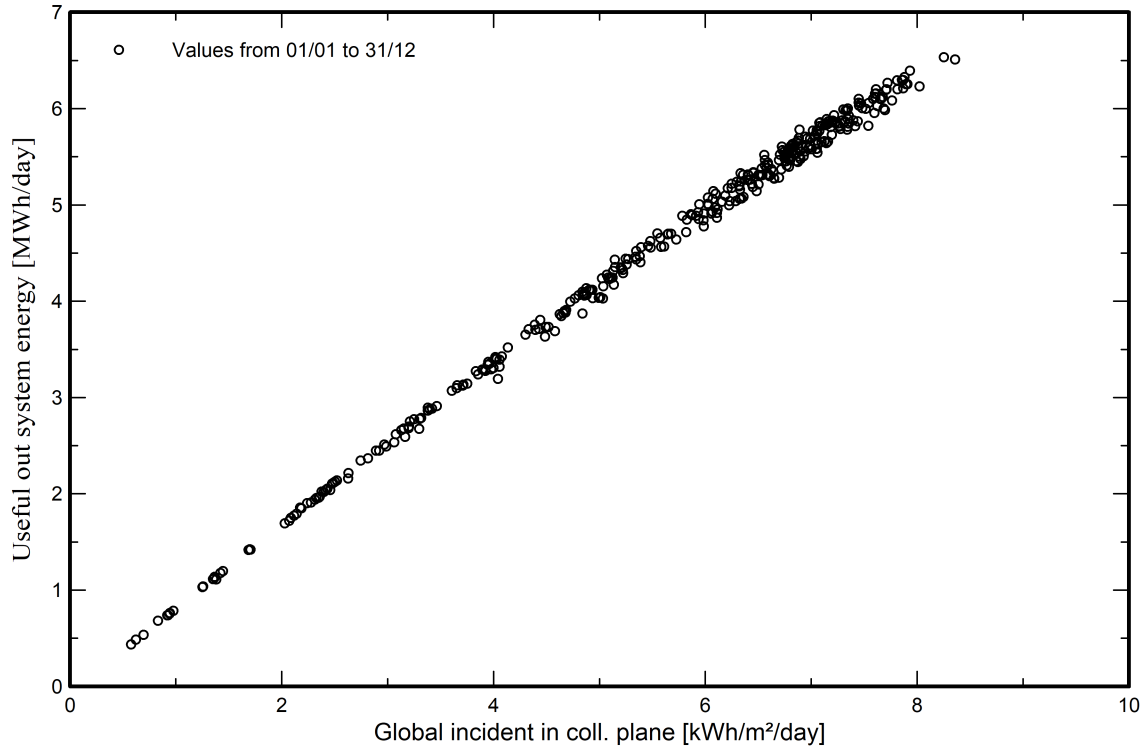


**PVsyst V7.4.5**

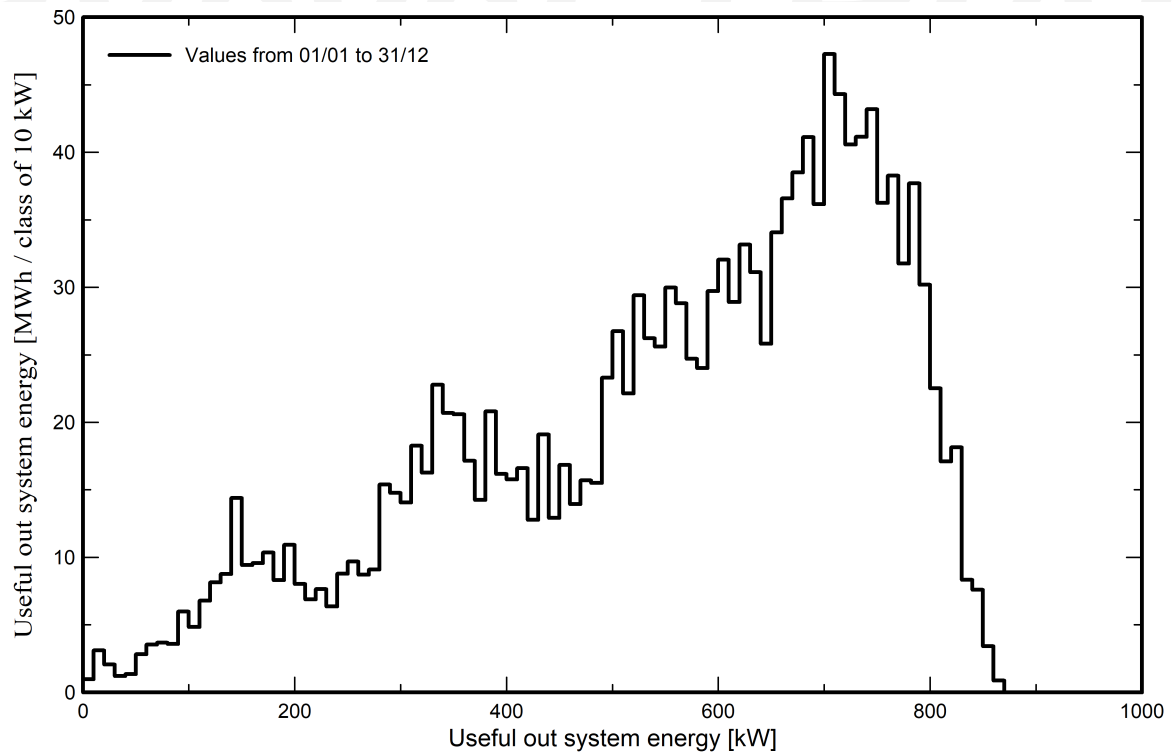
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**Predef. graphs**

**Daily Input/Output diagram**



**System Output Power Distribution**

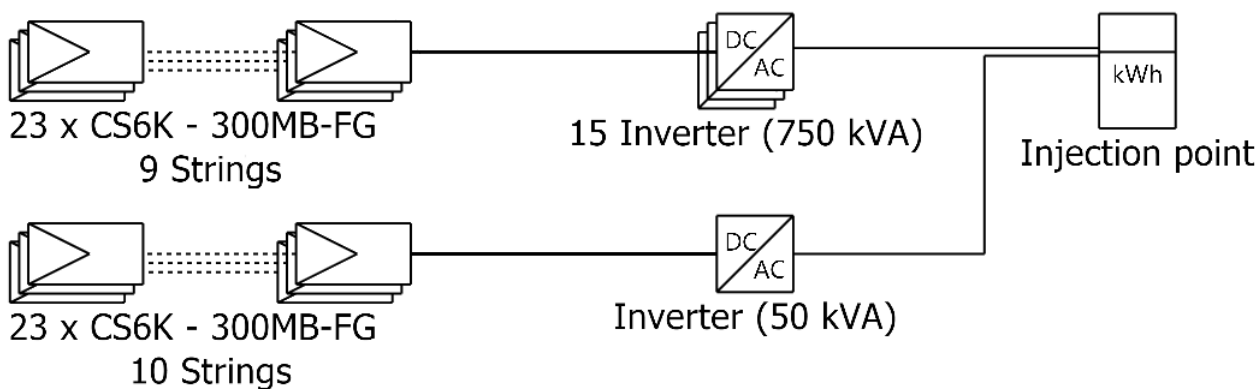




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# Single-line diagram



PV module	CS6K - 300MB-FG
Inverter	SG50CX-P2
String	23 x CS6K - 300MB-FG

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