

# PVsyst - Simulation report

## Grid-Connected System

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Project: District female hospital Sultanpur

Variant: New simulation variant

Unlimited sheds

System power: 95.1 kWp

Khallābād - India

**Author**

Jakson Limited (India)



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## PVsyst V8.0.2

VC0, Simulation date:  
17/12/24 10:18  
with V8.0.2

Jakson Limited (India)

### Project summary

#### Geographical Site

**Khallābād**

India

#### Situation

Latitude 26.26 °N

Longitude 82.07 °E

Altitude 105 m

Time zone UTC+5.5

#### Project settings

Albedo 0.20

#### Weather data

Khallābād

Meteonorm 8.2 (1996-2015), Sat=100% - Synthetic

### System summary

#### Grid-Connected System

#### Orientation #1

##### Sheds

Tilt 10 °

Azimuth 40 °

#### Unlimited sheds

#### Near Shadings

Mutual shadings of sheds

#### User's needs

Unlimited load (grid)

#### System information

##### PV Array

Nb. of modules 164 units

Pnom total 95.1 kWp

##### Inverters

Nb. of units 1 unit

Pnom total 80.0 kWac

Pnom ratio 1.189

### Results summary

Produced Energy 134387 kWh/year Specific production 1413 kWh/kWp/year Perf. Ratio PR 90.24 %

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## General parameters

## Grid-Connected System

## Orientation #1

## Sheds

Tilt	10 °
Azimuth	40 °

## Unlimited sheds

## Sheds configuration

Nb. of sheds	2 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	7.8 °

## Sizes

Sheds spacing	6.80 m
Collector width	3.00 m
Average GCR	44.1 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

## Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

## Horizon

Free Horizon

## Near Shadings

Mutual shadings of sheds

## Bifacial system definition

## Orientation #1

## Bifacial system

Model	Unlimited Sheds 2D Model
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## Bifacial model geometry

Sheds spacing	6.80 m
Sheds width	3.04 m
Limit profile angle	7.8 °
GCR	44.7 %
Height above ground	1.50 m
Nb. of sheds	2 units

## Bifacial model definitions

Ground albedo	0.30
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

## User's needs

Unlimited load (grid)

## PV Array Characteristics

## PV module

Manufacturer	Panasonic Life Solutions India Pvt. Ltd
Model	AE14T580VHC16B5R
(Custom parameters definition)	

Unit Nom. Power	580 Wp
Number of PV modules	164 units
Nominal (STC)	95.1 kWp

## Array #1 - PV Array

Number of PV modules	144 units
Nominal (STC)	83.5 kWp
Modules	9 string x 16 In series

## At operating cond. (50°C)

Pmpp	77.4 kWp
U mpp	657 V
I mpp	118 A

## Inverter

Manufacturer	Growatt New Energy
Model	MAX 80KTL3 LV
(Original PVsyst database)	

Unit Nom. Power	80.0 kWac
Number of inverters	1 unit
Total power	80.0 kWac

Number of inverters	6 * MPPT 14% 0.9 unit
Total power	68.6 kWac

Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.22
No power sharing between MPPTs	



## PV Array Characteristics

## Array #2 - Sub-array #2

Number of PV modules	20 units	Number of inverters	1 * MPPT 14% 0.1 unit
Nominal (STC)	11.60 kWp	Total power	11.4 kWac
Modules	2 string x 10 In series		
<b>At operating cond. (50°C)</b>			
Pmpp	10.76 kWp	Operating voltage	200-1000 V
U mpp	411 V	Pnom ratio (DC:AC)	1.01
I mpp	26 A		

## Total PV power

Nominal (STC)	95 kWp
Total	164 modules
Module area	423 m <sup>2</sup>

## Total inverter power

Total power	80 kWac
Number of inverters	1 unit
Pnom ratio	1.19
No power sharing	

## Array losses

## Array Soiling Losses

Loss Fraction	2.0 %
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## Thermal Loss factor

Module temperature according to irradiance	
Uc (const)	29.0 W/m <sup>2</sup> K
Uv (wind)	0.0 W/m <sup>2</sup> K/m/s

## Serie Diode Loss

Voltage drop	0.7 V
Loss Fraction	0.1 % at STC

## LID - Light Induced Degradation

Loss Fraction	0.3 %
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## Module Quality Loss

Loss Fraction	0.0 %
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## Module mismatch losses

## Array #1 - PV Array

Loss Fraction	1.0 % at MPP
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## Array #2 - Sub-array #2

Loss Fraction	1.0 % at MPP
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## 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	0.963	0.917	0.812	0.567	0.000

## DC wiring losses

Global wiring resistance	10 mΩ
Loss Fraction	1.5 % at STC

## Array #1 - PV Array

Global array res.	91 mΩ
Loss Fraction	1.5 % at STC

## Array #2 - Sub-array #2

Global array res.	255 mΩ
Loss Fraction	1.5 % at STC

## System losses

## Unavailability of the system

Time fraction	1.0 %
	3.7 days,
	3 periods



### AC wiring losses

#### Inv. output line up to injection point

Inverter voltage 400 Vac tri  
Loss Fraction 1.54 % at STC

#### Inverter: MAX 80KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 70 mm<sup>2</sup>  
Wires length 65 m

#### Inverter: MAX 80KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 50 mm<sup>2</sup>  
Wires length 0 m



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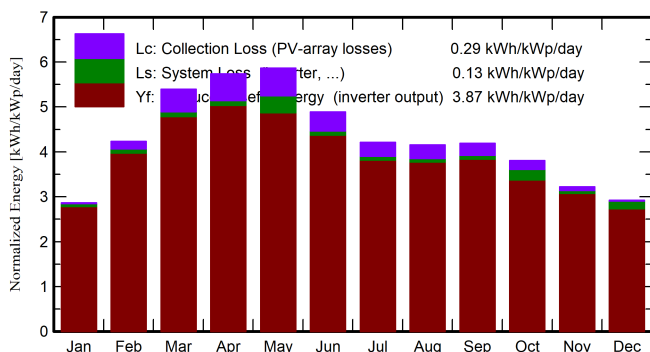
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## Main results

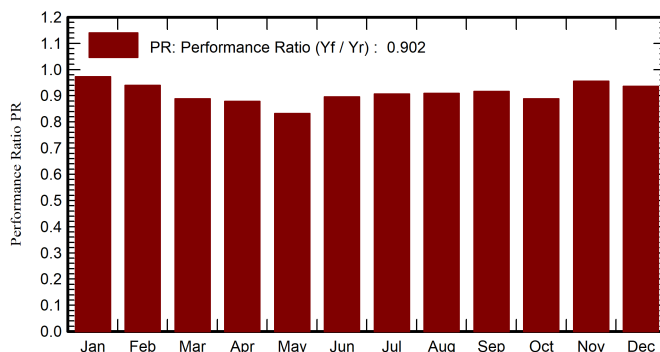
### System Production

Produced Energy (P50)	134387 kWh/year	Specific production (P50)	1413 kWh/kWp/year	Perf. Ratio PR	90.24 %
Produced Energy (P90)	131281 kWh/year	Specific production (P90)	1380 kWh/kWp/year		
Produced Energy (P75)	132754 kWh/year	Specific production (P75)	1396 kWh/kWp/year		

### Normalized productions (per installed kWp)



### Performance Ratio PR



## Balances and main results

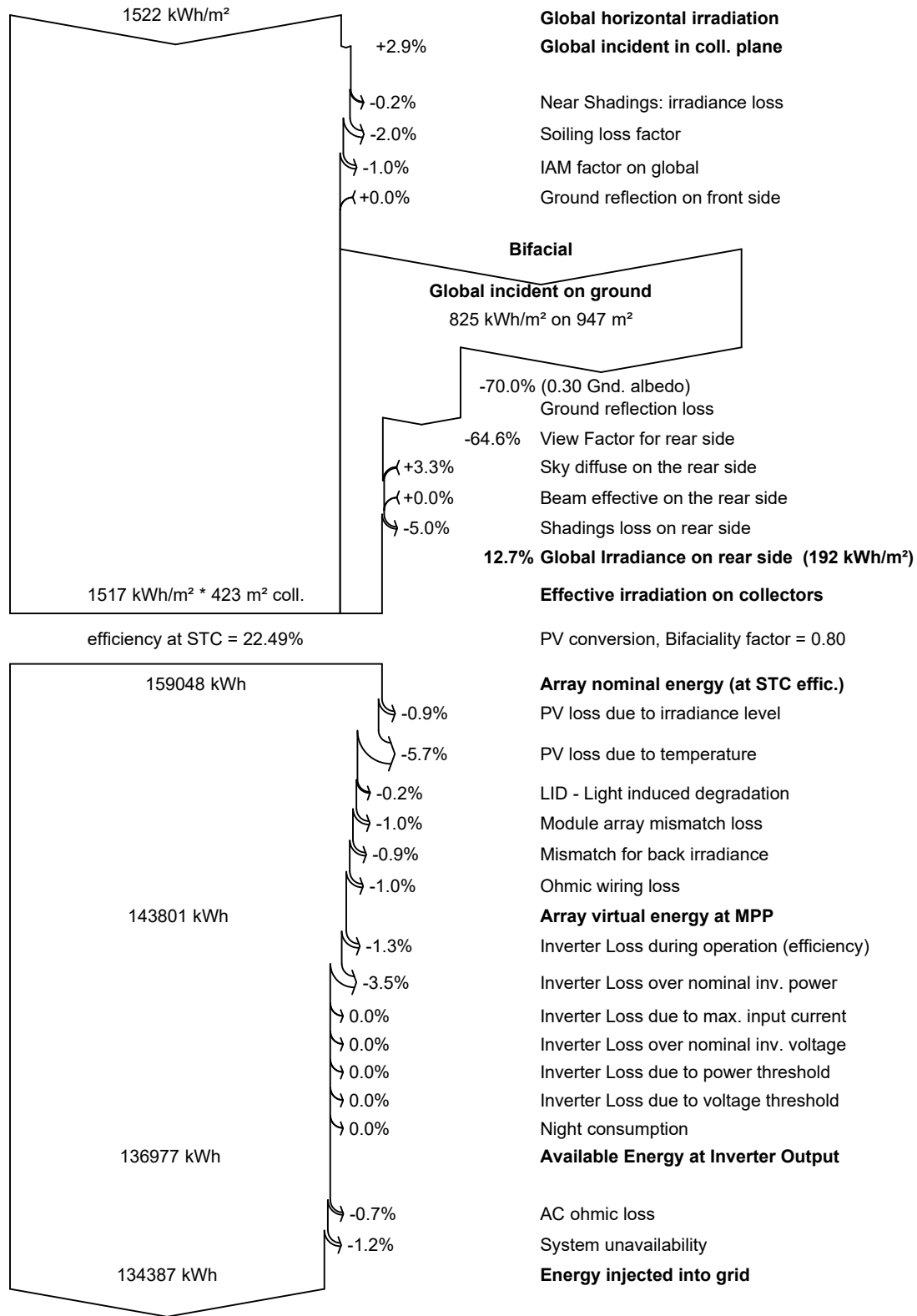
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	kWh	kWh	ratio
January	82.3	51.11	14.87	88.9	85.9	8402	8224	0.972
February	110.5	58.93	19.33	118.6	115.0	10831	10598	0.940
March	159.6	72.90	25.36	167.2	162.3	14442	14128	0.889
April	169.5	87.01	30.42	172.2	167.1	14690	14379	0.878
May	182.6	99.92	33.35	181.8	176.4	15484	14385	0.832
June	148.7	97.55	32.41	146.6	142.0	12757	12484	0.895
July	132.4	84.99	30.22	130.7	126.5	11516	11266	0.906
August	128.6	84.31	29.66	128.8	124.7	11378	11137	0.909
September	122.7	77.74	28.66	125.8	121.7	11204	10966	0.917
October	112.4	71.20	26.83	118.0	114.3	10657	9970	0.889
November	89.8	58.51	21.39	96.6	93.5	8965	8781	0.955
December	83.0	53.57	16.74	90.6	87.6	8579	8069	0.936
Year	1522.2	897.73	25.80	1565.6	1517.0	138905	134387	0.902

### 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		



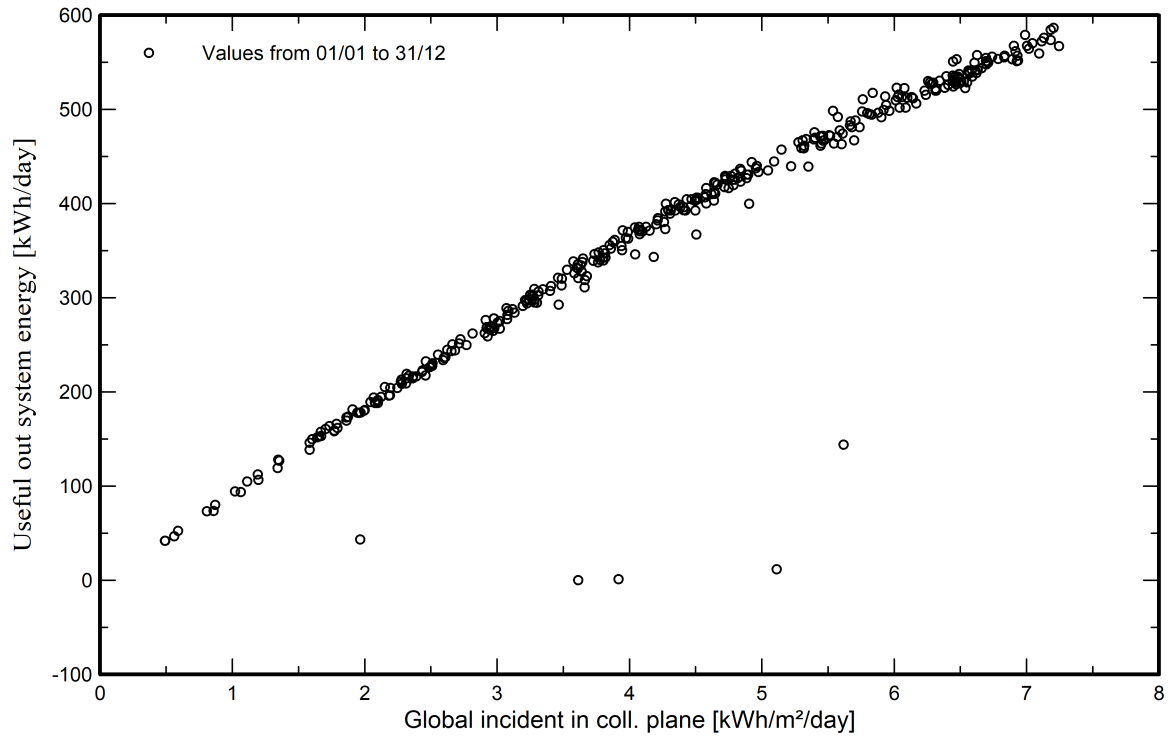
### Loss diagram



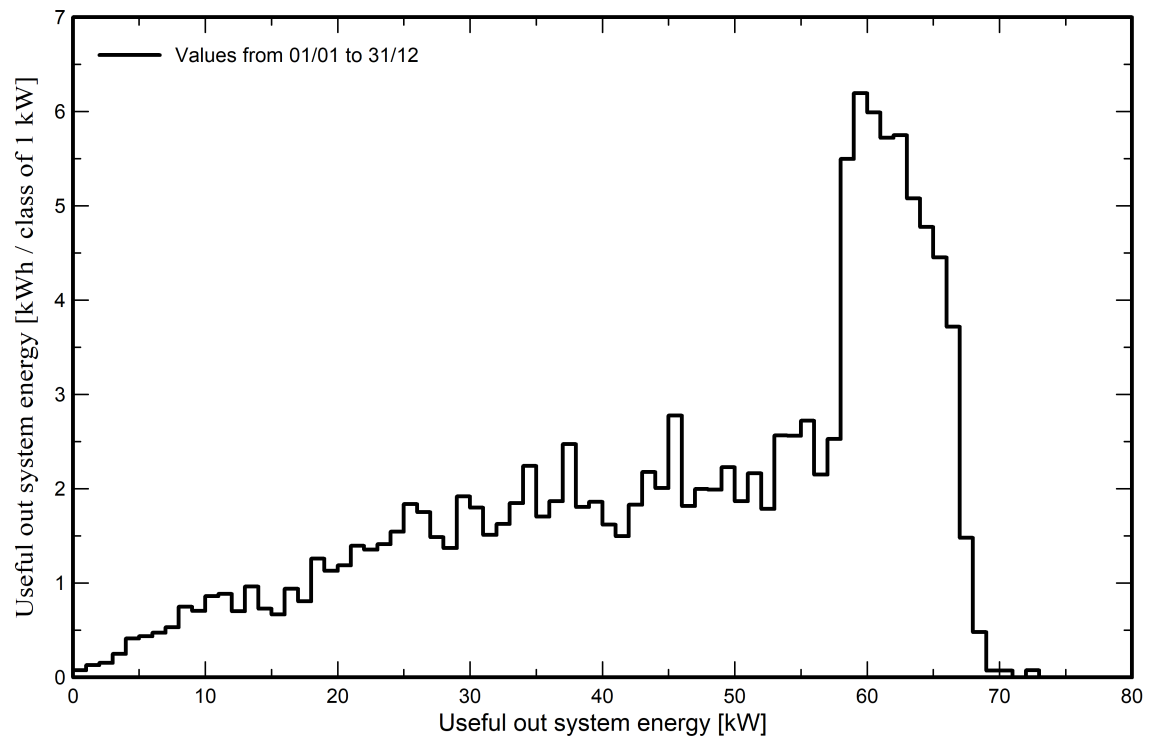


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution







### P50 - P90 evaluation

#### Weather data

Source Meteonorm 8.2 (1996-2015), Sat=100%  
Kind Not defined  
Year-to-year variability(Variance) 0.0 %

#### Specified Deviation

#### Global variability (weather data + 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 2.42 MWh  
P50 134.39 MWh  
P90 131.28 MWh  
P75 132.75 MWh

### Probability distribution

