

# PVsyst - Simulation report

## Grid-Connected System

Project: Baba Kinaram Autonomus State Medical College, Chandauli (UP)

Variant: New simulation variant

Multiple Orientation

System power: 424 kWp

Sarāi Fidāi - India

**Author**

Jakson Limited (India)



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## PVsyst V8.0.2

VC0, Simulation date:  
16/12/24 17:12  
with V8.0.2

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### Project summary

#### Geographical Site

Sarāi Fidāi

India

#### Situation

Latitude 25.25 °N

Longitude 83.38 °E

Altitude 78 m

Time zone UTC+5.5

#### Project settings

Albedo 0.20

#### Weather data

Sarāi Fidāi

Meteonorm 8.2 (2001-2020), Sat=100% - Synthetic

### System summary

#### Grid-Connected System

##### Orientation #1

##### Sheds

Tilt 10 °

Azimuth 5 °

#### Multiple Orientation

##### Orientation #2

##### Fixed plane

Tilt/Azimuth 6 / 94 °

##### Orientation #3

##### Fixed plane

Tilt/Azimuth 6 / -86 °

#### Near Shadings

no Shadings

#### User's needs

Unlimited load (grid)

#### System information

##### PV Array

Nb. of modules 731 units

Pnom total 424 kWp

##### Inverters

Nb. of units 3 units

Pnom total 350 kWac

Pnom ratio 1.211

### Results summary

Produced Energy 569445 kWh/year Specific production 1343 kWh/kWp/year Perf. Ratio PR 85.95 %

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## General parameters

### Grid-Connected System

#### Orientation #1

##### Sheds

Tilt	10 °
Azimuth	5 °

#### Orientation #2

##### Fixed plane

Tilt/Azimuth	6 / 94 °
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#### Orientation #3

##### Fixed plane

Tilt/Azimuth	6 / -86 °
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#### Near Shadings

no Shadings

### Multiple Orientation

#### Sheds configuration

Nb. of sheds	5 units
Unlimited sheds	
<b>Shading limit angle</b>	
Limit profile angle	11.7 °

#### Sheds configuration

No 3D scene defined

#### Sheds configuration

No 3D scene defined

#### User's needs

Unlimited load (grid)

#### Sizes

Sheds spacing	5.50 m
Collector width	3.00 m
Average GCR	54.5 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

#### Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

#### Horizon

Free Horizon

## PV Array Characteristics

### PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd  
ModelAE14T580VHC16B5R  
(Custom parameters definition)

Unit Nom. Power	580 Wp
Number of PV modules	536 units
Nominal (STC)	311 kWp

### Array #1 - PV Array

Orientation	#1
Tilt/Azimuth	10/5 °
Number of PV modules	266 units
Nominal (STC)	154 kWp
Modules	19 string x 14 In series

### At operating cond. (50°C)

Pmpp	143 kWp
U mpp	575 V
I mpp	249 A

### Array #2 - Sub-array #2

Mixed orient.

#2/3: 9/9 strings

Tilt/Azimuth	6/94 °
	6/-86 °
Number of PV modules	270 units
Nominal (STC)	157 kWp
Modules	18 string x 15 In series

### At operating cond. (50°C)

Pmpp	145 kWp
U mpp	616 V
I mpp	236 A

### Inverter

ManufacturerGrowatt New Energy  
ModelMAX 125KTL3-X LV  
(Original PVsyst database)

Unit Nom. Power	125 kWac
Number of inverters	2 units
Total power	250 kWac

Number of inverters	1 unit
Total power	125 kWac

Operating voltage	180-1000 V
Pnom ratio (DC:AC)	1.23
Power sharing within this inverter	

Number of inverters	1 unit
Total power	125 kWac

Operating voltage	180-1000 V
Pnom ratio (DC:AC)	1.25
Power sharing within this inverter	



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### PV Array Characteristics

#### Array #3 - Sub-array #3

Mixed orient.

#2/3: 7/6 strings

Tilt/Azimuth 6/94 °  
6/-86 °

#### PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd

Model AE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power 580 Wp  
Number of PV modules 195 units  
Nominal (STC) 113 kWp  
Modules 13 string x 15 In series

#### At operating cond. (50°C)

Pmpp 105 kWp  
U mpp 616 V  
I mpp 170 A

#### Total PV power

Nominal (STC) 424 kWp  
Total 731 modules  
Module area 1887 m²

#### Inverter

Manufacturer

Growatt New Energy

Model

MAX 100KTL3-X LV

(Original PVsyst database)

Unit Nom. Power 100 kWac  
Number of inverters 1 unit  
Total power 100 kWac  
Operating voltage 180-1000 V  
Pnom ratio (DC:AC) 1.13  
Power sharing within this inverter

#### Total inverter power

Total power 350 kWac  
Number of inverters 3 units  
Pnom ratio 1.21

### 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

#### Serie Diode Loss

Voltage drop 0.7 V  
Loss Fraction 0.1 % at STC

#### LID - Light Induced Degradation

Loss Fraction 0.3 %

#### Module Quality Loss

Loss Fraction 0.0 %

#### Module mismatch losses

##### Array #1 - PV Array

Loss Fraction 1.0 % at MPP

##### Array #2 - Sub-array #2

Loss Fraction 1.0 % at MPP

##### Array #3 - Sub-array #3

Loss Fraction 1.0 % at MPP

#### 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



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**DC wiring losses**

Global wiring resistance 10 mΩ

Loss Fraction 1.5 % at STC

**Array #1 - PV Array**

Global array res. 38 mΩ

Loss Fraction 1.5 % at STC

**Array #3 - Sub-array #3**

Global array res. 59 mΩ

Loss Fraction 1.5 % at STC

**Array #2 - Sub-array #2**

Global array res. 43 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 0.52 % at STC

**Inverters: MAX 125KTL3-X LV, MAX 100KTL3-X LV**

Wire section (2 Inv.) Alu 2 x 3 x 95 mm<sup>2</sup>

Average wires length 23 m

**Inverter: MAX 125KTL3-X LV**

Wire section (1 Inv.) Alu 1 x 3 x 150 mm<sup>2</sup>

Wires length 0 m



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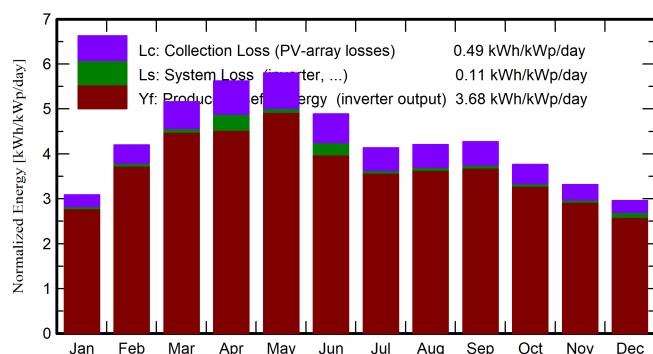
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## Main results

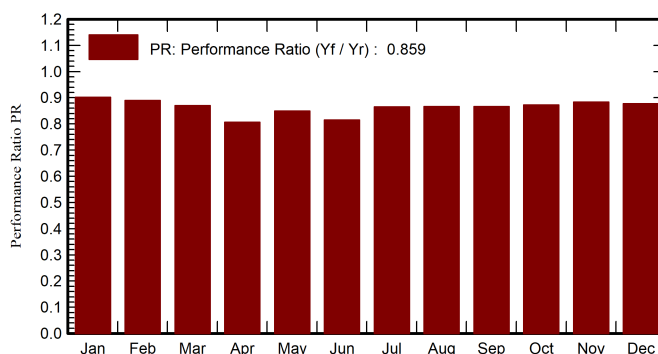
### System Production

Produced Energy (P50)	569445 kWh/year	Specific production (P50)	1343 kWh/kWp/year	Perf. Ratio PR	85.95 %
Produced Energy (P90)	556281 kWh/year	Specific production (P90)	1312 kWh/kWp/year		
Produced Energy (P75)	562524 kWh/year	Specific production (P75)	1327 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	92.1	54.4	15.24	95.7	92.3	37221	36599	0.902
February	113.8	59.3	19.74	117.5	113.7	45078	44324	0.890
March	156.7	75.3	25.58	159.9	155.2	60016	58985	0.870
April	167.6	85.5	30.66	168.7	163.6	62179	57668	0.806
May	180.6	100.4	33.54	179.9	174.7	65906	64784	0.849
June	147.9	95.5	32.51	146.8	142.2	54156	50714	0.815
July	129.2	92.4	30.32	128.1	123.8	47806	46993	0.865
August	130.7	90.6	29.76	130.3	126.0	48697	47878	0.867
September	126.7	72.3	28.84	128.0	123.9	47824	46995	0.866
October	114.4	72.3	27.02	116.7	112.9	43896	43150	0.872
November	96.1	57.3	21.89	99.5	96.2	37916	37268	0.883
December	88.2	56.8	16.98	91.6	88.4	35531	34087	0.878
Year	1544.0	912.0	26.03	1562.7	1512.8	586227	569445	0.859

### 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		



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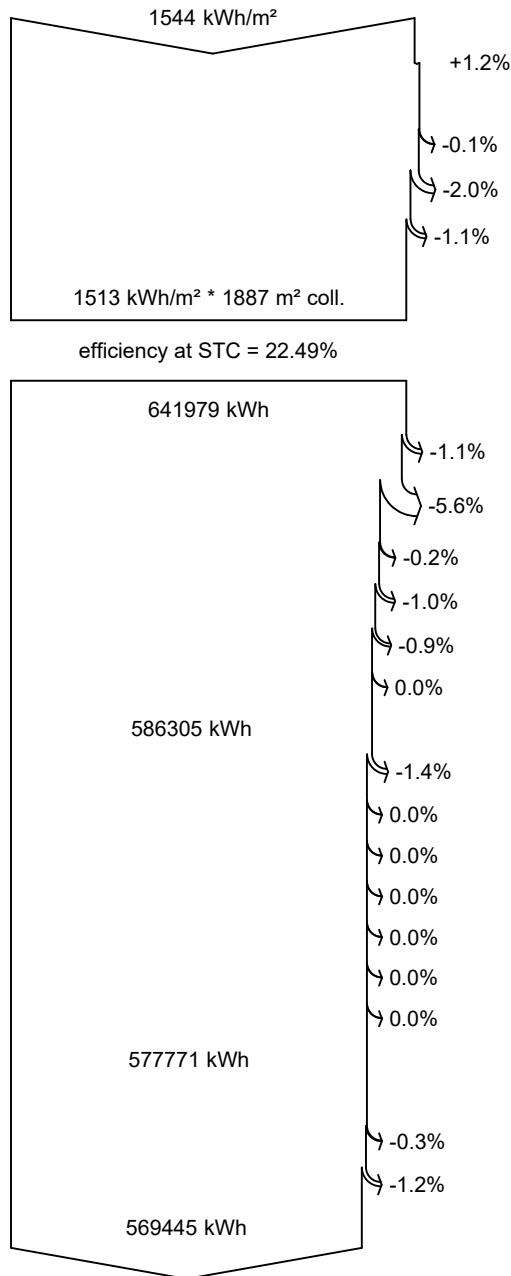
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## Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

Soiling loss factor

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

LID - Light induced degradation

Mismatch loss, modules and strings

Ohmic wiring loss

Mixed orientation mismatch 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

AC ohmic loss

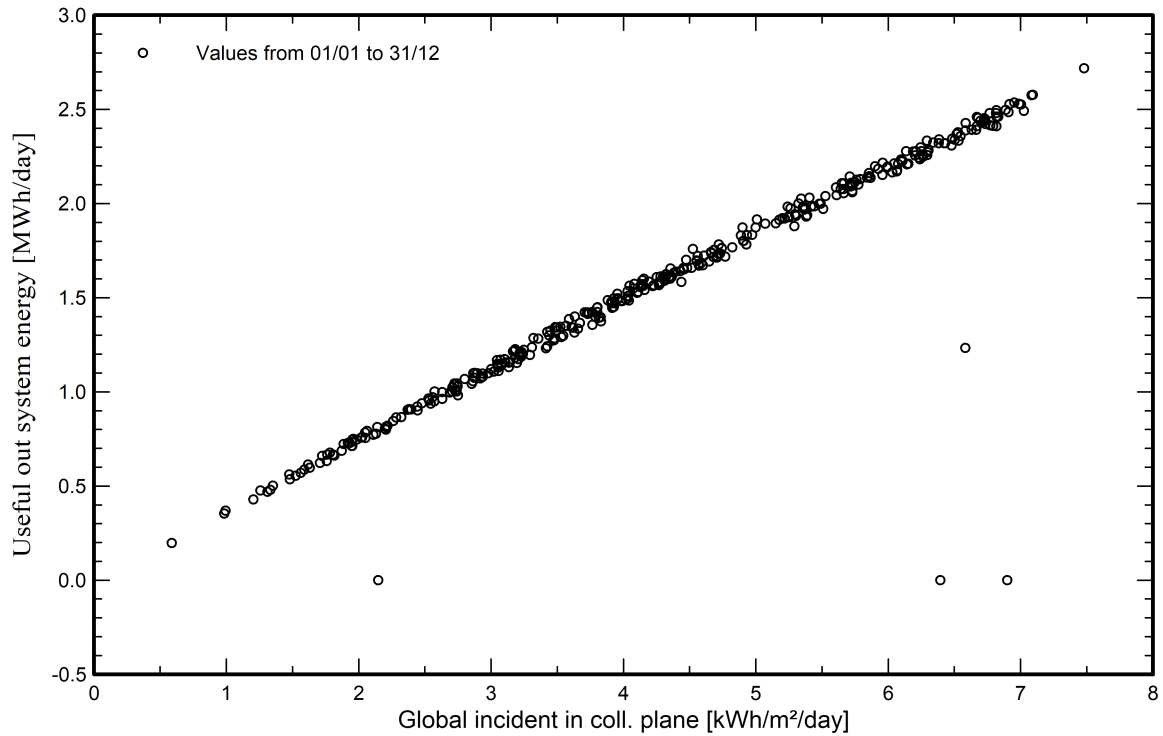
System unavailability

Energy injected into grid

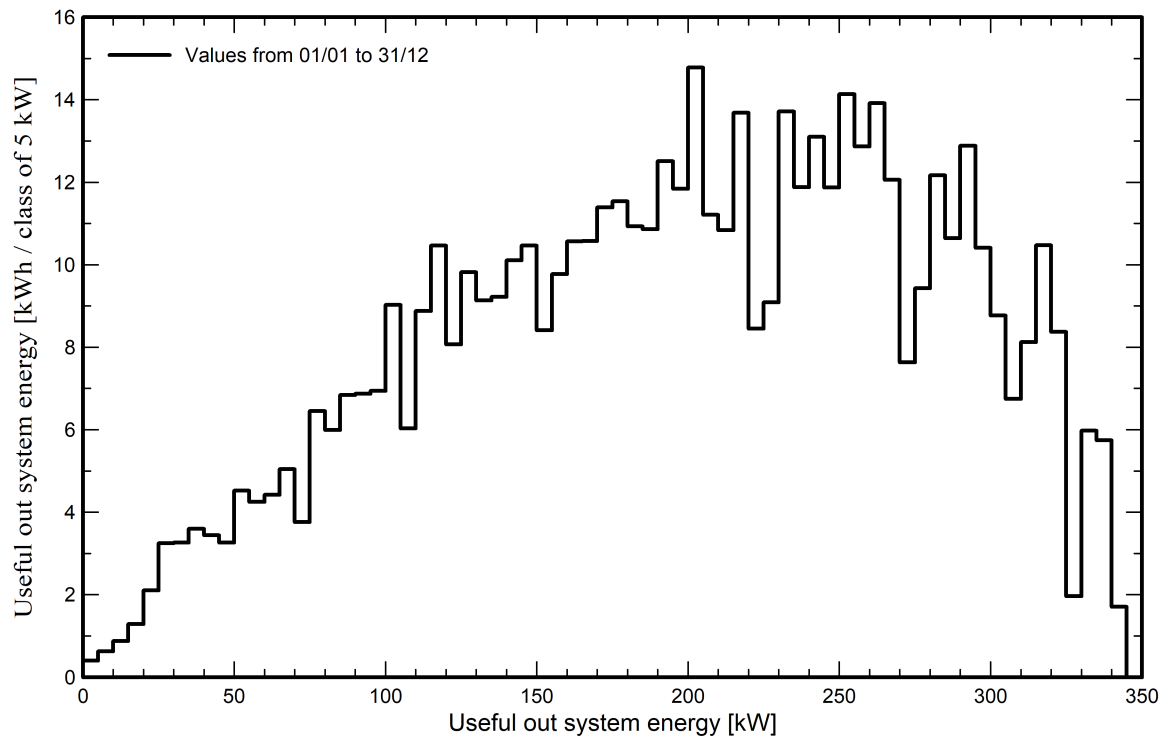


### Predef. graphs

Daily Input/Output diagram



System Output Power Distribution







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## P50 - P90 evaluation

### Weather data

Source Meteonorm 8.2 (2001-2020), 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 10.3 MWh  
P50 569.4 MWh  
P90 556.3 MWh  
P75 562.5 MWh

## Probability distribution

