

PVsyst - Simulation report

Grid-Connected System

Project: UHM District Male Hospital Kanpur Nagar

Variant: New simulation variant

Unlimited sheds

System power: 249 kWp

Collectorganj - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
25/12/24 08:38
with V8.0.2

Jakson Limited (India)

Project summary

Geographical Site

Collectorganj

India

Situation

Latitude 26.47 °N

Longitude 80.35 °E

Altitude 123 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Collectorganj

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

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 11 °

Unlimited sheds

Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules

429 units

Pnom total

249 kWp

Inverters

Nb. of units

4 units

Pnom total

230 kWac

Pnom ratio

1.082

Results summary

Produced Energy 379066 kWh/year Specific production 1523 kWh/kWp/year Perf. Ratio PR 93.28 %

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General parameters

Grid-Connected System

Unlimited sheds

Orientation #1

Sheds

Tilt	10 °
Azimuth	11 °

Sheds configuration

Nb. of sheds	10 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	8.5 °

Sizes

Sheds spacing	6.50 m
Collector width	3.00 m
Average GCR	46.2 %
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	6.50 m
Sheds width	3.04 m
Limit profile angle	8.5 °
GCR	46.8 %
Height above ground	1.50 m
Nb. of sheds	10 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

Array #1 - PV Array

PV module

Manufacturer	Panasonic Life Solutions India Pvt. Ltd
Model	AE14T580VHC16B5R
(Custom parameters definition)	
Unit Nom. Power	580 Wp
Number of PV modules	38 units
Nominal (STC)	22.04 kWp
Modules	2 string x 19 In series

At operating cond. (50°C)

Pmpp	20.44 kWp
U mpp	780 V
I mpp	26 A

Inverter

Manufacturer	Growatt New Energy
Model	MID 30KTL3-X
(Original PVsyst database)	
Unit Nom. Power	30.0 kWac
Number of inverters	1 unit
Total power	30.0 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	0.73
Power sharing within this inverter	



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PV Array Characteristics

Array #2 - Sub-array #2

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules76 units
Nominal (STC)44.1 kWp
Modules4 string x 19 In series

At operating cond. (50°C)

Pmpp40.9 kWp
U mpp780 V
I mpp52 A

Array #3 - Sub-array #3

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules120 units
Nominal (STC)69.6 kWp
Modules8 string x 15 In series

At operating cond. (50°C)

Pmpp64.5 kWp
U mpp616 V
I mpp105 A

Array #4 - Sub-array #4

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules195 units
Nominal (STC)113 kWp
Modules13 string x 15 In series

At operating cond. (50°C)

Pmpp105 kWp
U mpp616 V
I mpp170 A

Total PV power

Nominal (STC)249 kWp
Total429 modules
Module area1107 m²

Inverter

Manufacturer

Growatt New Energy

Model

MID 40KTL3-X

(Original PVsyst database)

Unit Nom. Power40.0 kWac
Number of inverters1 unit
Total power40.0 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.10
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 60KTL3 LV

(Original PVsyst database)

Unit Nom. Power60.0 kWac
Number of inverters1 unit
Total power60.0 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.16
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 100KTL3-X LV

(Original PVsyst database)

Unit Nom. Power100 kWac
Number of inverters1 unit
Total power100 kWac
Operating voltage180-1000 V
Pnom ratio (DC:AC)1.13
Power sharing within this inverter

Total inverter power

Total power230 kWac
Number of inverters4 units
Pnom ratio1.08



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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

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

DC wiring losses

Global wiring resistance 10 mΩ

Loss Fraction 1.5 % at STC

Array #1 - PV Array

Global array res. 485 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 243 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 96 mΩ

Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 59 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 0.05 % at STC

Inverter: MID 30KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 35 mm²

Wires length 50 m

Inverter: MAX 60KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 50 mm²

Wires length 0 m

Inverter: MID 40KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 25 mm²

Wires length 0 m

Inverter: MAX 100KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 95 mm²

Wires length 0 m



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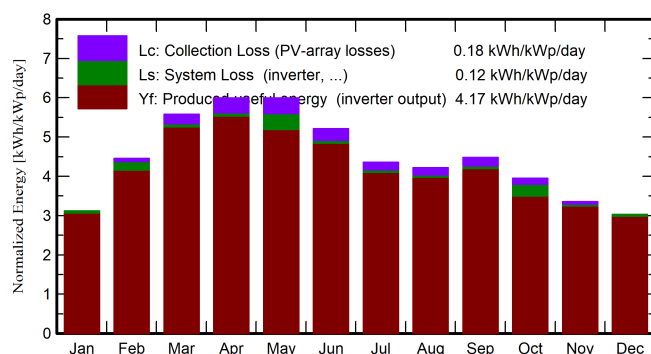
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Main results

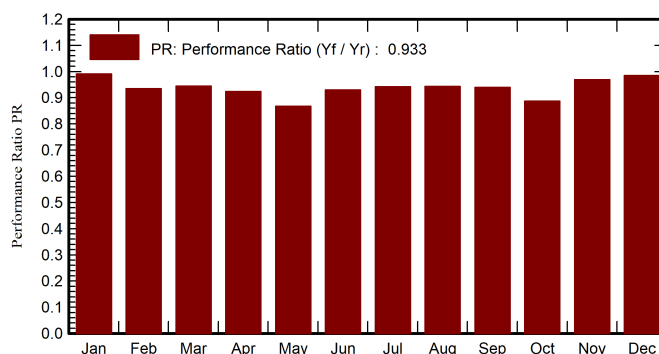
System Production

Produced Energy (P50)	379066 kWh/year	Specific production (P50)	1523 kWh/kWp/year	Perf. Ratio PR	93.28 %
Produced Energy (P90)	370303 kWh/year	Specific production (P90)	1488 kWh/kWp/year		
Produced Energy (P75)	374459 kWh/year	Specific production (P75)	1505 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

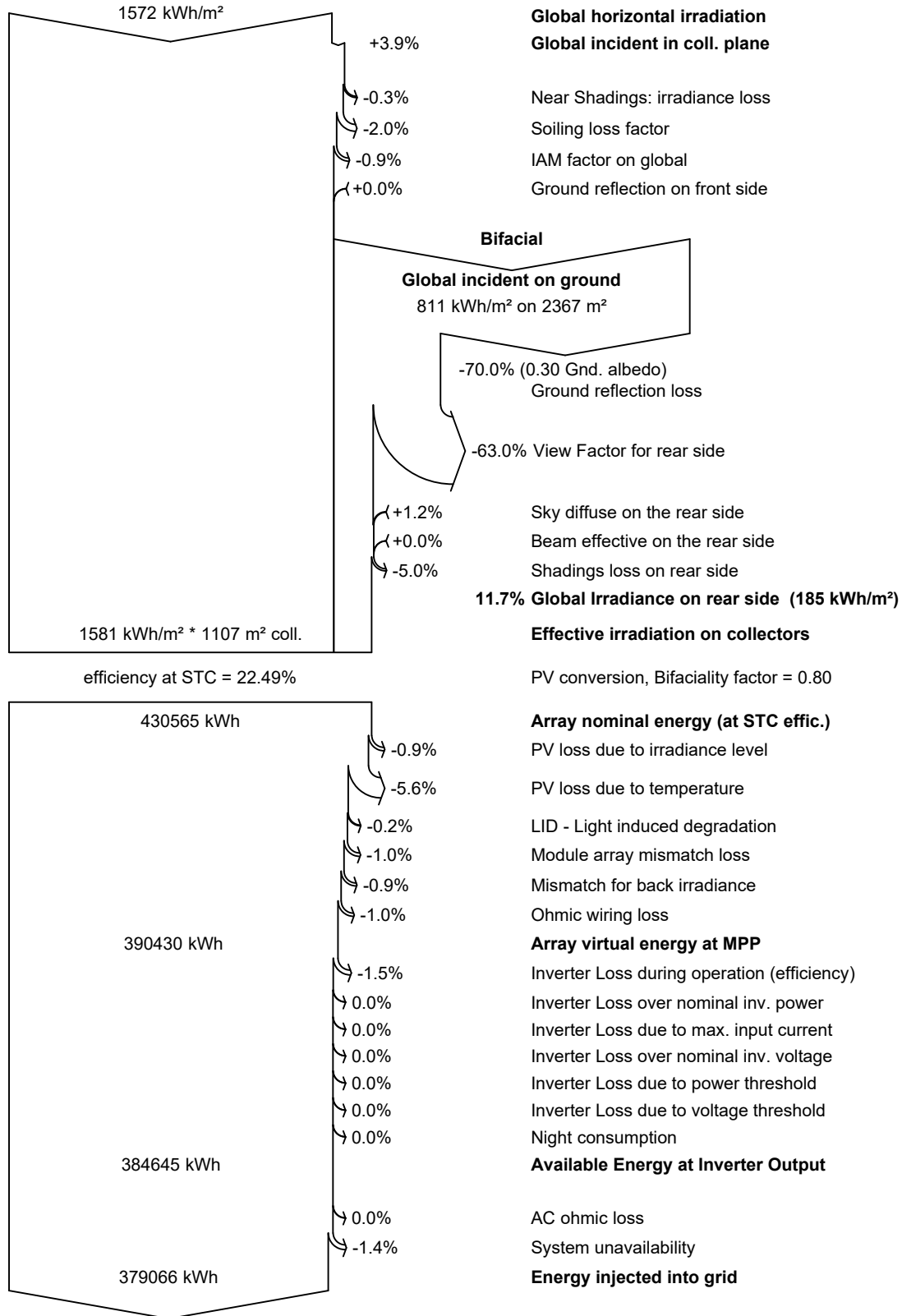
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	86.7	53.1	13.66	96.2	93.0	24069	23700	0.990
February	113.5	57.1	18.30	124.7	120.9	30553	29014	0.935
March	162.2	74.7	24.34	172.9	167.7	41211	40611	0.944
April	175.3	85.1	30.04	179.8	174.4	41950	41343	0.924
May	186.4	101.8	32.95	185.8	180.1	43246	40098	0.868
June	158.9	97.7	32.45	156.4	151.4	36729	36167	0.929
July	137.3	96.0	30.18	135.2	130.6	32184	31696	0.942
August	130.8	94.8	29.64	130.8	126.3	31174	30699	0.943
September	129.4	75.6	28.67	134.3	129.9	31873	31383	0.939
October	115.3	73.6	26.44	122.5	118.6	29357	27040	0.887
November	92.0	59.9	20.53	100.7	97.3	24642	24280	0.969
December	83.9	52.0	15.40	94.0	90.8	23392	23036	0.985
Year	1571.9	921.6	25.24	1633.2	1580.9	390378	379066	0.933

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		



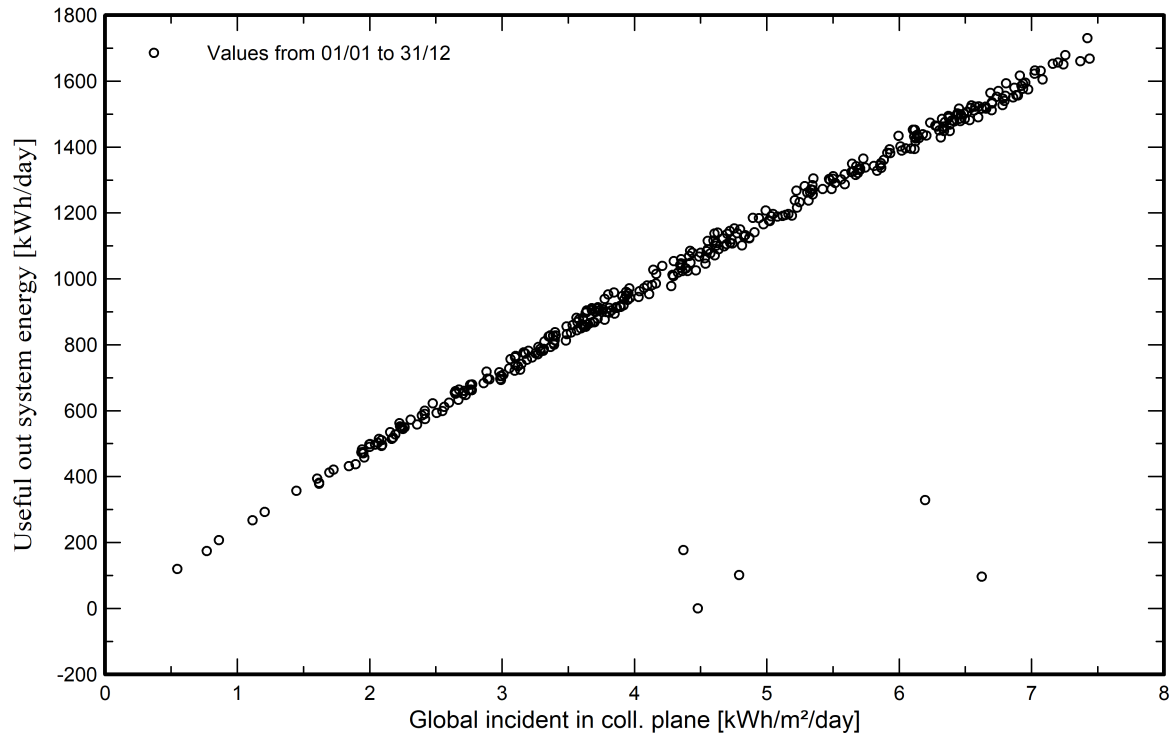
Loss diagram



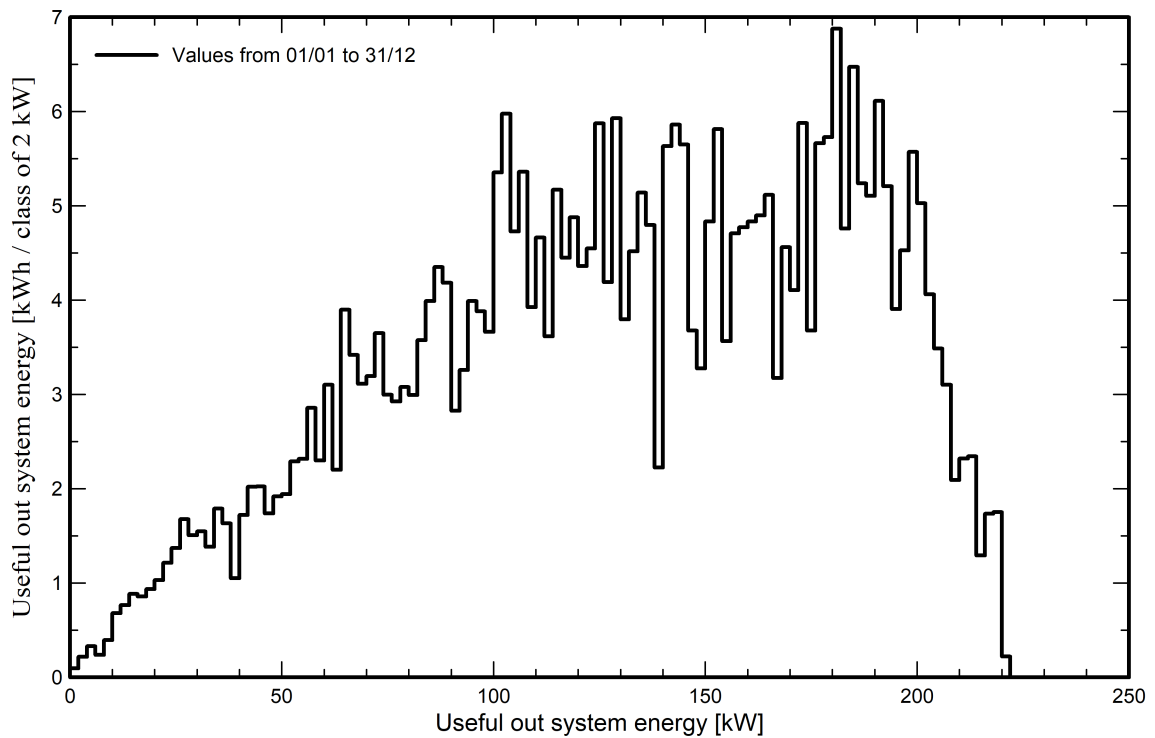


Predef. graphs

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 6.8 MWh
P50 379.1 MWh
P90 370.3 MWh
P75 374.5 MWh

Probability distribution

