

PVsyst - Simulation report

Grid-Connected System

Project: Medical college Bijnor

Variant: New simulation variant

Unlimited sheds

System power: 368 kWp

Bijnor - India

Author

Jakson Limited (India)

**PVsyst V8.0.2**

VC0, Simulation date:
17/12/24 09:31
with V8.0.2

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Jakson Limited (India)

Project summary**Geographical Site**

Bijnor

India

Situation

Latitude 29.38 °N

Longitude 78.14 °E

Altitude 251 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Bijnor

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

System summary**Grid-Connected System****Orientation #1****Sheds**

Tilt 10 °

Azimuth 28 °

Unlimited sheds**Near Shadings**

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules

634 units

Pnom total

368 kWp

Inverters

Nb. of units

6 units

Pnom total

320 kWac

Pnom ratio

1.149

Results summary

Produced Energy 547049 kWh/year Specific production 1488 kWh/kWp/year Perf. Ratio PR 93.64 %

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General parameters

Grid-Connected System

Unlimited sheds

Orientation #1

Sheds

Tilt	10 °
Azimuth	28 °

Sheds configuration

Nb. of sheds	10 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	8 °

Sizes

Sheds spacing	6.70 m
Collector width	3.00 m
Average GCR	44.8 %
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	6.70 m
Sheds width	3.04 m
Limit profile angle	8.0 °
GCR	45.4 %
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	70 units
Nominal (STC)	40.6 kWp
Modules	5 string x 14 In series

At operating cond. (50°C)

Pmpp	37.6 kWp
U mpp	575 V
I mpp	65 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)	1.35
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 modules168 units
Nominal (STC)97.4 kWp
Modules12 string x 14 In series

At operating cond. (50°C)

Pmpp90.4 kWp
U mpp575 V
I mpp157 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 modules396 units
Nominal (STC)230 kWp
Modules22 string x 18 In series

At operating cond. (50°C)

Pmpp213 kWp
U mpp739 V
I mpp288 A

Total PV power

Nominal (STC)368 kWp
Total634 modules
Module area1636 m²

Inverter

Manufacturer

Growatt New Energy

Model

MID 40KTL3-X

(Original PVsyst database)

Unit Nom. Power40.0 kWac
Number of inverters2 units
Total power80.0 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.22
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 70KTL3 LV

(Original PVsyst database)

Unit Nom. Power70.0 kWac
Number of inverters3 units
Total power210 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.09
Power sharing within this inverter

Total inverter power

Total power320 kWac
Number of inverters6 units
Pnom ratio1.15

Array losses

Array Soiling Losses

Loss Fraction2.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const)29.0 W/m²KUv (wind)0.0 W/m²K/m/s

Serie Diode Loss

Voltage drop0.7 V

Loss Fraction0.1 % at STC

LID - Light Induced Degradation

Loss Fraction0.3 %

Module Quality Loss

Loss Fraction0.0 %

Module mismatch losses

Array #1 - PV Array

Loss Fraction1.0 % at MPP

Array #2 - Sub-array #2

Loss Fraction1.0 % at MPP

Array #3 - Sub-array #3

Loss Fraction1.0 % 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. 143 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 42 mΩ

Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 60 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 0.08 % at STC

Inverters: MID 30KTL3-X, MAX 70KTL3 LVWire section (4 Inv.) Alu 4 x 3 x 50 mm²

Average wires length 11 m

Inverter: MID 40KTL3-XWire section (2 Inv.) Alu 2 x 3 x 25 mm²

Average wires length 0 m



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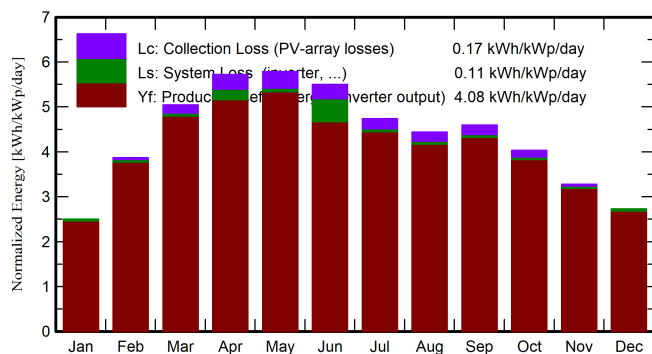
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Main results

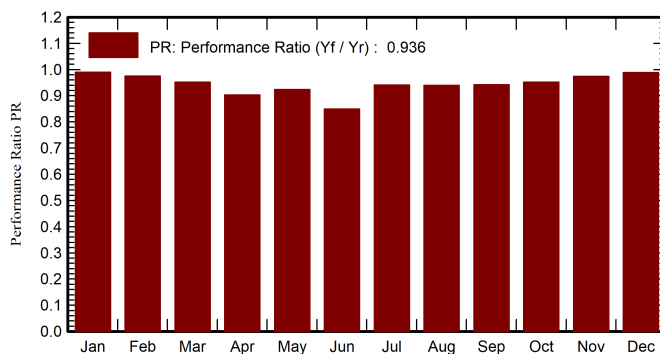
System Production

Produced Energy (P50)	547049 kWh/year	Specific production (P50)	1488 kWh/kWp/year	Perf. Ratio PR	93.64 %
Produced Energy (P90)	534403 kWh/year	Specific production (P90)	1453 kWh/kWp/year		
Produced Energy (P75)	540400 kWh/year	Specific production (P75)	1470 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

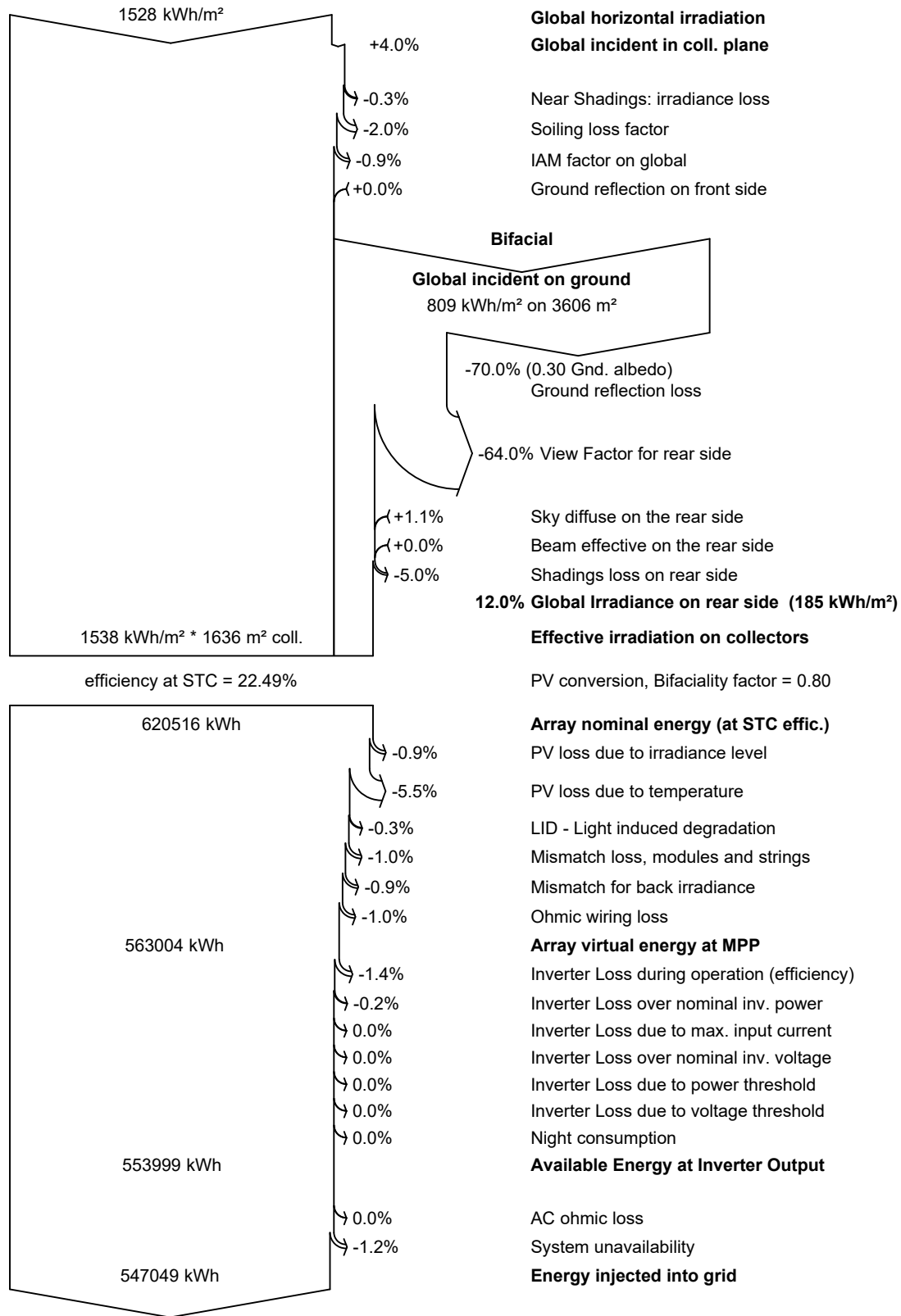
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	69.9	40.5	13.26	77.2	74.7	28561	28101	0.989
February	99.1	52.2	17.30	108.5	105.0	39468	38908	0.975
March	148.0	75.1	23.25	156.5	151.6	55510	54761	0.952
April	166.8	83.0	29.07	171.6	166.5	59622	56980	0.903
May	179.1	100.5	32.91	179.5	173.9	61823	60963	0.924
June	166.7	101.4	32.62	165.1	159.9	57269	51552	0.849
July	147.9	103.9	31.02	146.9	142.0	51521	50805	0.940
August	136.1	87.5	30.02	137.7	133.2	48305	47590	0.940
September	132.4	76.0	28.77	137.9	133.4	48431	47749	0.942
October	116.9	68.2	26.05	125.0	121.0	44361	43733	0.951
November	89.2	54.4	19.96	98.5	95.2	35752	35259	0.974
December	75.5	46.6	14.87	84.4	81.5	31118	30649	0.988
Year	1527.6	889.3	24.96	1588.8	1538.0	561743	547049	0.936

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		



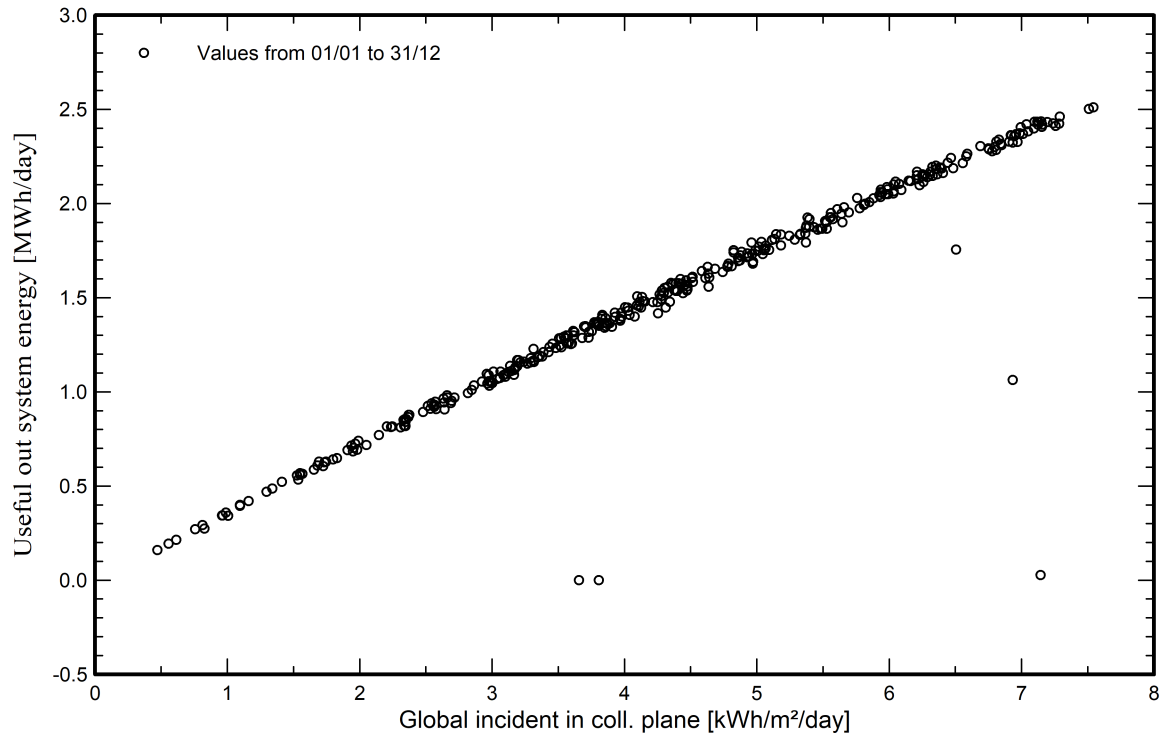
Loss diagram



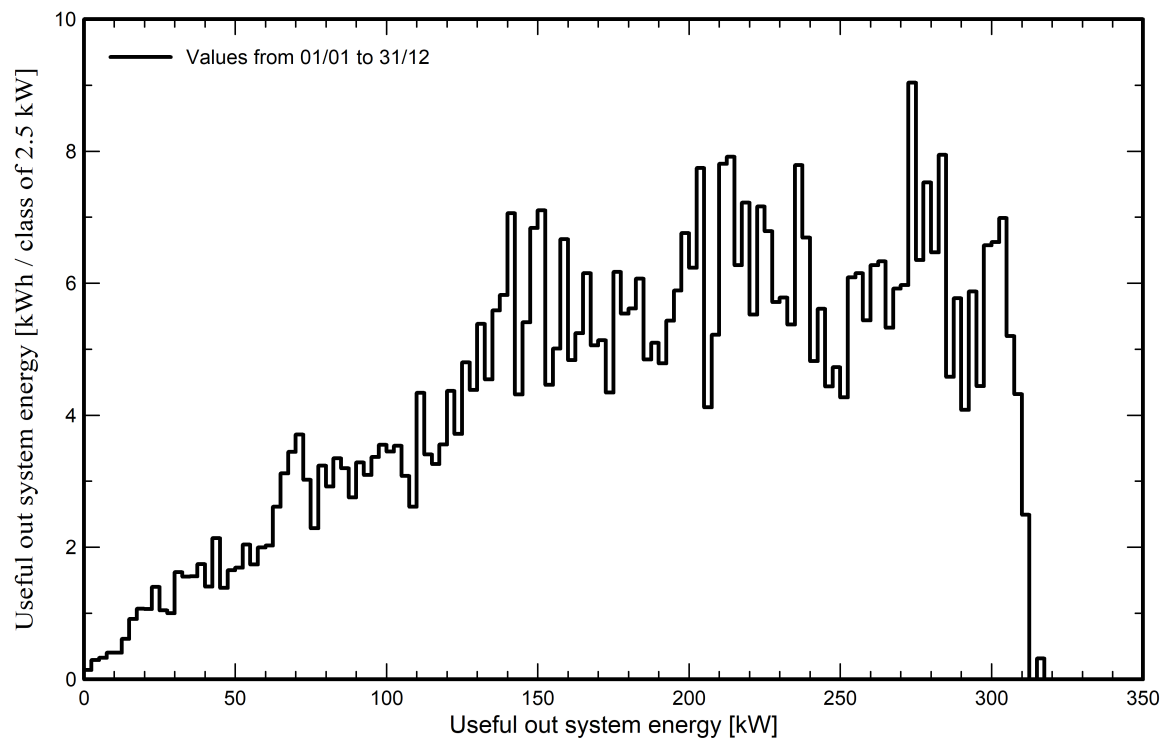


Predef. graphs

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 9.9 MWh
P50 547.0 MWh
P90 534.4 MWh
P75 540.4 MWh

Probability distribution

