

PVsyst - Simulation report

Grid-Connected System

Project: District Women Hospital Prayagraj

Variant: New simulation variant

Unlimited sheds

System power: 201 kWp

Khusru Bāgh - India

Author

Jakson Limited (India)



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PVsyst V8.0.2

VC0, Simulation date:
25/12/24 08:44
with V8.0.2

Jakson Limited (India)

Project summary

Geographical Site

Khusru Bāgh

India

Situation

Latitude 25.44 °N

Longitude 81.83 °E

Altitude 100 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

Khusru Bāgh

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

System summary

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °

Azimuth 0 °

Unlimited sheds

Orientation #2

Sheds

Tilt 10 °

Azimuth -38 °

Near Shadings

Mutual shadings of sheds

System information

PV Array

Nb. of modules

346 units

Pnom total

201 kWp

Inverters

Nb. of units

4 units

Pnom total

170 kWac

Pnom ratio

1.180

User's needs

Unlimited load (grid)

Results summary

Produced Energy 305775 kWh/year Specific production 1524 kWh/kWp/year Perf. Ratio PR 93.28 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt	10 °
Azimuth	0 °

Unlimited sheds

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

Orientation #2

Sheds

Tilt	10 °
Azimuth	-38 °

Sheds configuration

Nb. of sheds	5 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
-------	--------------------------

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)

Orientation #2

Bifacial system

Model	Unlimited Sheds 2D Model
-------	--------------------------

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	5 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 %

PV Array Characteristics

Array #1 - PV Array

Orientation	#1
Tilt/Azimuth	10/0 °



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PV Array Characteristics

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 153 units
Nominal (STC) 88.7 kWp
Modules 9 string x 17 In series
At operating cond. (50°C)
Pmpp 82.3 kWp
U mpp 698 V
I mpp 118 A

Array #2 - Sub-array #2

Orientation #1
Tilt/Azimuth 10/0 °

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 85 units
Nominal (STC) 49.3 kWp
Modules 5 string x 17 In series
At operating cond. (50°C)
Pmpp 45.7 kWp
U mpp 698 V
I mpp 65 A

Array #3 - Sub-array #3

Orientation #2
Tilt/Azimuth 10/-38 °

PV module

Manufacture Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 108 units
Nominal (STC) 62.6 kWp
Modules 6 string x 18 In series
At operating cond. (50°C)
Pmpp 58.1 kWp
U mpp 739 V
I mpp 79 A

Total PV power

Nominal (STC) 201 kWp
Total 346 modules
Module area 893 m²

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
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.11
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MID 40KTL3-X
(Original PVsyst database)
Unit Nom. Power 40.0 kWac
Number of inverters 1 unit
Total power 40.0 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.23
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MID 25KTL3-X
(Original PVsyst database)
Unit Nom. Power 25.0 kWac
Number of inverters 2 units
Total power 50.0 kWac
Operating voltage 160-1000 V
Pnom ratio (DC:AC) 1.25
Power sharing within this inverter

Total inverter power

Total power 170 kWac
Number of inverters 4 units
Pnom ratio 1.18



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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. 96 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 174 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 153 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 0.65 % at STC

Inverter: MAX 80KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 70 mm²
Wires length 60 m

Inverter: MID 40KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 25 mm²
Wires length 0 m

Inverter: MID 25KTL3-X

Wire section (2 Inv.) Alu 2 x 3 x 16 mm²
Average wires length 0 m



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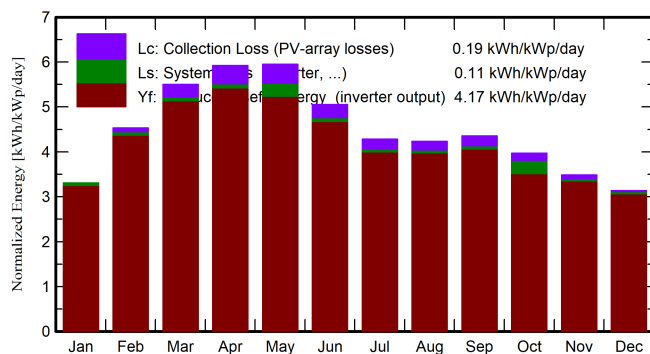
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Main results

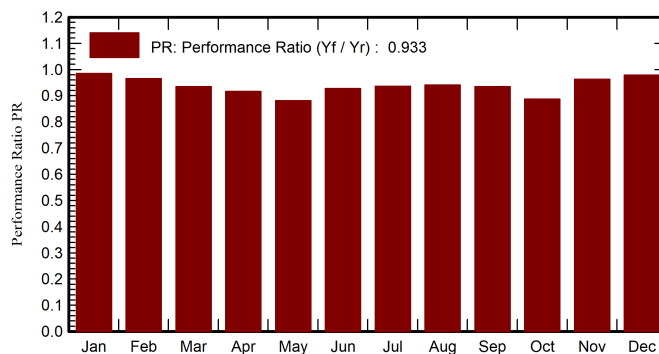
System Production

Produced Energy (P50)	305775 kWh/year	Specific production (P50)	1524 kWh/kWp/year	Perf. Ratio PR	93.28 %
Produced Energy (P90)	298707 kWh/year	Specific production (P90)	1488 kWh/kWp/year		
Produced Energy (P75)	302059 kWh/year	Specific production (P75)	1505 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

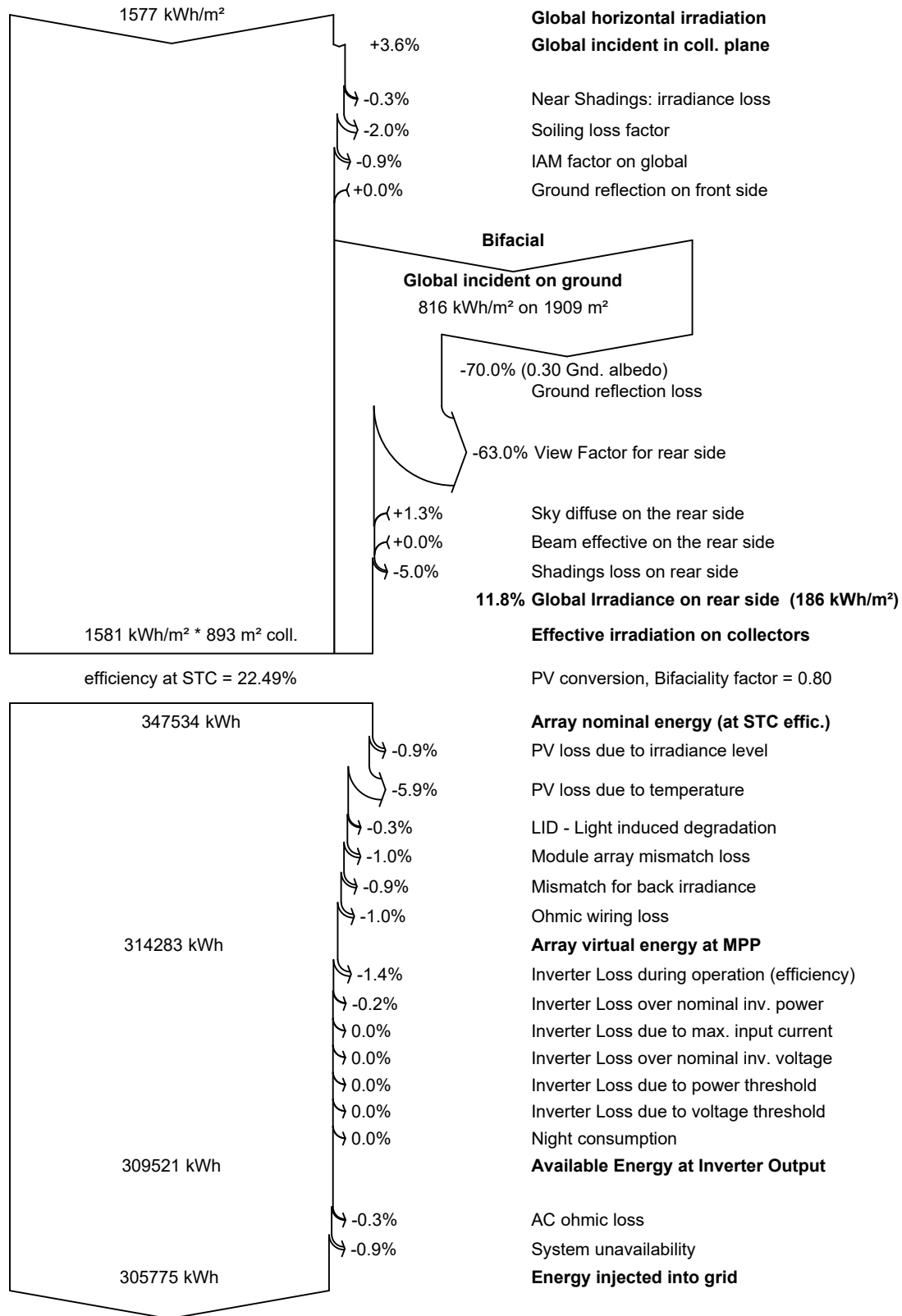
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	92.9	56.64	15.27	102.5	99.1	20599	20261	0.985
February	115.9	57.04	19.93	127.0	123.1	25012	24587	0.965
March	162.0	76.78	26.29	170.7	165.5	32579	32014	0.935
April	174.2	84.81	31.33	177.7	172.3	33250	32679	0.917
May	185.7	99.22	34.77	184.6	179.0	34451	32651	0.881
June	153.8	96.67	33.22	151.6	146.8	28697	28192	0.927
July	134.5	85.96	30.65	132.8	128.4	25375	24928	0.936
August	130.9	92.93	29.90	131.2	126.7	25184	24767	0.941
September	127.5	75.78	28.97	130.6	126.3	24928	24496	0.935
October	116.6	75.76	27.36	123.0	119.0	23747	21889	0.887
November	95.5	57.70	21.94	104.6	101.2	20557	20216	0.963
December	87.5	54.18	17.36	97.3	94.0	19412	19095	0.978
Year	1577.0	913.48	26.44	1633.4	1581.2	313792	305775	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		



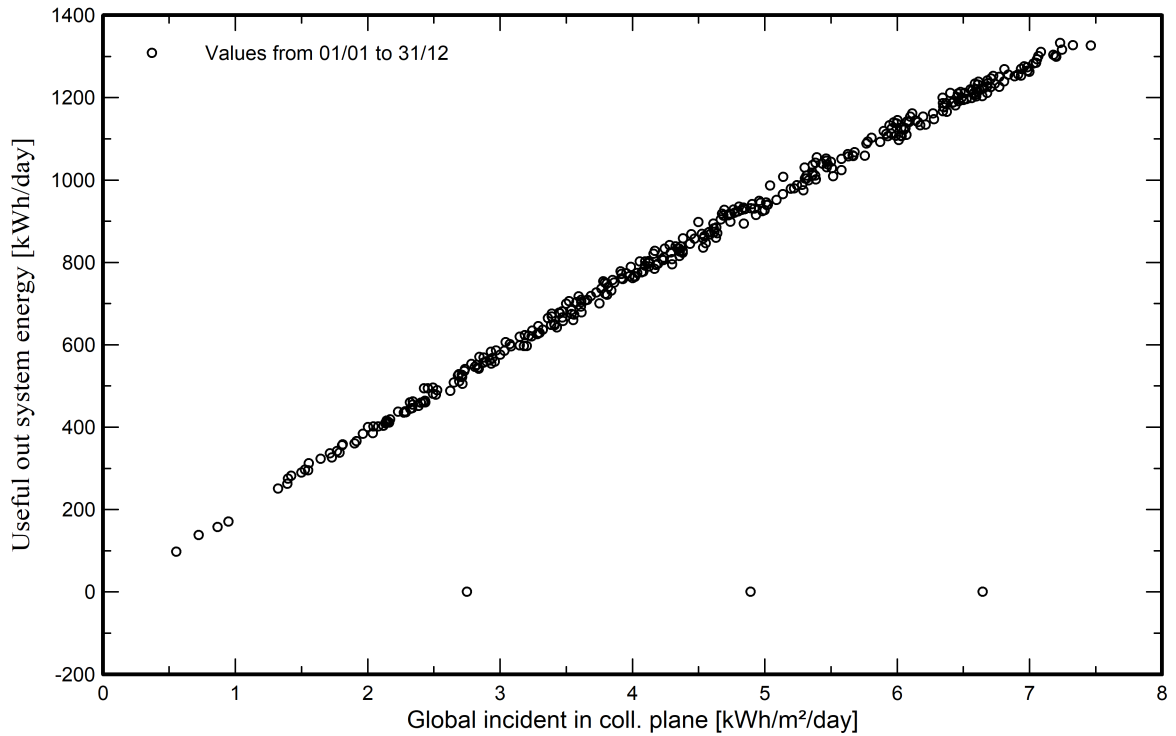
Loss diagram



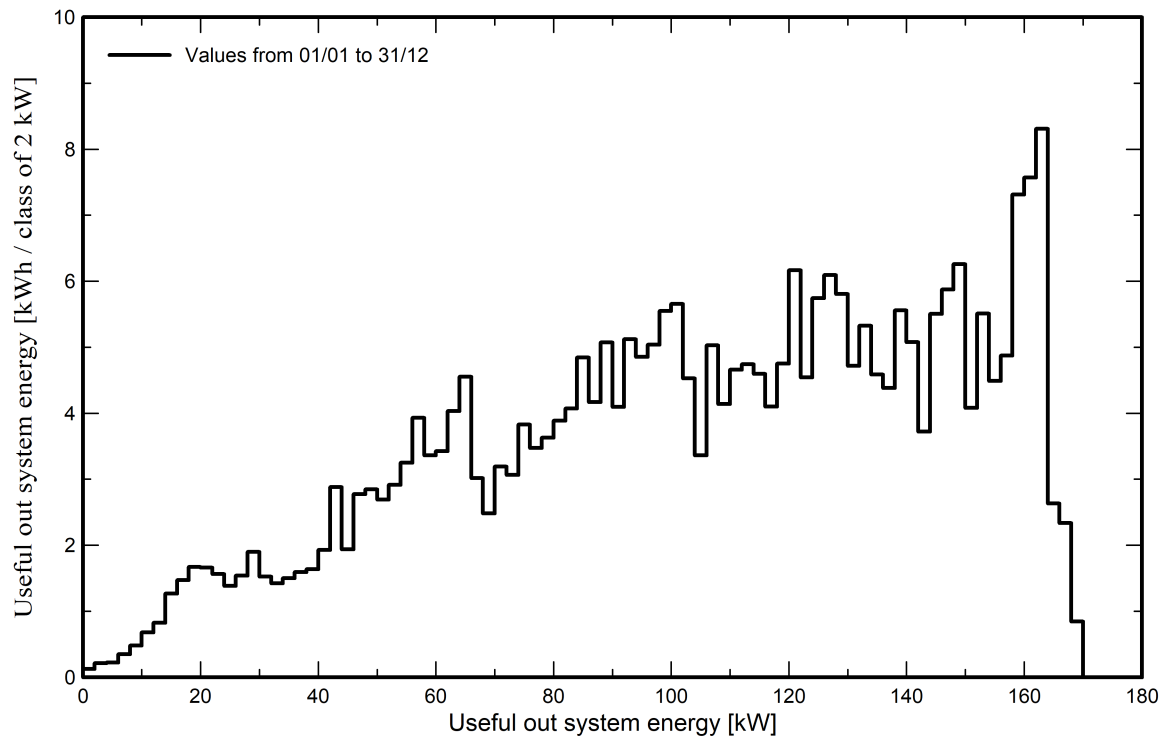


Predef. graphs

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 5.5 MWh
P50 305.8 MWh
P90 298.7 MWh
P75 302.1 MWh

Probability distribution

