

PVsyst - Simulation report

Grid-Connected System

Project: Banda Hospital

Variant: New simulation variant

Unlimited sheds

System power: 911 kWp

Hardauli - India

Author

Jakson Limited (India)

**PVsyst V8.0.2**

VC0, Simulation date:
25/12/24 08:21
with V8.0.2

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Project summary

Geographical Site

Hardauli
India

Situation

Latitude 25.49 °N
Longitude 80.33 °E
Altitude 121 m
Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

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

System summary

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

Tilt 10 °
Azimuth 19 °

Unlimited sheds**Orientation #2****Sheds**

Tilt 10 °
Azimuth 41 °

Near Shadings

Mutual shadings of sheds

System information**PV Array**

Nb. of modules 1571 units
Pnom total 911 kWp

Inverters

Nb. of units 9 units
Pnom total 780 kWac
Pnom ratio 1.168

User's needs

Unlimited load (grid)

Results summary

Produced Energy 1382724 kWh/year Specific production 1518 kWh/kWp/year Perf. Ratio PR 91.75 %

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General parameters**Grid-Connected System****Orientation #1****Sheds**

Tilt 10 °
Azimuth 19 °

Orientation #2**Sheds**

Tilt 10 °
Azimuth 41 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Bifacial system definition**Orientation #1****Bifacial system**

Model Unlimited Sheds 2D Model

Bifacial model geometry

Sheds spacing 6.40 m
Sheds width 3.04 m
Limit profile angle 8.7 °
GCR 47.5 %
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 %

Unlimited sheds**Sheds configuration**

Nb. of sheds 10 units
Unlimited sheds

Shading limit angle

Limit profile angle 8.7 °

Sheds configuration

Nb. of sheds 5 units
Unlimited sheds

Shading limit angle

Limit profile angle 8.7 °

Horizon

Free Horizon

Sizes

Sheds spacing 6.40 m
Collector width 3.00 m
Average GCR 46.9 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Sizes

Sheds spacing 6.40 m
Collector width 3.00 m
Average GCR 46.9 %
Top inactive band 0.02 m
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Near Shadings

Mutual shadings of sheds

User's needs

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PV Array Characteristics**Array #1 - PV Array**

Orientation #2
Tilt/Azimuth 10/41 °



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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 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

Array #2 - Sub-array #2

Orientation #2
Tilt/Azimuth 10/41 °

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 266 units
Nominal (STC) 154 kWp
Modules 14 string x 19 In series
At operating cond. (50°C)
Pmpp 143 kWp
U mpp 780 V
I mpp 183 A

Array #3 - Sub-array #3

Orientation #1
Tilt/Azimuth 10/19 °

PV module

Manufacturer Panasonic Life Solutions India Pvt. Ltd
Model AE14T580VHC16B5R
(Custom parameters definition)
Unit Nom. Power 580 Wp
Number of PV modules 1235 units
Nominal (STC) 716 kWp
Modules 65 string x 19 In series
At operating cond. (50°C)
Pmpp 664 kWp
U mpp 780 V
I mpp 851 A

Total PV power

Nominal (STC) 911 kWp
Total 1571 modules
Module area 4055 m²

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) 1.02
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MAX 70KTL3 LV
(Original PVsyst database)
Unit Nom. Power 70.0 kWac
Number of inverters 2 units
Total power 140 kWac
Operating voltage 200-1000 V
Pnom ratio (DC:AC) 1.10
Power sharing within this inverter

Inverter

Manufacturer Growatt New Energy
Model MAX 100KTL3-X LV
(Original PVsyst database)
Unit Nom. Power 100 kWac
Number of inverters 6 units
Total power 600 kWac
Operating voltage 180-1000 V
Pnom ratio (DC:AC) 1.19
Power sharing within this inverter

Total inverter power

Total power 780 kWac
Number of inverters 9 units
Pnom ratio 1.17

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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. 143 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 69 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 15 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 0.02 % at STC

Inverters: MID 40KTL3-X, MAX 100KTL3-X LV

Wire section (7 Inv.) Alu 7 x 3 x 95 mm²
Average wires length 7 m

Inverter: MAX 70KTL3 LV

Wire section (2 Inv.) Alu 2 x 3 x 50 mm²
Average wires length 0 m



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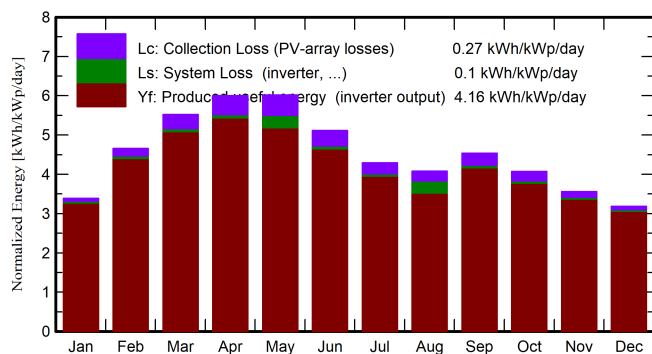
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Main results

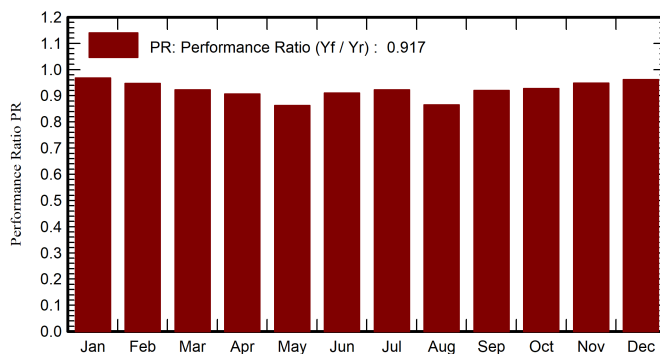
System Production

Produced Energy (P50)	1382724 kWh/year	Specific production (P50)	1518 kWh/kWp/year	Perf. Ratio PR	91.75 %
Produced Energy (P90)	1350760 kWh/year	Specific production (P90)	1482 kWh/kWp/year		
Produced Energy (P75)	1365919 kWh/year	Specific production (P75)	1499 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

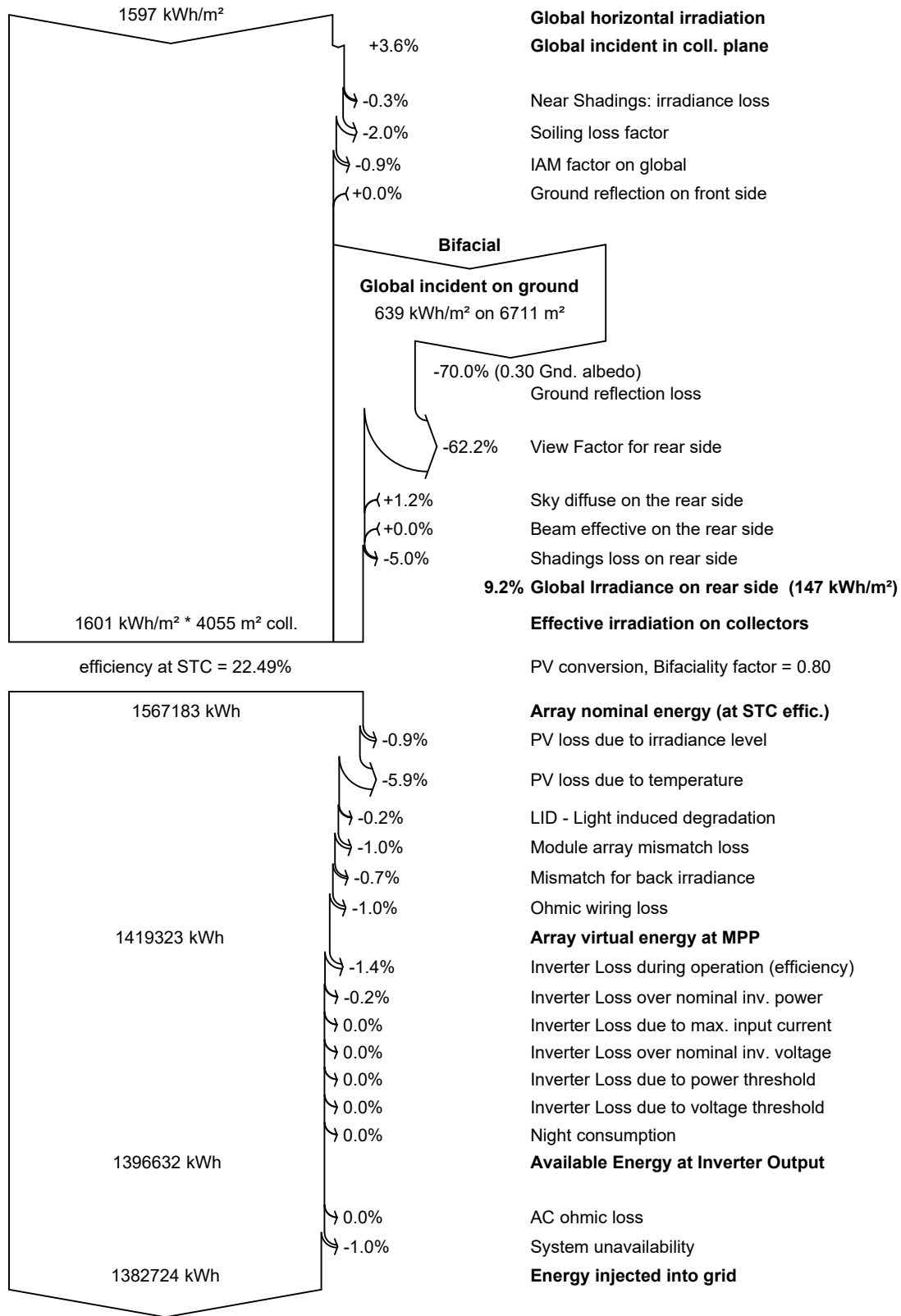
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	95.1	55.43	14.87	105.0	101.5	93930	92577	0.968
February	119.7	54.85	19.58	130.5	126.4	114160	112528	0.947
March	162.1	74.68	25.91	171.2	166.0	145951	143870	0.922
April	177.0	85.94	31.06	180.0	174.5	150914	148791	0.907
May	187.9	99.83	34.40	186.6	180.9	155561	146572	0.862
June	156.9	95.11	33.07	153.4	148.5	129150	127214	0.910
July	134.6	92.48	30.55	133.0	128.6	113522	111800	0.923
August	126.3	88.93	29.83	126.5	122.1	108390	99724	0.865
September	131.4	73.54	28.91	136.1	131.6	115798	114077	0.920
October	119.2	71.13	27.20	126.3	122.3	108376	106755	0.927
November	97.7	60.30	21.64	106.8	103.3	93625	92305	0.948
December	88.7	53.31	16.85	98.7	95.4	87791	86512	0.962
Year	1596.6	905.52	26.18	1654.0	1601.1	1417168	1382724	0.917

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





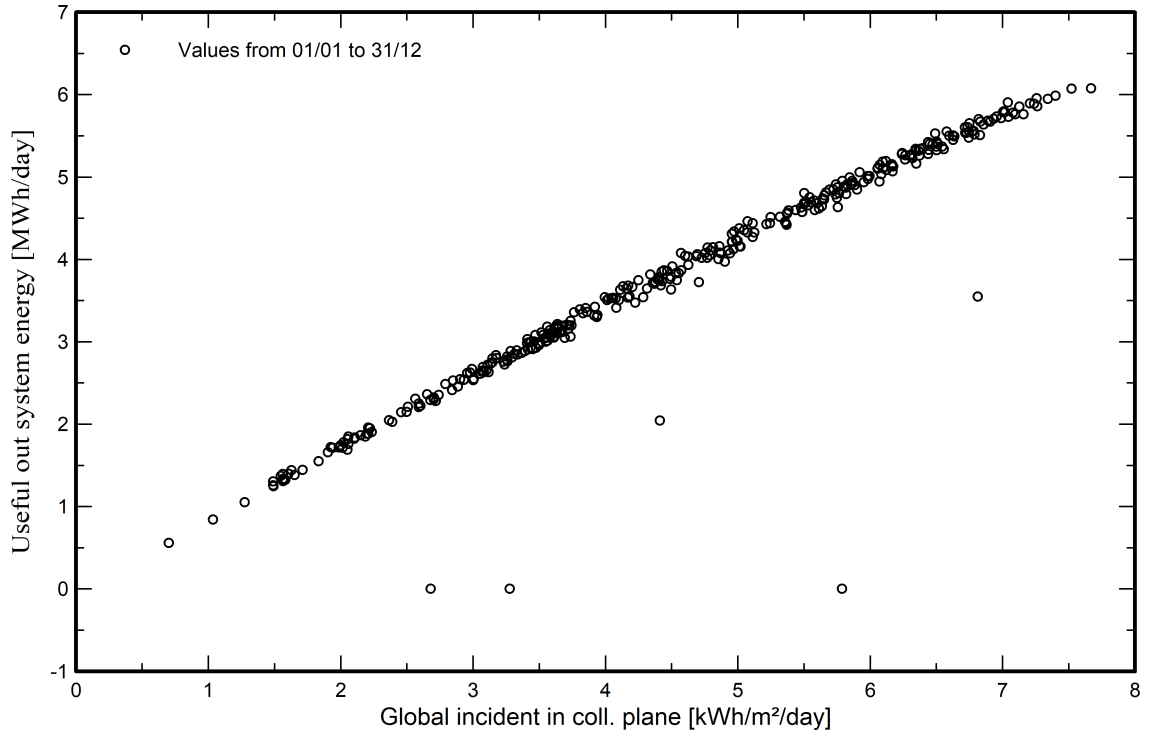
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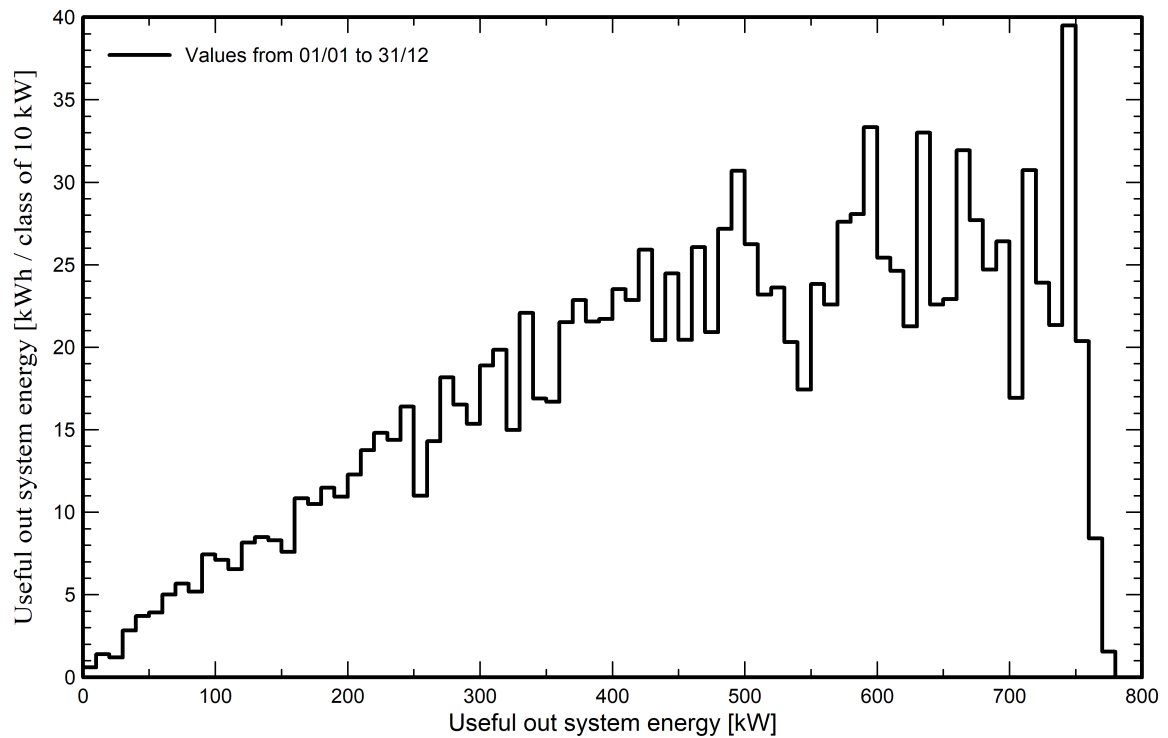
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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





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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 24.9 MWh
P50 1382.7 MWh
P90 1350.8 MWh
P75 1365.9 MWh

Probability distribution

