

PVsyst - Simulation report

Grid-Connected System

Project: Kaili Hospital Basti

Variant: New simulation variant

Unlimited sheds

System power: 726 kWp

Kaili - India

Author

Jakson Limited (India)

**PVsyst V8.0.2**

VC0, Simulation date:
27/11/24 16:16
with V8.0.2

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Project summary**Geographical Site**

Kaili
India

Situation

Latitude 26.78 °N
Longitude 82.76 °E
Altitude 92 m
Time zone UTC+5.5

Project settings

Albedo 0.20

Weather data

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

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

Tilt 10 °
Azimuth 32 °

Unlimited sheds**Near Shadings**

Mutual shadings of sheds

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules 1252 units
Pnom total 726 kWp

Inverters

Nb. of units 9 units
Pnom total 640 kWac
Pnom ratio 1.135

Results summary

Produced Energy 1048187 kWh/year Specific production 1443 kWh/kWp/year Perf. Ratio PR 93.27 %

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General parameters

Grid-Connected System

Unlimited sheds

Orientation #1

Sheds

Tilt	10 °
Azimuth	32 °

Sheds configuration

Nb. of sheds	10 units
Unlimited sheds	
Shading limit angle	
Limit profile angle	6 °

Sizes

Sheds spacing	8.00 m
Collector width	3.00 m
Average GCR	37.5 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon

Free Horizon

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	8.00 m
Sheds width	3.04 m
Limit profile angle	6.0 °
GCR	38.0 %
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	280 units
Nominal (STC)	162 kWp
Modules	20 string x 14 In series

At operating cond. (50°C)

Pmpp	151 kWp
U mpp	575 V
I mpp	262 A

Inverter

Manufacturer	Growatt New Energy
Model	MAC 50KTL3-X LV
(Custom parameters definition)	
Unit Nom. Power	50.0 kWac
Number of inverters	3 units
Total power	150 kWac
Operating voltage	200-1000 V
Pnom ratio (DC:AC)	1.08
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 modules144 units
Nominal (STC)83.5 kWp
Modules9 string x 16 In series

At operating cond. (50°C)

Pmpp77.4 kWp
U mpp657 V
I mpp118 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 modules630 units
Nominal (STC)365 kWp
Modules35 string x 18 In series

At operating cond. (50°C)

Pmpp339 kWp
U mpp739 V
I mpp458 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 modules198 units
Nominal (STC)115 kWp
Modules11 string x 18 In series

At operating cond. (50°C)

Pmpp106 kWp
U mpp739 V
I mpp144 A

Total PV power

Nominal (STC)726 kWp
Total1252 modules
Module area3231 m²

Inverter

Manufacturer

Growatt New Energy

Model

MAX 70KTL3 LV

(Original PVsyst database)

Unit Nom. Power70.0 kWac
Number of inverters1 unit
Total power70.0 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.19
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAX 80KTL3 LV

(Original PVsyst database)

Unit Nom. Power80.0 kWac
Number of inverters28 * MPPT 14% 4 units
Total power320 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.14
No power sharing between MPPTs

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)1.15
Power sharing within this inverter

Total inverter power

Total power640 kWac
Number of inverters9 units
Pnom ratio1.13

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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**Array #1 - PV Array**

Loss Fraction 0.5 % at MPP

Array #2 - Sub-array #2

Loss Fraction 0.5 % at MPP

Array #3 - Sub-array #3

Loss Fraction 0.5 % at MPP

Array #4 - Sub-array #4

Loss Fraction 0.5 % 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. 36 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 91 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 26 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 84 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 0.15 % at STC

Inverters: MAC 50KTL3-X LV, MAX 100KTL3-X LV

Wire section (4 Inv.) Alu 4 x 3 x 95 mm²
Average wires length 45 m

Inverter: MAX 70KTL3 LV

Wire section (1 Inv.) Alu 1 x 3 x 50 mm²
Wires length 0 m

Inverter: MAX 80KTL3 LV

Wire section (4 Inv.) Alu 4 x 3 x 70 mm²
Average wires length 0 m

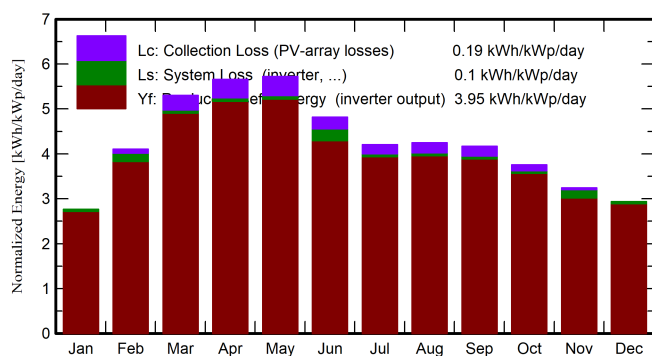


Main results

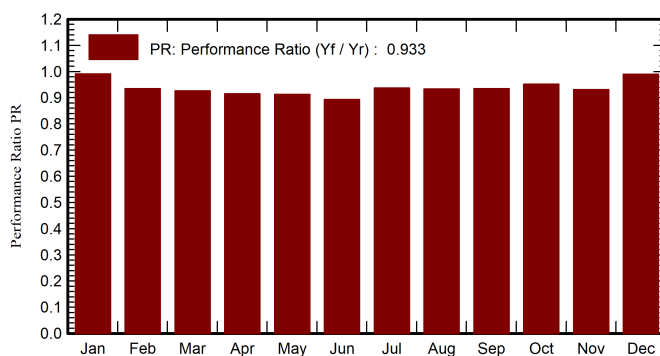
System Production

Produced Energy (P50)	1048187 kWh/year	Specific production (P50)	1443 kWh/kWp/year	Perf. Ratio PR	93.27 %
Produced Energy (P90)	1023957 kWh/year	Specific production (P90)	1410 kWh/kWp/year		
Produced Energy (P75)	1035448 kWh/year	Specific production (P75)	1426 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

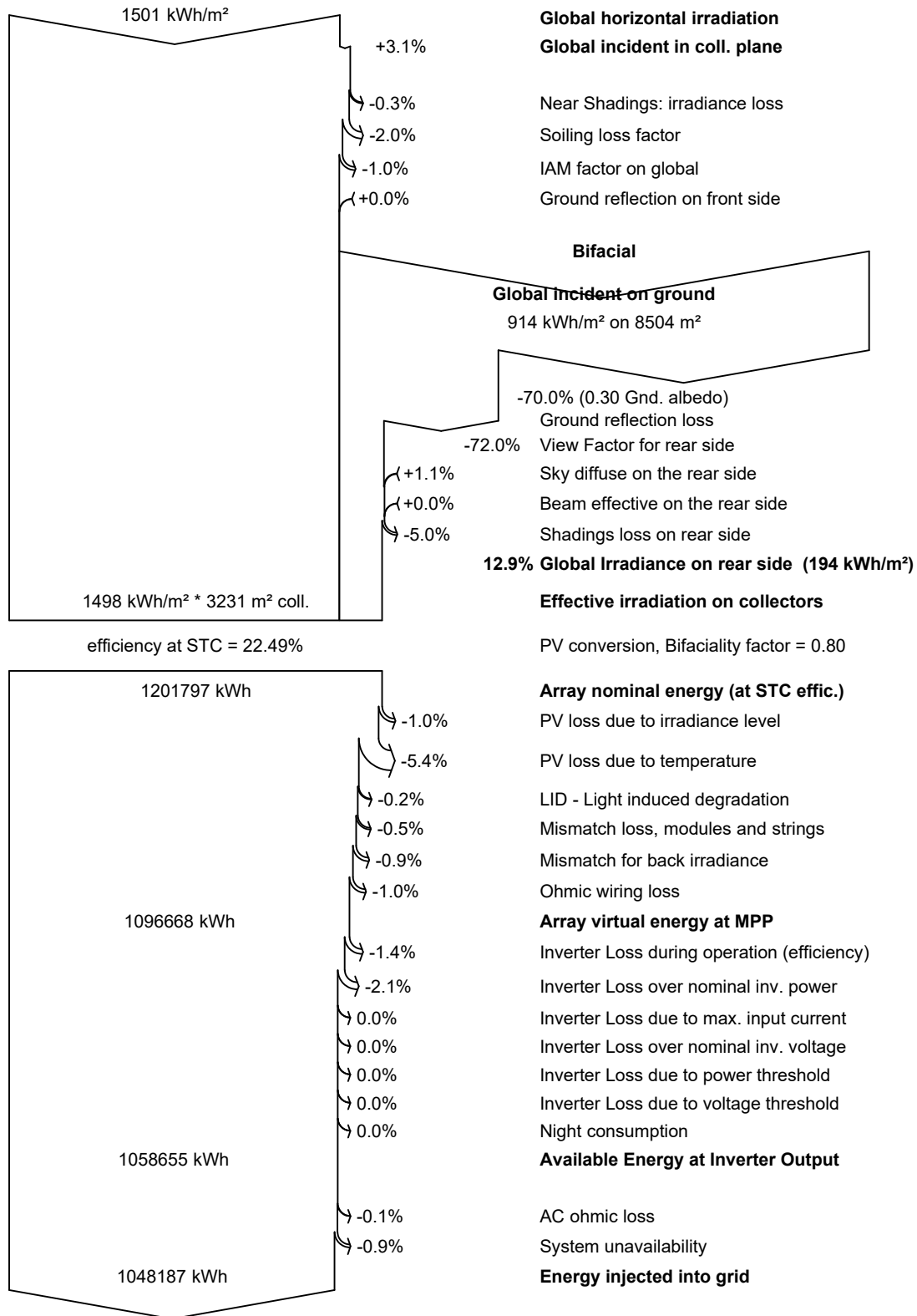
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_Grid kWh	PR ratio
January	77.4	47.58	14.37	85.1	82.3	62232	61230	0.991
February	107.2	60.29	19.18	115.0	111.4	81722	78018	0.935
March	155.7	74.00	24.73	164.3	159.4	112214	110572	0.927
April	166.8	87.77	29.42	169.7	164.5	114402	112768	0.915
May	178.0	97.98	31.20	177.4	172.1	119353	117567	0.913
June	146.5	96.76	30.69	144.5	139.9	99432	93687	0.893
July	132.2	87.98	29.48	130.5	126.2	90224	88796	0.937
August	131.7	82.44	29.31	131.6	127.3	90626	89246	0.934
September	122.2	75.48	28.35	125.1	121.0	86138	84825	0.934
October	110.4	72.19	26.20	116.4	112.6	81666	80433	0.952
November	90.2	60.52	21.00	97.4	94.2	69833	65890	0.932
December	82.4	51.99	16.34	90.7	87.6	66153	65155	0.989
Year	1500.5	894.99	25.04	1547.5	1498.3	1073995	1048187	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		



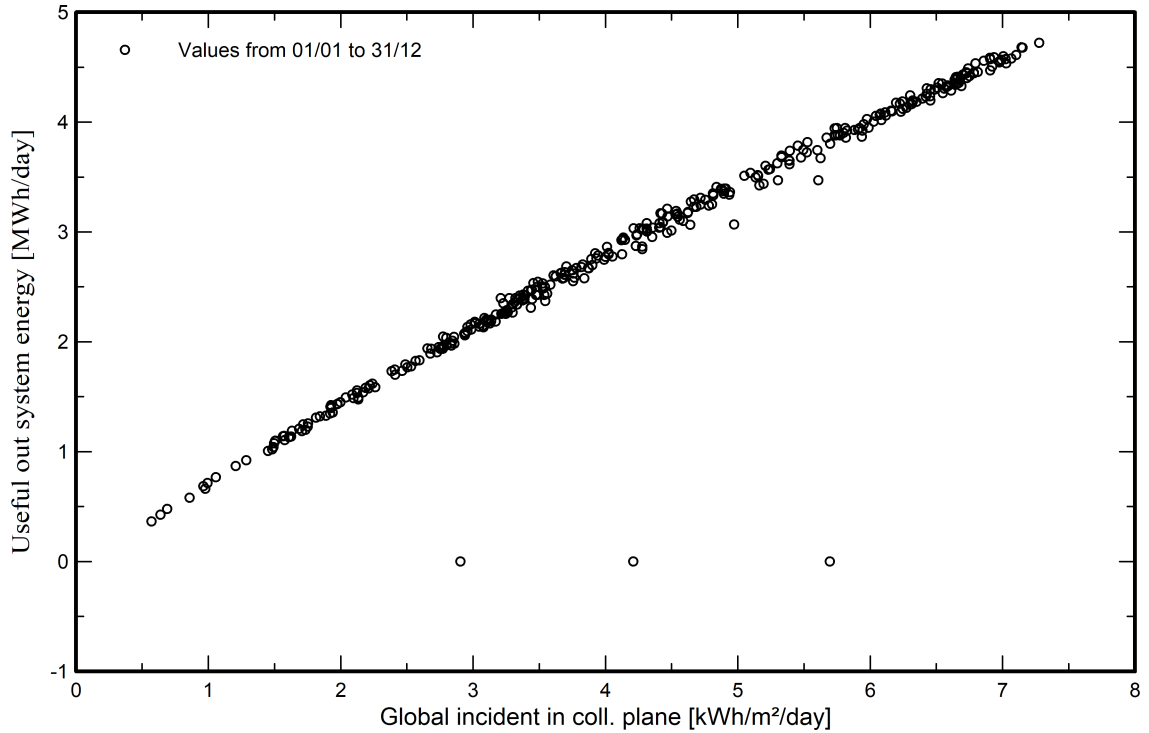
Loss diagram



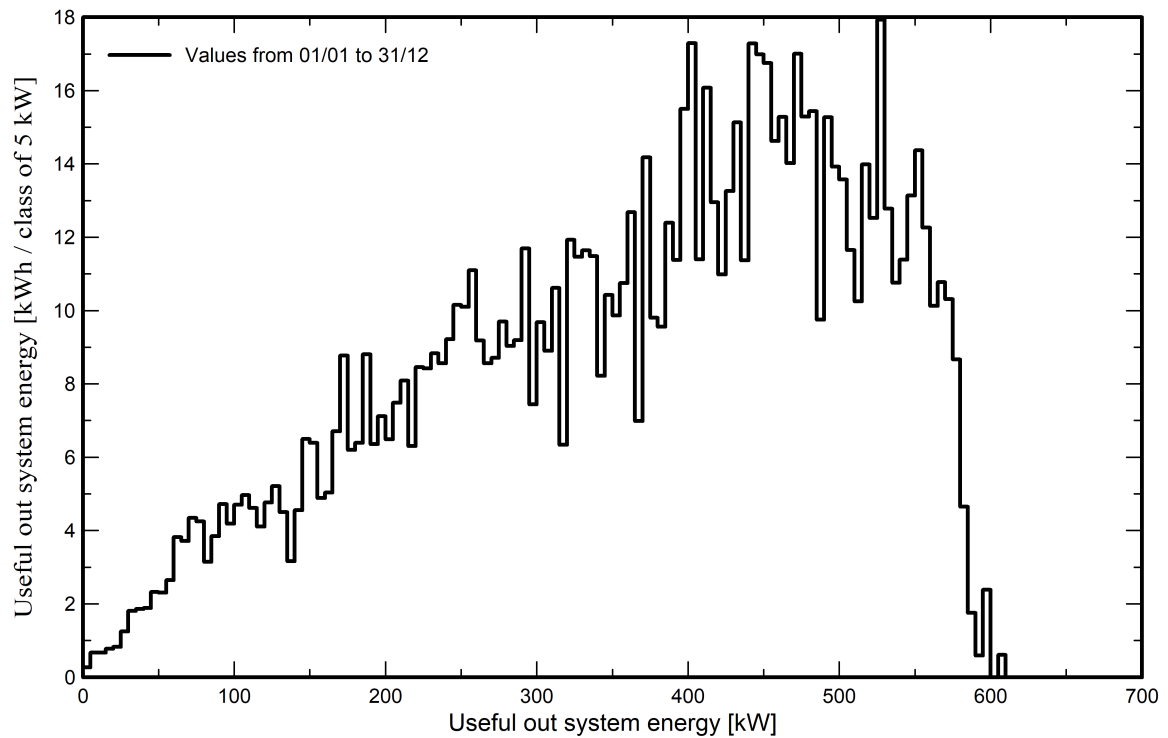


Predef. graphs

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 18.9 MWh
P50 1048.2 MWh
P90 1024.0 MWh
P75 1035.4 MWh

Probability distribution

