

PVsyst - Simulation report

Grid-Connected System

Project: Motilal Nehru Pragraj

Variant: New simulation variant

Unlimited sheds

System power: 300 kWp

Khusru Bāgh - India

Author

Jakson Limited (India)



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Variant: New simulation variant

PVsyst V8.0.2

VC0, Simulation date:
25/12/24 07:40
with V8.0.2

Jakson Limited (India)

Project summary

Geographical Site

Khusru Bāgh

India

Situation

Latitude 25.44 °N

Longitude 81.83 °E

Altitude 98 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 25 °

Unlimited sheds

Orientation #2

Sheds

Tilt 10 °

Azimuth -8 °

Near Shadings

Mutual shadings of sheds

System information

PV Array

Nb. of modules

518 units

Pnom total

300 kWp

Inverters

Nb. of units

4 units

Pnom total

265 kWac

Pnom ratio

1.134

User's needs

Unlimited load (grid)

Results summary

Produced Energy 440845 kWh/year Specific production 1467 kWh/kWp/year Perf. Ratio PR 89.76 %

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General parameters

Grid-Connected System

Orientation #1

Sheds

Tilt 10 °
Azimuth 25 °

Orientation #2

Sheds

Tilt 10 °
Azimuth -8 °

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 6.00 m
Sheds width 3.04 m
Limit profile angle 9.8 °
GCR 50.7 %
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 %

Unlimited sheds

Sheds configuration

Nb. of sheds 5 units
Unlimited sheds
Shading limit angle
Limit profile angle 9.8 °

Sheds configuration

Nb. of sheds 5 units
Unlimited sheds
Shading limit angle
Limit profile angle 9.8 °

Horizon

Free Horizon

Sizes

Sheds spacing 6.00 m
Collector width 3.00 m
Average GCR 50.0 %
Top inactive band 0.02 m
Bottom inactive band 0.02 m

Sizes

Sheds spacing 6.00 m
Collector width 3.00 m
Average GCR 50.0 %
Top inactive band 0.02 m
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Near Shadings

Mutual shadings of sheds

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array

Orientation #1
Tilt/Azimuth 10/25 °



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PV Array Characteristics

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules39 units
Nominal (STC)22.62 kWp
Modules3 string x 13 In series

At operating cond. (50°C)

Pmpp20.98 kWp
U mpp534 V
I mpp39 A

Array #2 - Sub-array #2

Orientation#1

Tilt/Azimuth10/25 °

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules98 units
Nominal (STC)56.8 kWp
Modules7 string x 14 In series

At operating cond. (50°C)

Pmpp52.7 kWp
U mpp575 V
I mpp92 A

Array #3 - Sub-array #3

Orientation#1

Tilt/Azimuth10/25 °

PV module

ManufacturePanasonic Life Solutions India Pvt. Ltd

ModelAE14T580VHC16B5R

(Custom parameters definition)

Unit Nom. Power580 Wp
Number of PV modules126 units
Nominal (STC)73.1 kWp
Modules7 string x 18 In series

At operating cond. (50°C)

Pmpp67.8 kWp
U mpp739 V
I mpp92 A

Array #4 - Sub-array #4

Orientation#2

Tilt/Azimuth10/-8 °

Inverter

Manufacturer

Growatt New Energy

Model

MID 20KTL3-X

(Original PVsyst database)

Unit Nom. Power20.0 kWac
Number of inverters1 unit
Total power20.0 kWac
Operating voltage160-1000 V
Pnom ratio (DC:AC)1.13
Power sharing within this inverter

Inverter

Manufacturer

Growatt New Energy

Model

MAC 50KTL3-X LV

(Custom parameters definition)

Unit Nom. Power50.0 kWac
Number of inverters1 unit
Total power50.0 kWac
Operating voltage200-1000 V
Pnom ratio (DC:AC)1.14
Power sharing within this inverter

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)1.04
Power sharing within this inverter



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Jakson Limited (India)

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 255 units
Nominal (STC) 148 kWp
Modules 17 string x 15 In series

At operating cond. (50°C)

Pmpp 137 kWp
U mpp 616 V
I mpp 223 A

Total PV power

Nominal (STC) 300 kWp
Total 518 modules
Module area 1337 m²

Inverter

Manufacturer

Growatt New Energy

Model

MAX 125KTL3-X LV

(Original PVsyst database)

Unit Nom. Power 125 kWac
Number of inverters 1 unit
Total power 125 kWac
Operating voltage 180-1000 V
Pnom ratio (DC:AC) 1.18
Power sharing within this inverter

Total inverter power

Total power 265 kWac
Number of inverters 4 units
Pnom ratio 1.13

Array losses

Array Soiling Losses

Loss Fraction 2.0 %

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 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 1.0 % at MPP

Array #2 - Sub-array #2

Loss Fraction 1.0 % at MPP

Array #3 - Sub-array #3

Loss Fraction 1.0 % at MPP

Array #4 - Sub-array #4

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. 221 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 131 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 102 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 45 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

Inverter: MID 20KTL3-X

Wire section (1 Inv.) Alu 1 x 3 x 70 mm²
Wires length 45 m

Inverter: MAX 70KTL3 LV

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

Inverter: MAC 50KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 35 mm²
Wires length 0 m

Inverter: MAX 125KTL3-X LV

Wire section (1 Inv.) Alu 1 x 3 x 150 mm²
Wires length 0 m

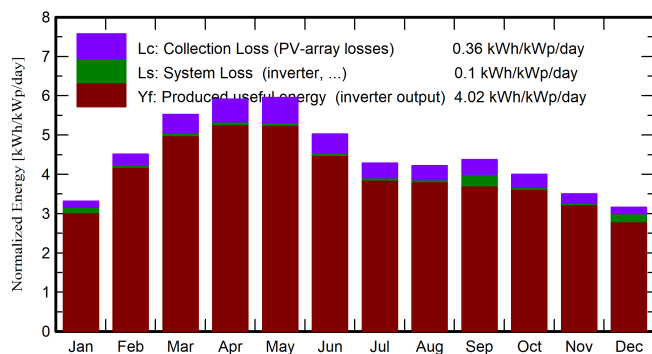


Main results

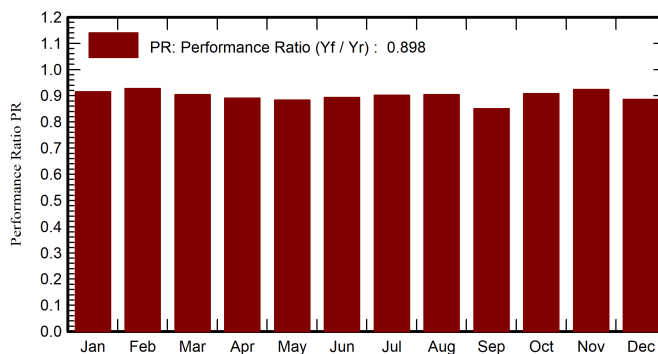
System Production

Produced Energy (P50)	440845 kWh/year	Specific production (P50)	1467 kWh/kWp/year	Perf. Ratio PR	89.76 %
Produced Energy (P90)	430654 kWh/year	Specific production (P90)	1433 kWh/kWp/year		
Produced Energy (P75)	435487 kWh/year	Specific production (P75)	1449 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

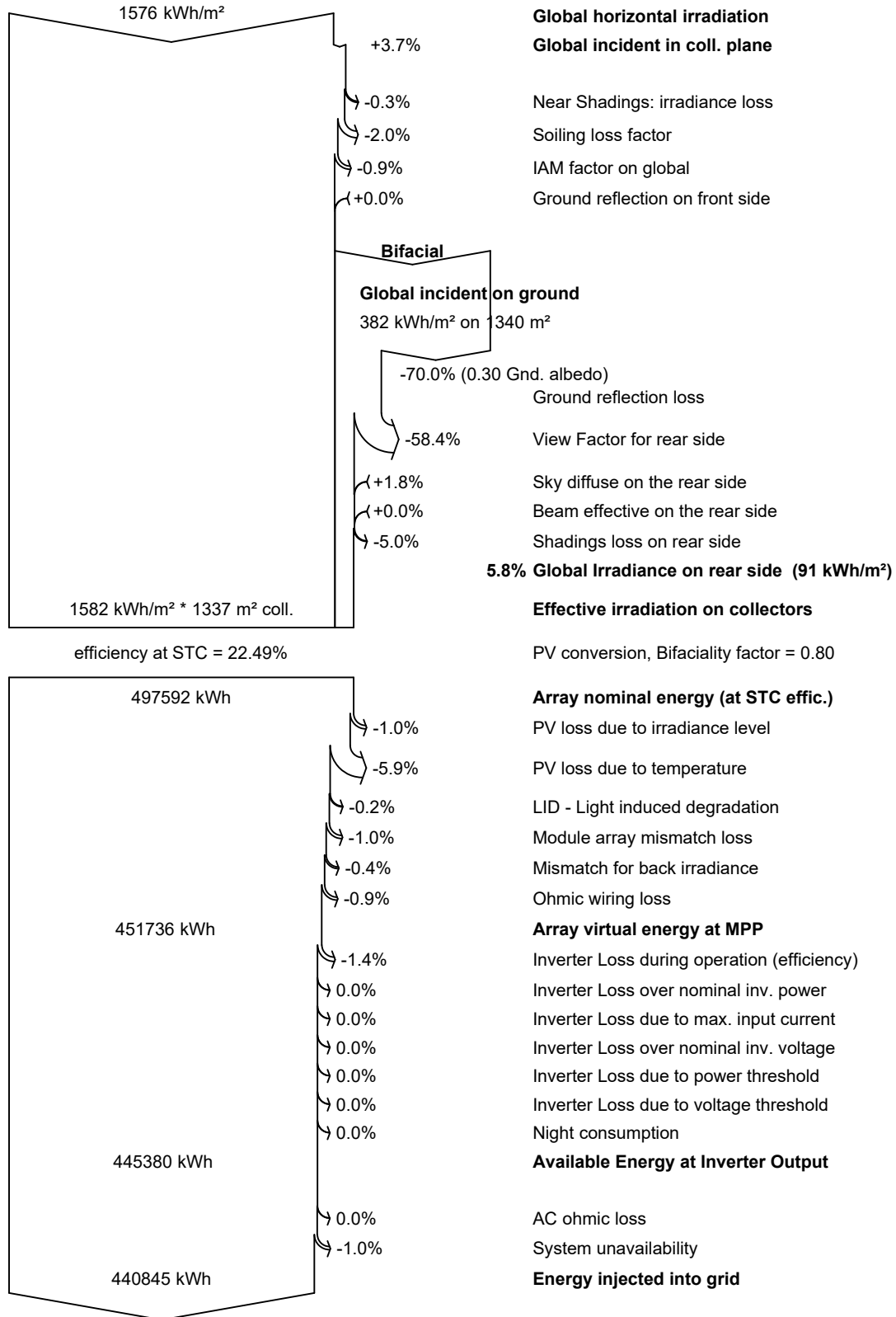
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	92.9	56.64	15.29	102.7	99.2	29532	28229	0.915
February	116.0	58.98	19.95	126.3	122.4	35706	35210	0.928
March	161.9	77.64	26.30	171.2	165.9	47159	46509	0.904
April	174.2	90.37	31.29	177.5	172.0	48149	47498	0.891
May	185.6	98.44	34.69	184.5	178.8	49632	48934	0.883
June	153.6	99.32	33.17	150.8	145.9	41064	40461	0.893
July	134.6	91.26	30.64	132.8	128.3	36509	35972	0.902
August	130.9	89.10	29.92	130.9	126.4	36079	35557	0.904
September	127.5	76.93	28.99	131.1	126.7	36110	33496	0.850
October	116.6	70.07	27.38	123.9	120.0	34282	33784	0.907
November	95.2	57.14	21.96	105.0	101.5	29534	29120	0.923
December	87.4	50.95	17.39	98.0	94.7	27975	26077	0.886
Year	1576.3	916.83	26.44	1634.8	1581.9	451730	440845	0.898

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		



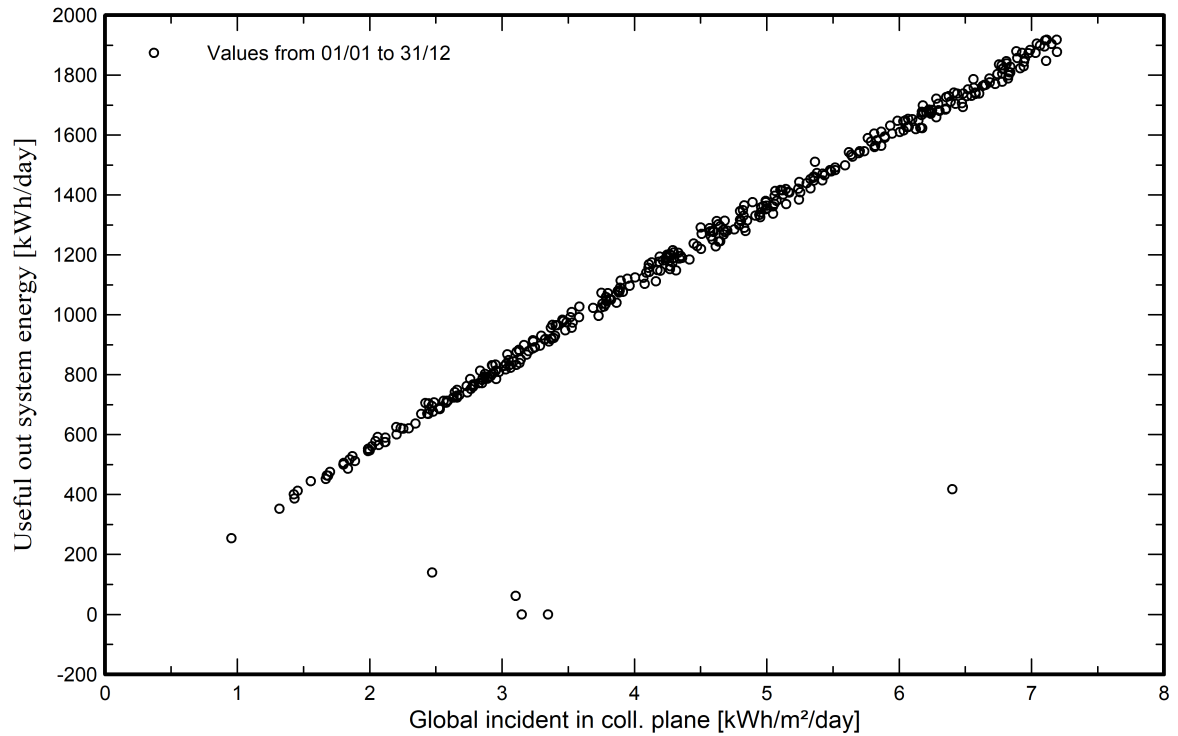
Loss diagram



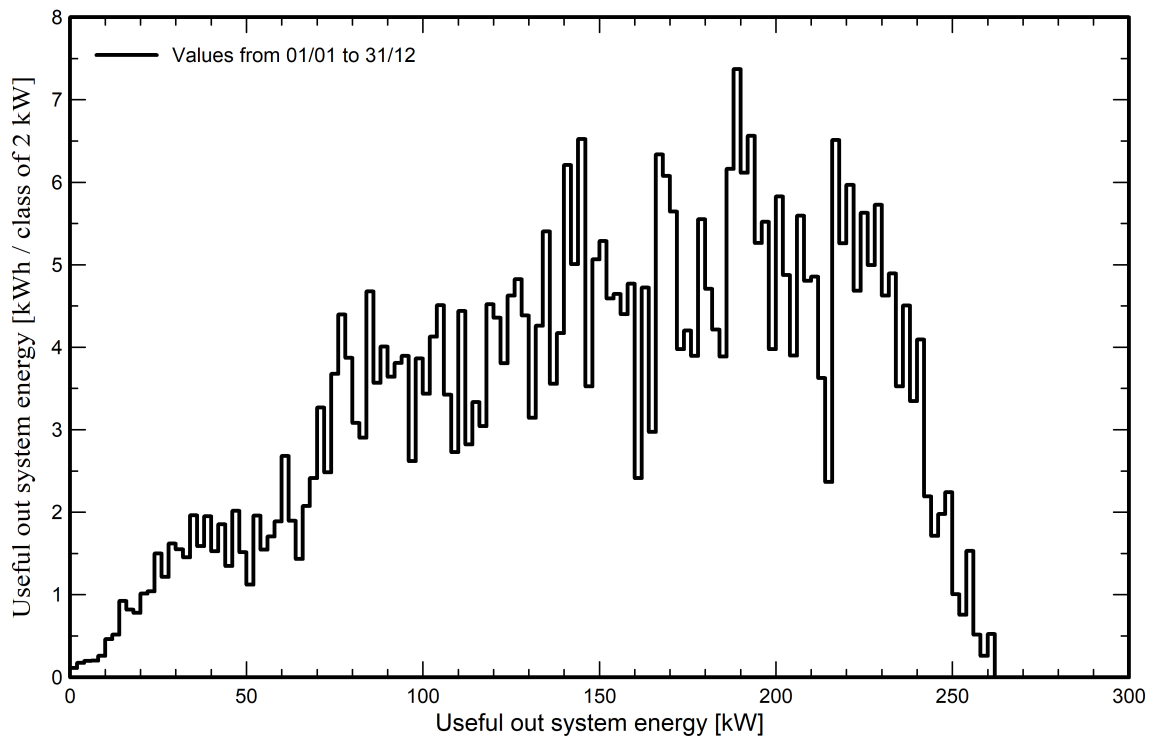


Predef. graphs

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 7.9 MWh
P50 440.8 MWh
P90 430.7 MWh
P75 435.5 MWh

Probability distribution

