

PVsyst - Simulation report

Grid-Connected System

Project: Delhi_Ground_Mounted_Project_(VNM)

Variant: New simulation variant

No 3D scene defined, no shadings

System power: 4929 kWp

Delhi Ground Mounted Project(VNM) - India



Project: Delhi_Ground_Mounted_Project_(VNM)

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PVsyst V7.2.4

VC0, Simulation date:
16/02/23 16:48
with v7.2.4

Project summary

Geographical Site

Delhi Ground Mounted Project(VNM)

India

Situation

Latitude 28.57 °N

Longitude 76.85 °E

Altitude 214 m

Time zone UTC+5.5

Project settings

Albedo 0.20

Meteo data

Delhi_Ground_Mounted_Project (VNM)

Meteonorm 8.0 (1981-2010), Sat=3% - Synthetic

System summary

Grid-Connected System

Simulation for year no 10

No 3D scene defined, no shadings

PV Field Orientation

Fixed plane

Tilt/Azimuth 10 / 0 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 9044 units

Pnom total 4929 kWp

Inverters

Nb. of units 18 units

Pnom total 3960 kWac

Pnom ratio 1.245

Results summary

Produced Energy 7338 MWh/year Specific production 1489 kWh/kWp/year Perf. Ratio PR 77.34 %

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Project: Delhi_Ground_Mounted_Project_(VNM)

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General parameters

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 10 / 0 °

Sheds configuration

No 3D scene defined

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Free Horizon

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer

Jinkosolar

Model

JKM545M-72HL4-V

(Custom parameters definition)

Unit Nom. Power

545 Wp

Number of PV modules

9044 units

Nominal (STC)

4929 kWp

Modules

323 Strings x 28 In series

At operating cond. (40°C)

Pmpp

4678 kWp

U mpp

1086 V

I mpp

4307 A

Total PV power

Nominal (STC)

4929 kWp

Total

9044 modules

Module area

23322 m²

Cell area

21502 m²

Inverter

Manufacturer

Solis

Model

Solis-255K-EHV-5G-NEW

(Custom parameters definition)

Unit Nom. Power

220 kWac

Number of inverters

18 unit

Total power

3960 kWac

Operating voltage

600-1500 V

Max. power (=>30°C)

255 kWac

Pnom ratio (DC:AC)

1.24

Total inverter power

Total power

3960 kWac

Nb. of inverters

18 units

Pnom ratio

1.24

Array losses

Array Soiling Losses

Loss Fraction 2.8 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 20.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 2.7 mΩ

Loss Fraction 1.0 % at STC

Serie Diode Loss

Voltage drop 0.7 V

Loss Fraction 0.1 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 10

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

Vmp RMS dispersion 0.4 %/year

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.999	0.988	0.965	0.925	0.743	0.000



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System losses

Unavailability of the system

Time fraction 1.0 %
 3.7 days,
 3 periods

Auxiliaries loss

Proportionnal to Power 2.0 W/kW
0.0 kW from Power thresh.



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Main results

System Production

Produced Energy

7338 MWh/year

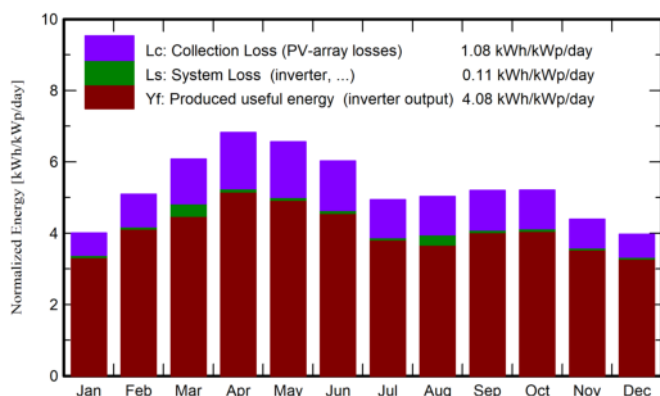
Specific production

1489 kWh/kWp/year

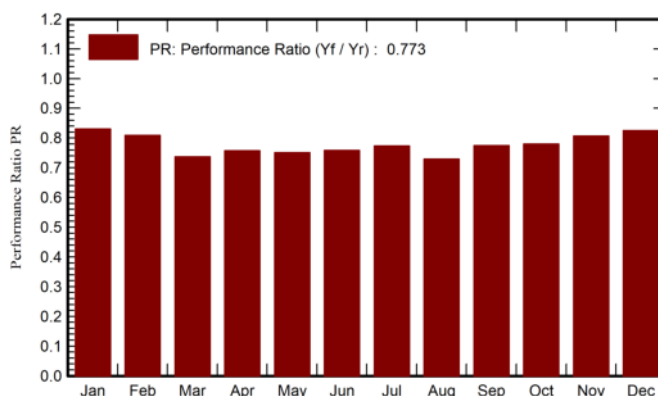
Performance Ratio PR

77.34 %

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	MWh	MWh	ratio
January	106.7	43.9	13.34	124.3	120.4	517.1	508.5	0.830
February	126.3	48.8	17.68	142.5	138.1	577.6	568.3	0.809
March	174.7	65.2	23.80	188.4	182.5	738.1	684.3	0.737
April	197.7	75.5	29.77	204.6	198.3	777.2	764.0	0.758
May	203.2	100.3	33.66	203.5	197.1	766.1	753.6	0.751
June	182.6	103.5	33.28	180.7	175.0	686.3	675.2	0.758
July	154.4	99.9	31.48	153.1	148.1	592.9	583.2	0.773
August	154.0	91.7	30.43	155.9	150.9	604.7	560.8	0.730
September	148.8	78.3	29.16	155.8	150.9	605.2	595.0	0.775
October	147.1	66.3	26.72	161.5	156.5	631.1	620.7	0.780
November	114.3	49.9	20.50	131.6	127.5	531.5	523.3	0.807
December	104.1	42.7	15.08	123.1	119.3	509.2	501.0	0.826
Year	1813.9	865.9	25.44	1925.0	1864.6	7537.1	7338.1	0.773

Legends

GlobHor Global horizontal irradiation

DiffHor Horizontal diffuse irradiation

T_Amb Ambient Temperature

GlobInc Global incident in coll. plane

GlobEff Effective Global, corr. for IAM and shadings

EArray Effective energy at the output of the array

E_Grid Energy injected into grid

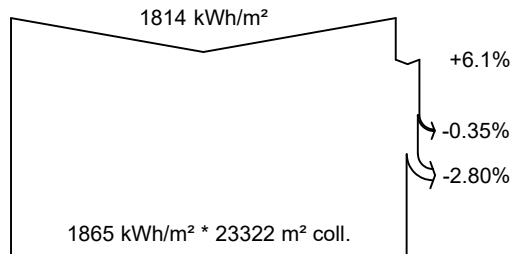
PR Performance Ratio



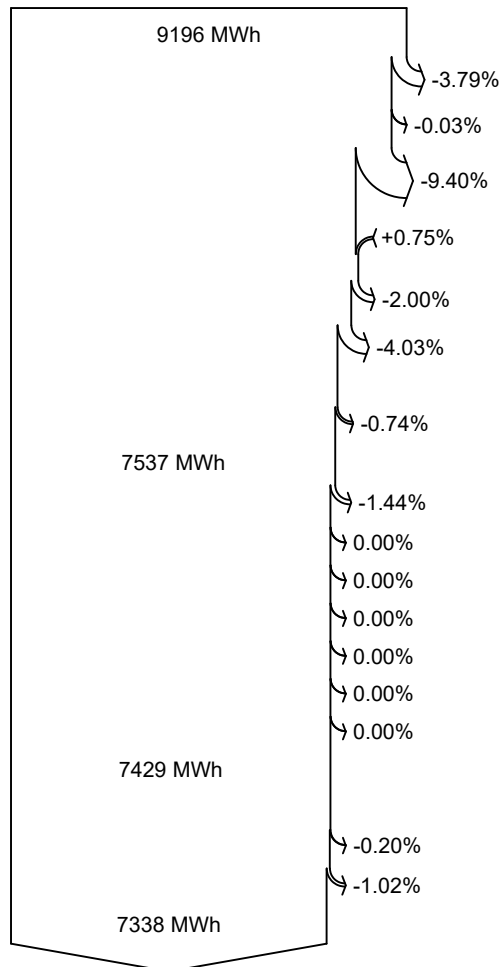
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Loss diagram



efficiency at STC = 21.15%



Global horizontal irradiation

Global incident in coll. plane

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

Module Degradation Loss (for year #10)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

LID - Light induced degradation

Mismatch loss, modules and strings
(including 1.9% for degradation dispersion)

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Auxiliaries (fans, other)

System unavailability

Energy injected into grid

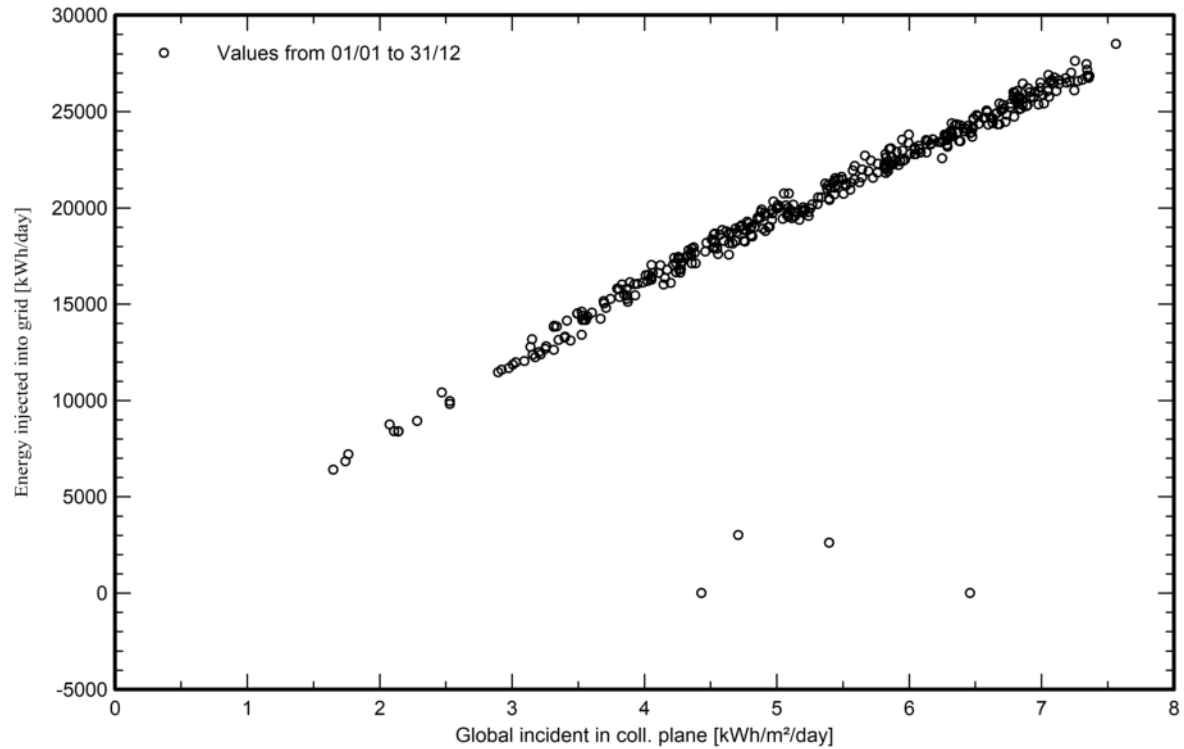


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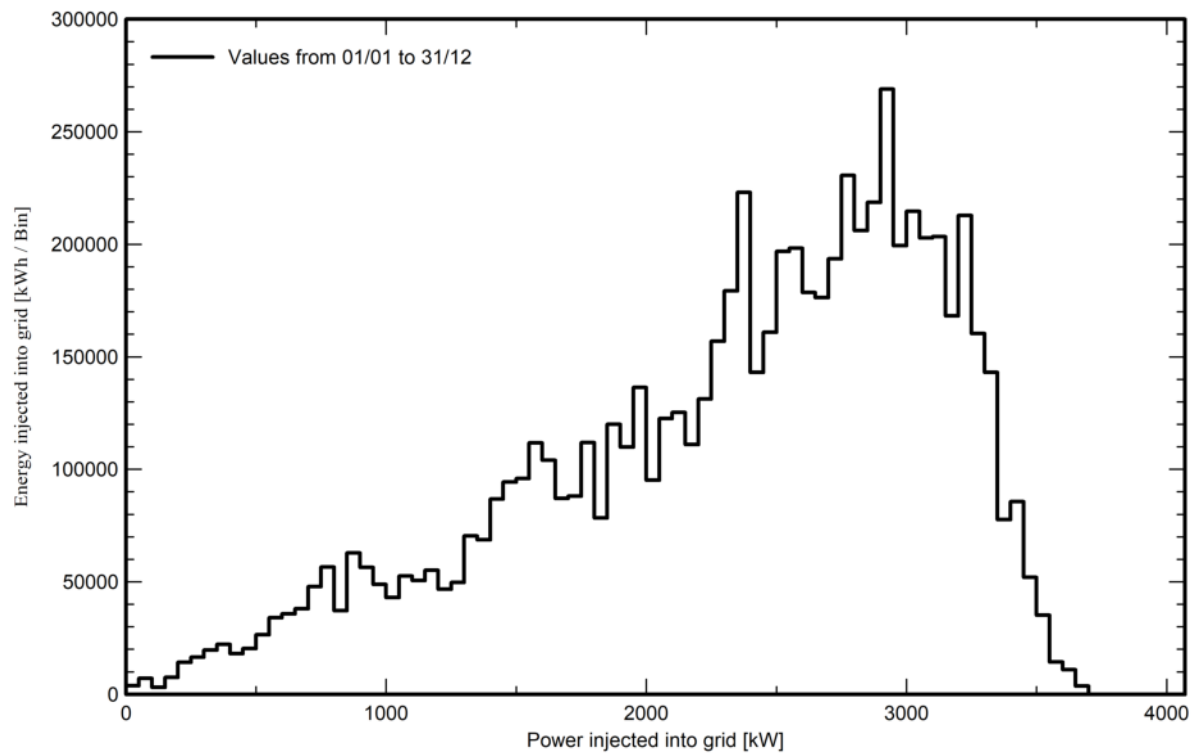
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Special graphs

Daily Input/Output diagram



System Output Power Distribution





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P50 - P90 evaluation

Meteo data

Meteo data source: Meteonorm 8.0 (1981-2010), Sat=3%
Kind: Not defined
Year-to-year variability(Variance): 2.5 %

Specified Deviation

Global variability (meteo + system)

Variability (Quadratic sum): 3.1 %

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	226 MWh
P50	7338 MWh
P90	7048 MWh
P75	7186 MWh

Probability distribution

