

PVsyst - Simulation report

Grid-Connected System

Project: For linkedin

Variant: New simulation variant

Tables on a building

System power: 131 kWp

Ranchi - India



Project: For linkedin

Variant: New simulation variant

PVsyst V7.3.1

VCO, Simulation date:
13/03/25 20:27
with v7.3.1

Project summary

Geographical Site		Situation		Project settings	
Ranchi		Latitude	23.34 °N	Albedo	0.20
India		Longitude	85.31 °E		
		Altitude	642 m		
		Time zone	UTC+5.3		
Meteo data					
Ranchi					
Meteonorm 8.1 (1991-2012), Sat=100% - Synthetic					

System summary

Grid-Connected System		Tables on a building		User's needs	
PV Field Orientation		Near Shadings		Monthly values	
Fixed plane		Linear shadings			
Tilt/Azimuth	30 / 0 °				
System information					
PV Array					
Nb. of modules	240 units	Inverters		2 units	
Pnom total	131 kWp	Nb. of units		120 kWac	
		Pnom total		1.090	
		Pnom ratio			

Results summary

Produced Energy	117916 kWh/year	Specific production	901 kWh/kWp/year	Perf. Ratio PR	49.84 %
Used Energy	93674 kWh/year			Solar Fraction SF	39.76 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed plane
Tilt/Azimuth 30 / 0 °

Horizon

Free Horizon

Tables on a building

Sheds configuration

Nb. of sheds 12 units

Sizes

Sheds spacing 2.20 m
Collector width 4.58 m
Ground Cov. Ratio (GCR) 208.0 %

Shading limit angle

Limit profile angle 127.6 °

Near Shadings

Linear shadings

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

User's needs

Monthly values

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year	
11.0	9.00	8.59	6.30	13.0	2.52	5.97	5.66	5.95	4.85	5.75	15.1	93.7	MWh/mth

PV Array Characteristics

PV module

Manufacturer Axitec Energy
Model AXIbipremium XXL HC MW AC-545MBT/144V
(Original PVsyst database)

Unit Nom. Power 545 Wp
Number of PV modules 240 units
Nominal (STC) 131 kWp

Array #1 - PV Array

Number of PV modules 60 units
Nominal (STC) 32.7 kWp
Modules 4 Strings x 15 In series

At operating cond. (50°C)

Pmpp 29.87 kWp
U mpp 563 V
I mpp 53 A

Array #2 - Sub-array #2

Number of PV modules 60 units
Nominal (STC) 32.7 kWp
Modules 4 Strings x 15 In series

At operating cond. (50°C)

Pmpp 29.87 kWp
U mpp 563 V
I mpp 53 A

Array #3 - Sub-array #3

Number of PV modules 60 units
Nominal (STC) 32.7 kWp
Modules 4 Strings x 15 In series

At operating cond. (50°C)

Pmpp 29.87 kWp
U mpp 563 V
I mpp 53 A

Inverter

Manufacturer Goodwe
Model GW60K-MT
(Original PVsyst database)

Unit Nom. Power 60.0 kWac
Number of inverters 2 units
Total power 120 kWac

Number of inverters 2 * MPPT 25% 0.5 unit
Total power 30.0 kWac

Operating voltage 200-850 V
Pnom ratio (DC:AC) 1.09

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PV Array Characteristics

Array #4 - Sub-array #4			
Number of PV modules	60 units	Number of inverters	2 * MPPT 25% 0.5 unit
Nominal (STC)	32.7 kWp	Total power	30.0 kWac
Modules	4 Strings x 15 In series		
At operating cond. (50°C)			
Pmpp	29.87 kWp	Operating voltage	200-850 V
U mpp	563 V	Pnom ratio (DC:AC)	1.09
I mpp	53 A		
Total PV power		Total inverter power	
Nominal (STC)	131 kWp	Total power	120 kWac
Total	240 modules	Number of inverters	2 units
Module area	620 m ²	Pnom ratio	1.09
Cell area	572 m ²	No Power sharing	

Array losses

Array Soiling Losses		Thermal Loss factor		Serie Diode Loss				
Loss Fraction	1.0 %	Module temperature according to irradiance		Voltage drop	0.7 V			
		Uc (const)	29.0 W/m ² K	Loss Fraction	0.1 % at STC			
		Uv (wind)	0.0 W/m ² K/m/s					
LID - Light Induced Degradation		Module Quality Loss		Module mismatch losses				
Loss Fraction	0.5 %	Loss Fraction	-0.2 %	Loss Fraction	2.0 % at MPP			
Strings Mismatch loss								
Loss Fraction	0.1 %							
IAM loss factor								
Incidence effect (IAM): Fresnel smooth glass, n = 1.526								
0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.998	0.981	0.948	0.862	0.776	0.636	0.403	0.000

DC wiring losses

Global wiring resistance	10 mΩ		
Loss Fraction	0.5 % at STC		
Array #1 - PV Array		Array #2 - Sub-array #2	
Global array res.	21 mΩ	Global array res.	175 mΩ
Loss Fraction	0.2 % at STC	Loss Fraction	1.5 % at STC
Array #3 - Sub-array #3		Array #4 - Sub-array #4	
Global array res.	175 mΩ	Global array res.	175 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC

System losses

Unavailability of the system	
Time fraction	2.0 %
	7.3 days,
	3 periods



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AC wiring losses

Inv. output line up to injection point

Inverter voltage	400 Vac tri
Loss Fraction	0.19 % at STC

Inverter: GW60K-MT

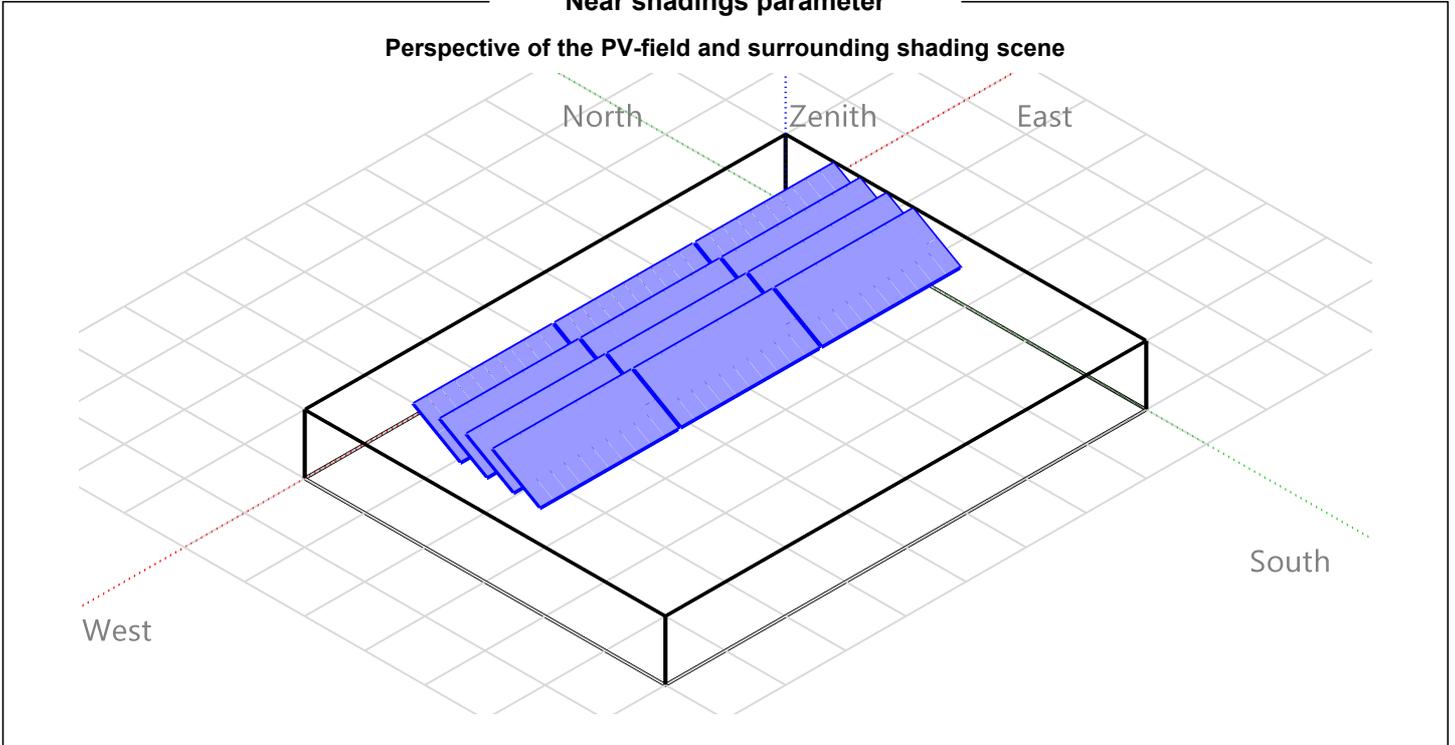
Wire section (2 Inv.)	Copper 2 x 3 x 25 mm ²
Average wires length	6 m



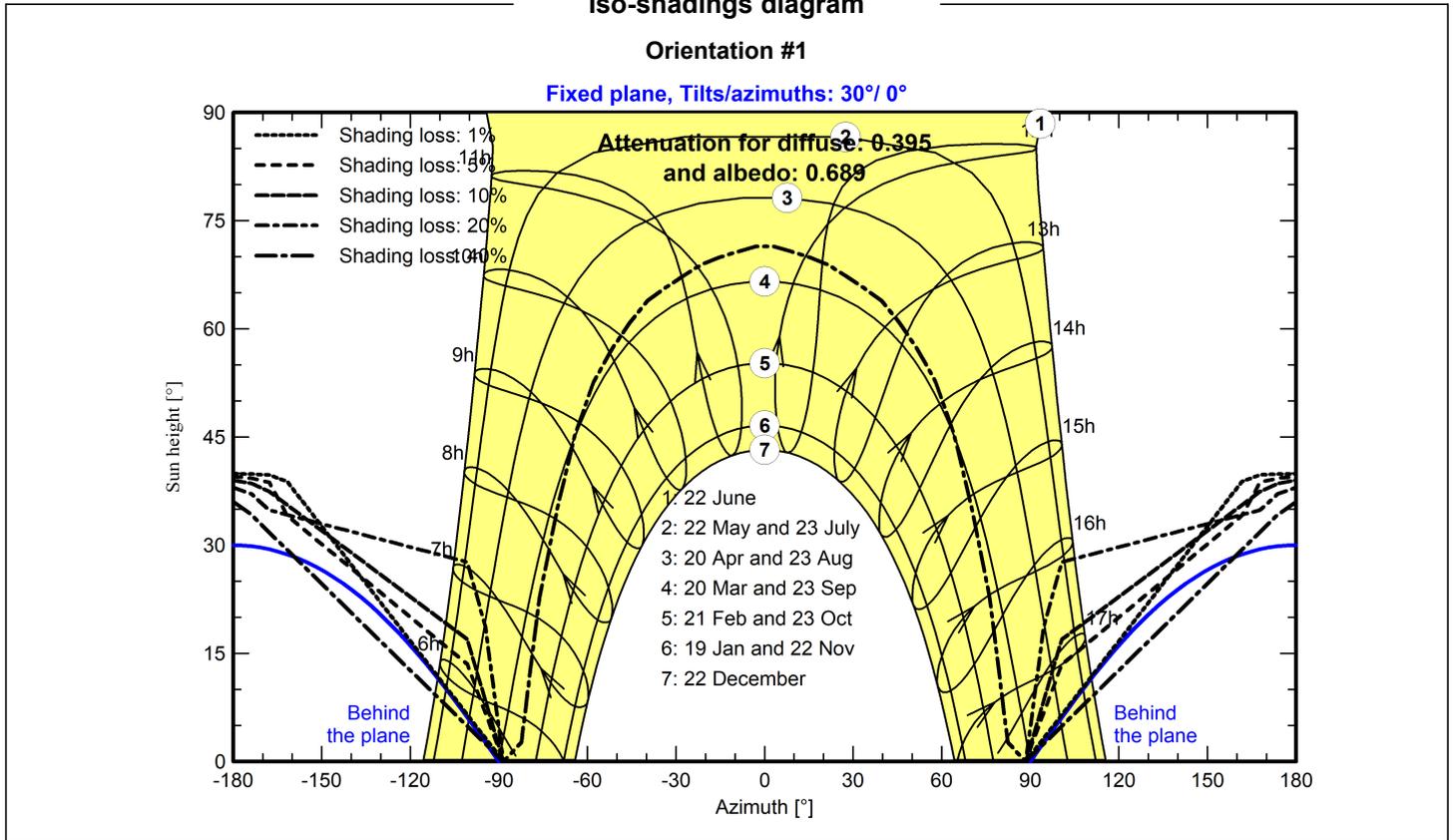
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Near shadings parameter



Iso-shadings diagram





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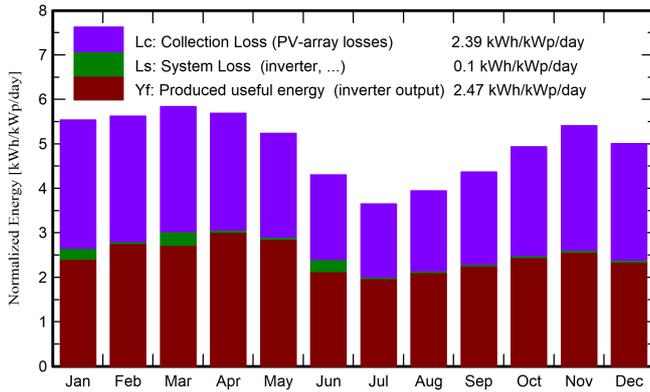
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Main results

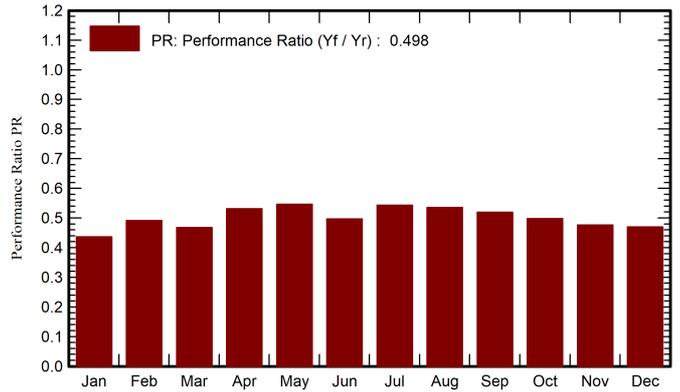
System Production

Produced Energy	117916 kWh/year	Specific production	901 kWh/kWp/year
Used Energy	93674 kWh/year	Performance Ratio PR	49.84 %
		Solar Fraction SF	39.76 %

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_User kWh	E_Solar kWh	E_Grid kWh	EFrGrid kWh
January	125.9	42.96	16.37	171.7	87.8	10789	11000	3890	5903	7110
February	128.7	52.59	20.03	157.3	84.7	10285	9000	3594	6530	5406
March	165.8	70.82	24.97	180.9	103.3	12281	8585	3255	7824	5330
April	174.2	79.52	28.92	170.7	102.8	12045	6302	2828	9026	3474
May	181.1	88.05	30.29	162.3	101.2	11788	13000	5334	6267	7666
June	147.8	92.36	28.14	129.2	80.2	9458	2523	1172	7214	1351
July	127.2	89.60	26.33	113.0	68.7	8171	5965	2634	5396	3331
August	130.1	82.35	25.91	122.3	73.2	8717	5662	2460	6110	3202
September	128.1	72.41	25.49	130.9	75.7	9036	5952	2521	6368	3431
October	133.9	69.98	24.07	152.8	84.3	10110	4852	2084	7865	2768
November	124.2	48.62	19.92	162.2	84.4	10268	5748	2262	7843	3486
December	113.9	46.81	16.71	155.2	78.9	9693	15085	5209	4327	9876
Year	1680.9	836.08	23.94	1808.8	1025.0	122642	93674	37243	80673	56431

Legends

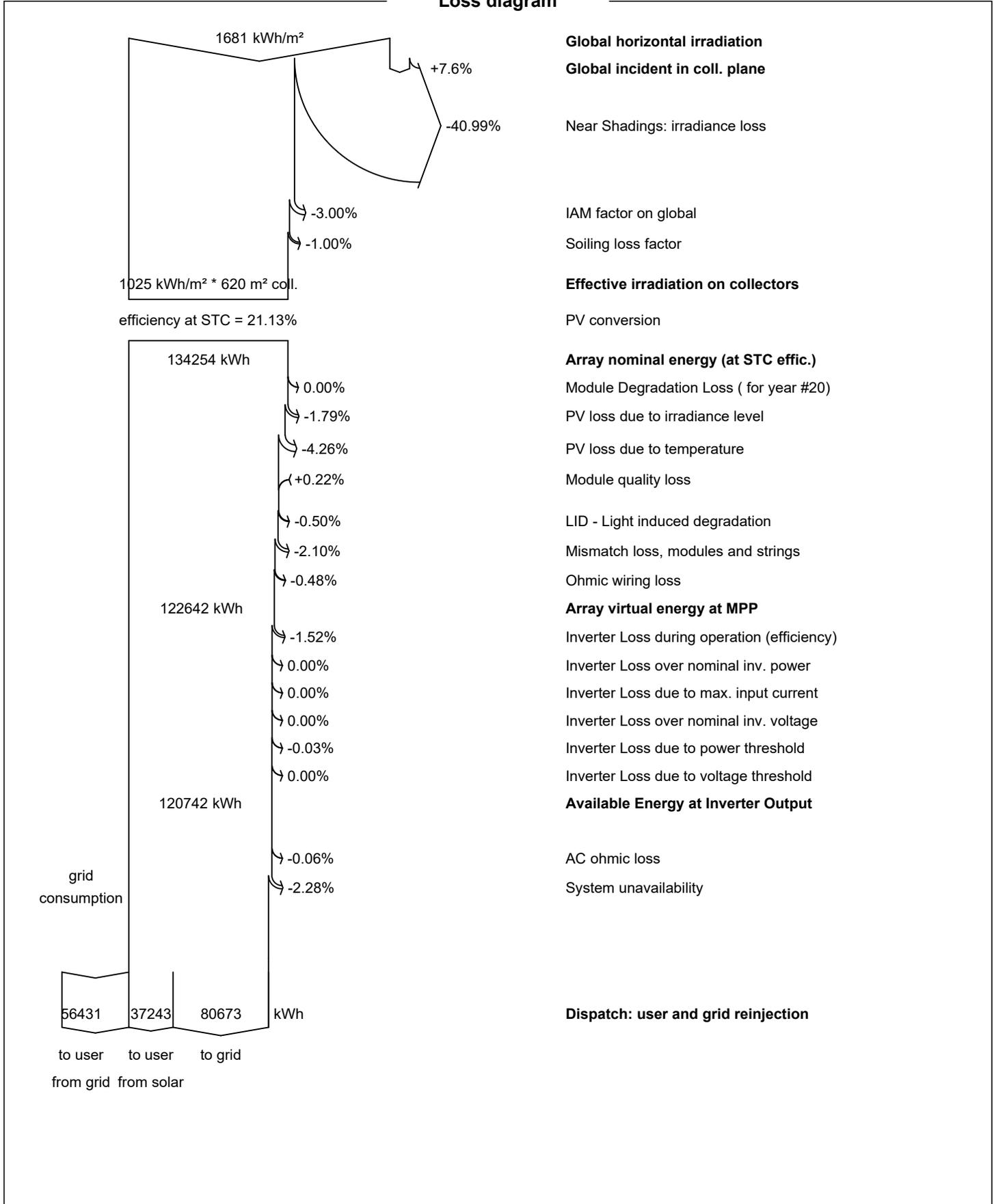
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_User	Energy supplied to the user
T_Amb	Ambient Temperature	E_Solar	Energy from the sun
GlobInc	Global incident in coll. plane	E_Grid	Energy injected into grid
GlobEff	Effective Global, corr. for IAM and shadings	EFrGrid	Energy from the grid



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Loss diagram



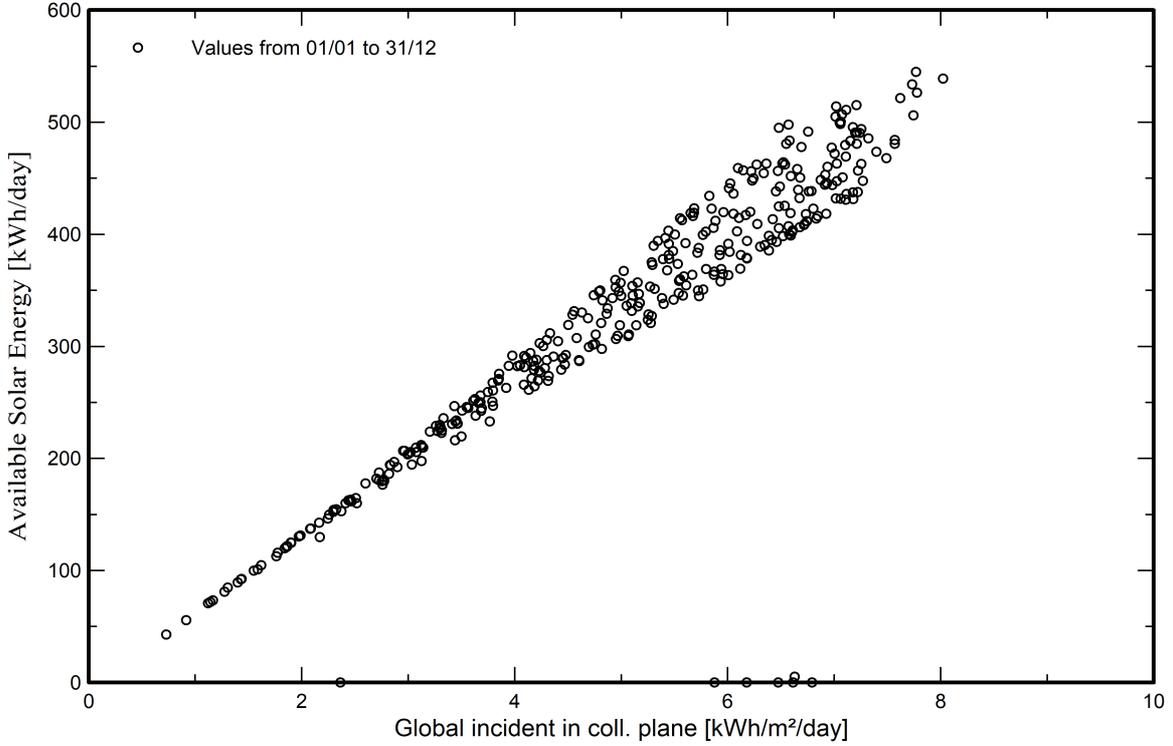


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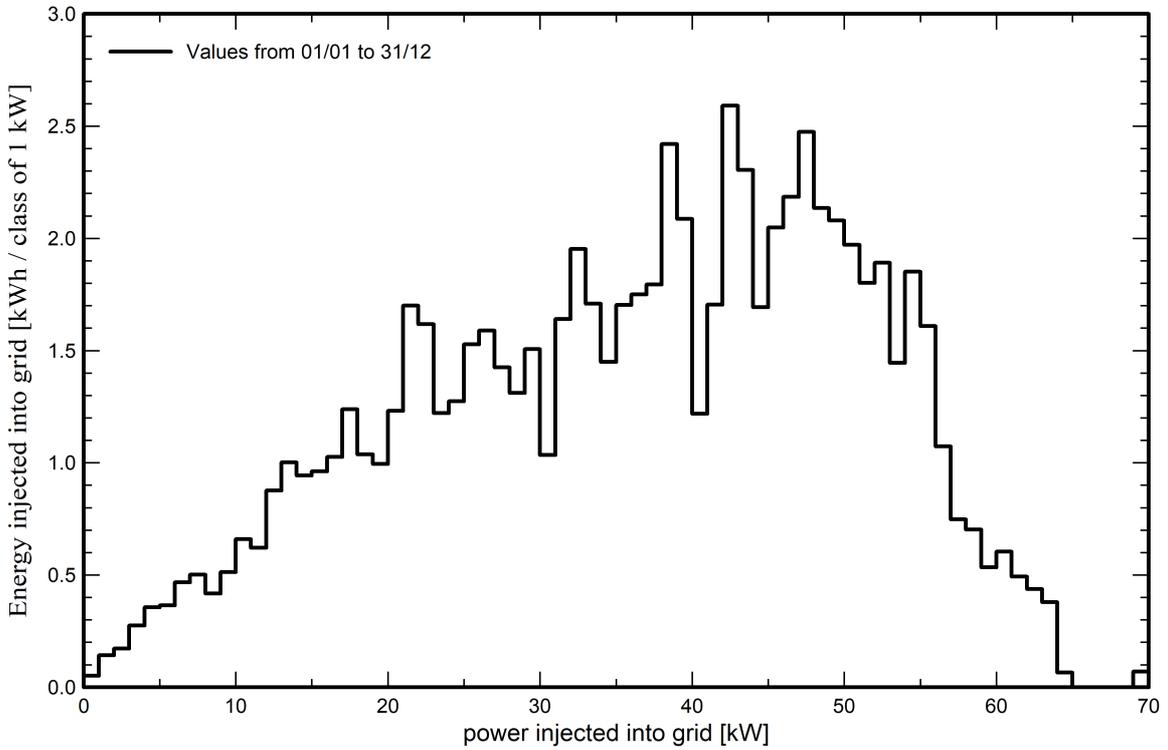
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Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





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P50 - P90 evaluation

Meteo data

Source Meteonorm 8.1 (1991-2012), Sat=100%
Kind Not defined
Year-to-year variability(Variance) 0.0 %

Specified Deviation

Global variability (meteo + system)

Variability (Quadratic sum) 1.8 %

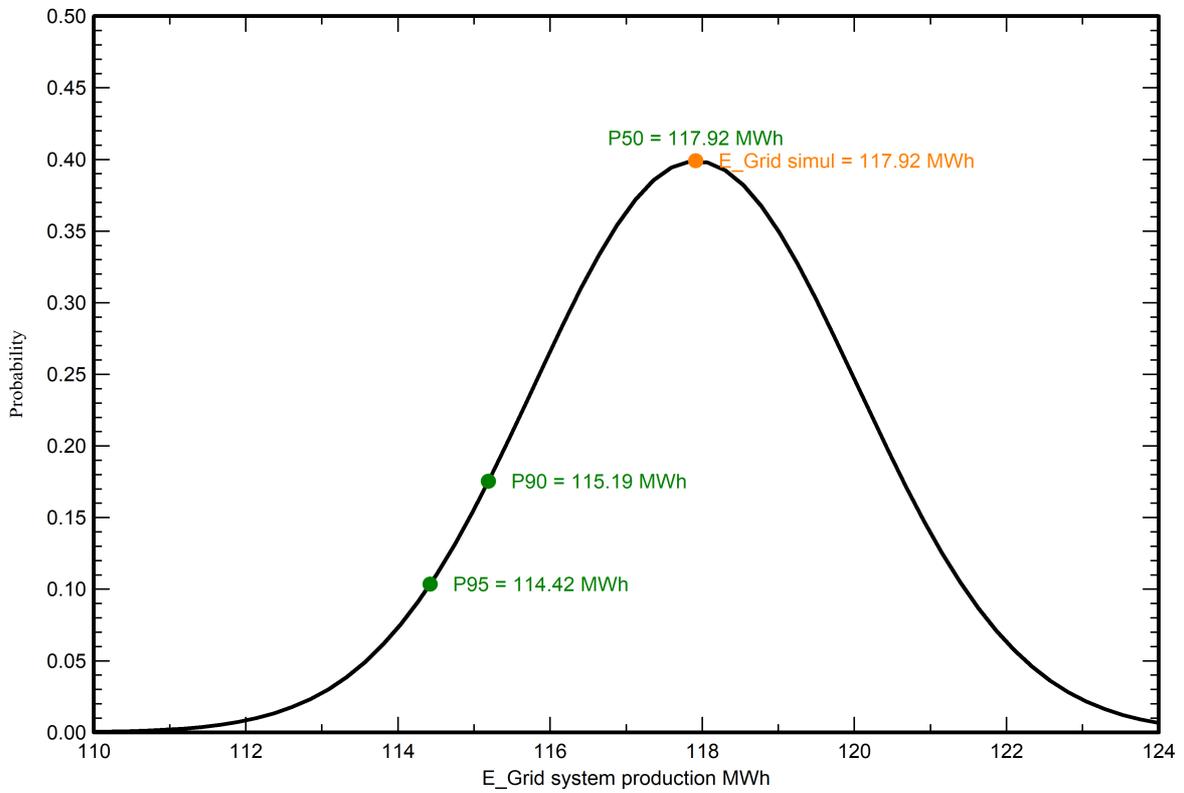
Simulation and parameters uncertainties

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 2.13 MWh
P50 117.92 MWh
P90 115.19 MWh
P95 114.42 MWh

Probability distribution





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Cost of the system

Installation costs

Item	Quantity units	Cost INR	Total INR
		Total	0.00
		Depreciable asset	0.00

Operating costs

Item	Total INR/year
Total (OPEX)	0.00

System summary

Total installation cost	0.00 INR
Operating costs	0.00 INR/year
Unused energy	37.2 MWh/year
Energy sold to the grid	80.7 MWh/year
Cost of produced energy (LCOE)	0.000 INR/kWh



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CO₂ Emission Balance

Total: 2632.7 tCO₂

Generated emissions

Total: 240.24 tCO₂

Source: Detailed calculation from table below:

Replaced Emissions

Total: 3311.1 tCO₂

System production: 117.92 MWh/yr

Grid Lifecycle Emissions: 936 gCO₂/kWh

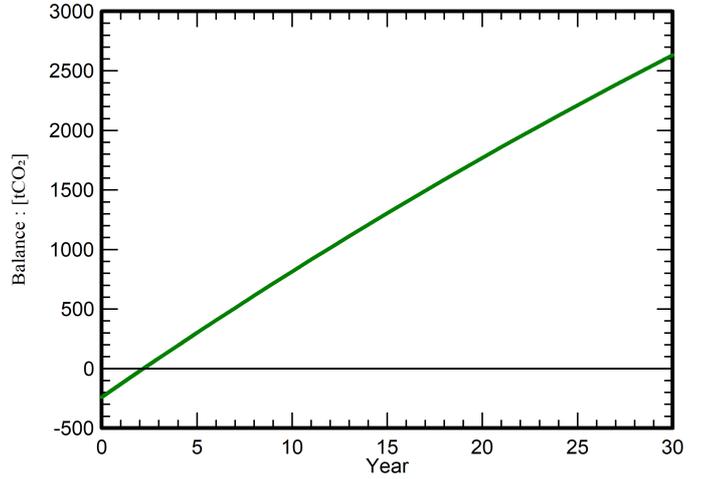
Source: IEA List

Country: India

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[kgCO ₂]
Modules	1713 kgCO ₂ /kWp	131 kWp	224024
Supports	6.24 kgCO ₂ /kg	2400 kg	14983
Inverters	619 kgCO ₂ /	2.00	1237