Version 7.4.5

PVsyst - Simulation report

Grid-Connected System

Project: Samson Controls Pvt Ltd

Variant: Bnkble 410KWp Samson Controls Pvt Ltd

No 3D scene defined, no shadings

System power: 410 kWp

Karegaon - India

Author

Boond Engineering & Devlopment Pvt. Ltd. (India)

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Project summary

Geographical Site
Karegaon
India

Situation

Latitude	18.79 °N
Longitude	74.29 °E
Altitude	654 m
Time zone	UTC+5.5

Project settings

Albedo	0.20

Meteo data
Ranjangaon Ganpati
PVGIS api TMY

System summary

Grid-Connected System

No 3D scene defined, no shadings

PV Field Orientation

Fixed planes	3 orientations
Tilts/azimuths	5 / -70 °
	5 / 110 °
	5 / 20 °

Near Shadings
No Shadings

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	617 units
Pnom total	410 kWp

Inverters

Nb. of units	3 units
Pnom total	330 kWac
Pnom ratio	1.243

Results summary

Produced Energy	738801 kWh/year	Specific production	1801 kWh/kWp/year	Perf. Ratio PR	85.49 %

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General parameters

Grid-Connected System — **No 3D scene defined, no shadings**

PV Field Orientation

Orientation		Sheds configuration	Models used	
Fixed planes	3 orientations	No 3D scene defined	Transposition	Perez
Tilts/azimuths	5 / -70 °		Diffuse	Imported
	5 / 110 °		Circumsolar	separate
	5 / 20 °			

Horizon	Near Shadings	User's needs
Free Horizon	No Shadings	Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Trina Solar
Model	TSM-DEG21C-20-665Wp Vertex
(Original PVsyst database)	
Unit Nom. Power	665 Wp
Number of PV modules	617 units
Nominal (STC)	410 kWp

Inverter

Manufacturer	Sungrow
Model	SG110CX-P2
(Original PVsyst database)	
Unit Nom. Power	110 kWac
Number of inverters	3 units
Total power	330 kWac

Array #1 - PV Array

Orientation	#1		
Tilt/Azimuth	5/-70 °		
Number of PV modules	95 units	Number of inverters	5 * MPPT 8% 0.4 unit
Nominal (STC)	63.2 kWp	Total power	45.9 kWac
Modules	5 string x 19 In series		
At operating cond. (50°C)		Operating voltage	180-1000 V
Pmpp	57.9 kWp	Pnom ratio (DC:AC)	1.38
U mpp	660 V		
I mpp	88 A		

Array #2 - Sub-array #2

Orientation	#3		
Tilt/Azimuth	5/20 °		
Number of PV modules	126 units	Number of inverters	7 * MPPT 8% 0.6 unit
Nominal (STC)	83.8 kWp	Total power	64.2 kWac
Modules	7 string x 18 In series		
At operating cond. (50°C)		Operating voltage	180-1000 V
Pmpp	76.8 kWp	Pnom ratio (DC:AC)	1.31
U mpp	625 V	No power sharing between MPPTs	
I mpp	123 A		

Array #3 - Sub-array #3

Orientation	#2		
Tilt/Azimuth	5/110 °		
Number of PV modules	234 units	Number of inverters	1 unit
Nominal (STC)	156 kWp	Total power	110 kWac
Modules	13 string x 18 In series		
At operating cond. (50°C)		Operating voltage	180-1000 V
Pmpp	143 kWp	Pnom ratio (DC:AC)	1.41
U mpp	625 V	Power sharing within this inverter	
I mpp	228 A		

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PV Array Characteristics

Array #4 - Sub-array #4

Orientation	#3		
Tilt/Azimuth	5/20 °		
Number of PV modules	162 units	Number of inverters	1 unit
Nominal (STC)	108 kWp	Total power	110 kWac
Modules	9 string x 18 In series		
At operating cond. (50°C)		Operating voltage	180-1000 V
Pmpp	98.7 kWp	Pnom ratio (DC:AC)	0.98
U mpp	625 V	Power sharing within this inverter	
I mpp	158 A		

Total PV power

Nominal (STC)	410 kWp	**Total inverter power**	
Total	617 modules	Total power	330 kWac
Module area	1917 m²	Number of inverters	3 units
		Pnom ratio	1.24
		No power sharing	

Array losses

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

Module Quality Loss
Loss Fraction 0.0 %

Module mismatch losses

Array #1 - PV Array
Loss Fraction 0.0 % at MPP

Array #2 - Sub-array #2
Loss Fraction 0.0 % at MPP

Array #3 - Sub-array #3
Loss Fraction 0.0 % at MPP

Array #4 - Sub-array #4
Loss Fraction 0.0 % at MPP

IAM loss factor
Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.5 % at STC

Array #1 - PV Array		**Array #2 - Sub-array #2**	
Global array res.	124 mΩ	Global array res.	84 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC
Array #3 - Sub-array #3		**Array #4 - Sub-array #4**	
Global array res.	45 mΩ	Global array res.	65 mΩ
Loss Fraction	1.5 % at STC	Loss Fraction	1.5 % at STC

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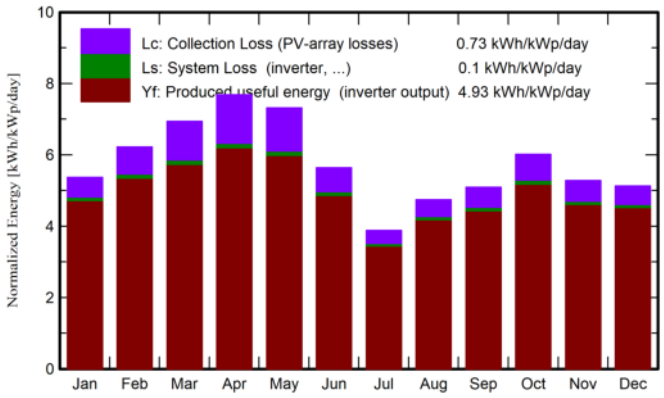
Main results

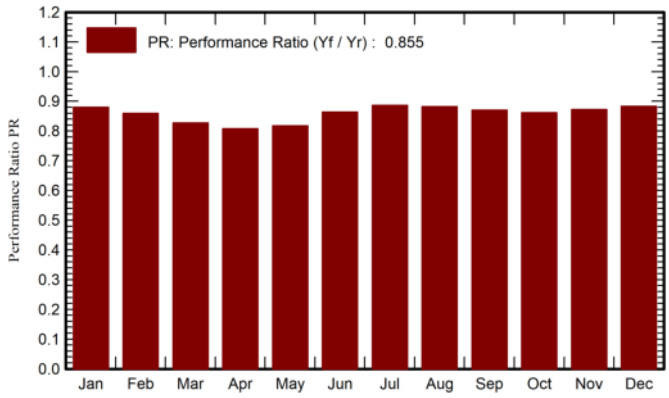
System Production

Produced Energy (P50)	738801 kWh/year	Specific production (P50)	1801 kWh/kWp/year	Perf. Ratio PR	85.49 %
Produced Energy (P90)	719270 kWh/year	Specific production (P90)	1753 kWh/kWp/year		
Produced Energy (P75)	728533 kWh/year	Specific production (P75)	1776 kWh/kWp/year		

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	162.0	45.36	21.84	166.3	161.5	61315	60064	0.880
February	171.2	44.78	22.59	174.3	170.1	62782	61451	0.859
March	212.9	56.28	26.20	215.1	210.6	74576	73009	0.827
April	229.7	58.01	29.30	230.4	226.1	77957	76344	0.808
May	227.7	67.66	30.07	226.8	222.8	77741	76111	0.818
June	170.0	85.56	26.87	169.1	165.7	61244	59954	0.864
July	121.2	87.50	23.28	120.4	116.9	44754	43827	0.887
August	147.4	91.81	23.89	147.0	143.4	54328	53207	0.882
September	152.3	74.79	23.67	152.8	149.1	55767	54603	0.871
October	184.1	59.66	24.74	186.6	182.2	67330	65942	0.861
November	155.1	53.11	25.65	158.5	153.8	57946	56762	0.873
December	154.3	46.96	21.60	158.8	153.7	58751	57527	0.883
Year	2088.0	771.48	24.98	2106.1	2055.9	754491	738801	0.855

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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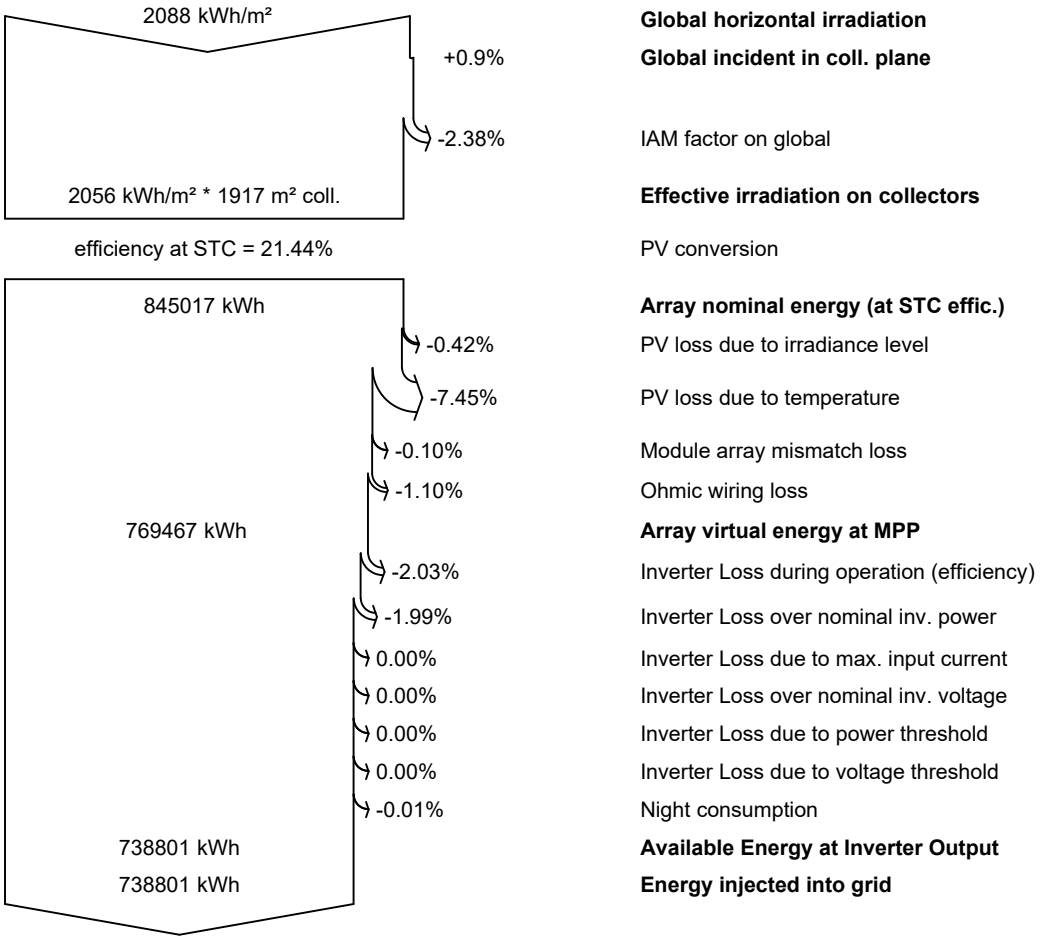
Loss diagram



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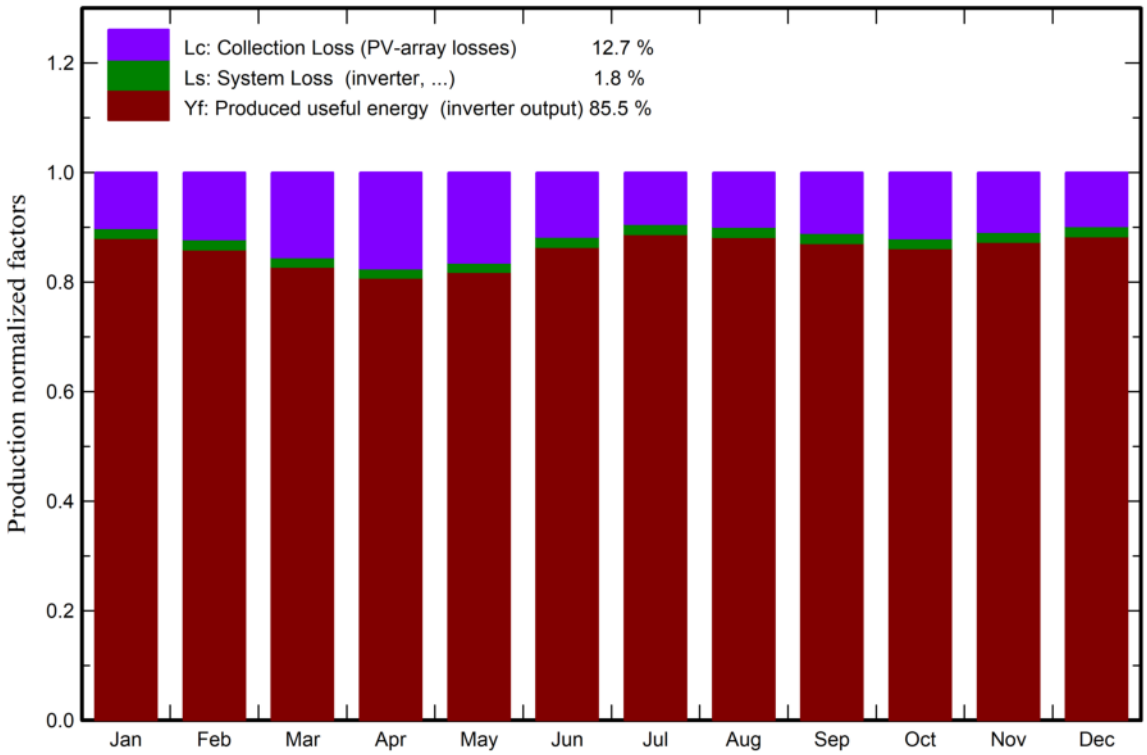
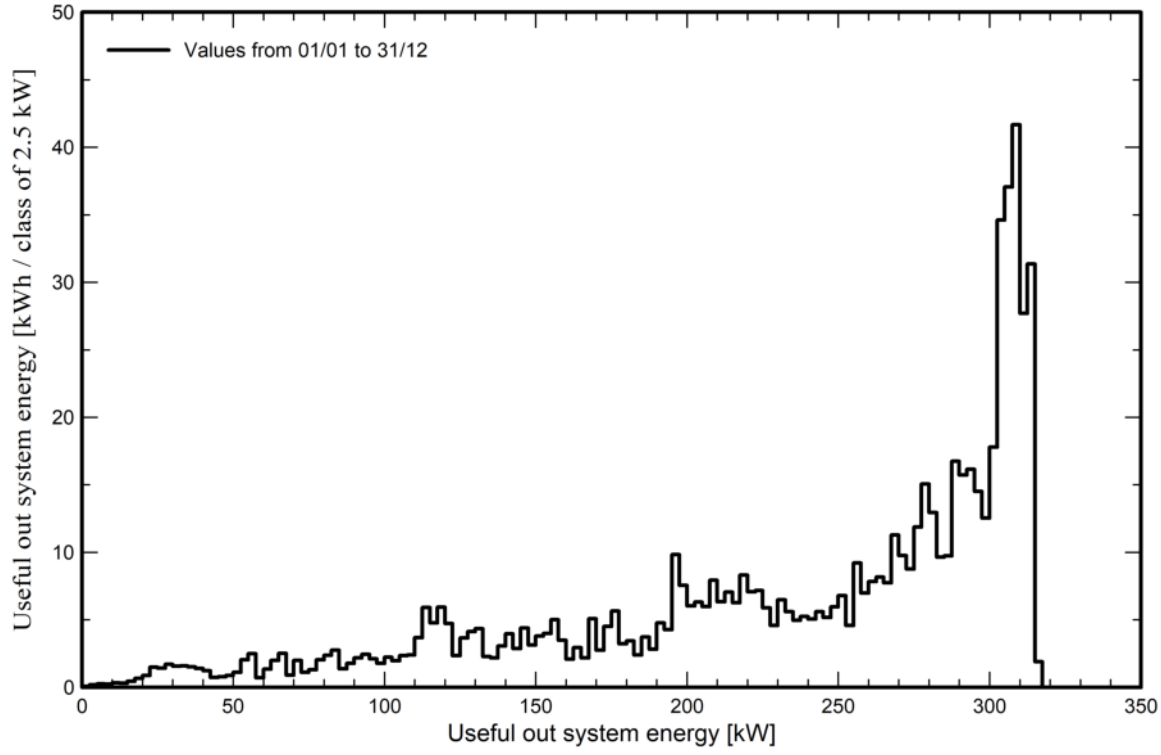
Predef. graphs

Normalized Production and Loss Factors



System Output Power Distribution



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P50 - P90 evaluation

Meteo data

Source	PVGIS api TMY
Kind	Not defined
Year-to-year variability(Variance)	-1.0 %
Specified Deviation	

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 %

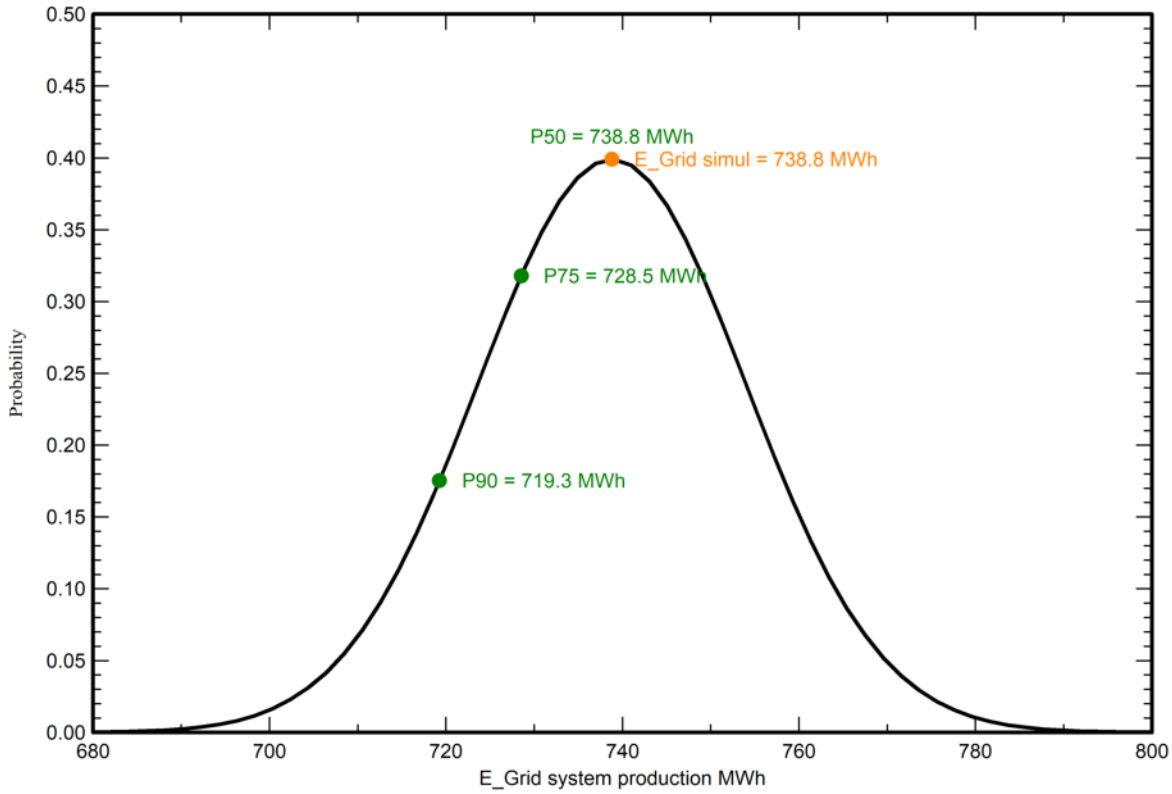
Global variability (meteo + system)

Variability (Quadratic sum)	2.1 %

Annual production probability

Variability	15.2 MWh
P50	738.8 MWh
P90	719.3 MWh
P75	728.5 MWh

Probability distribution



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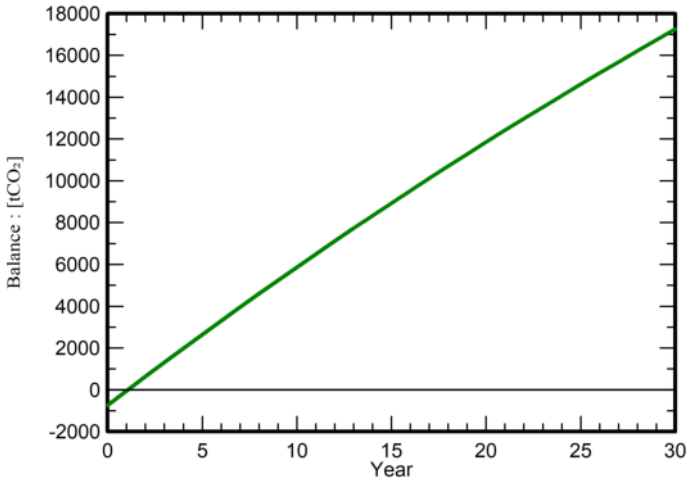
CO_2 Emission Balance

Total: 17257.1 tCO_2

Generated emissions
Total: 743.11 tCO_2
Source: Detailed calculation from table below

Replaced Emissions
Total: 20745.5 tCO_2
System production: 738.80 MWh/yr
Grid Lifecycle Emissions: 936 gCO_2/kWh
Source: IEA List
Country: India
Lifetime: 30 years
Annual degradation: 1.0 %

Saved CO_2 Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[$kgCO_2$]
Modules	1713 kgCO2/kWp	410 kWp	702738
Supports	6.24 kgCO2/kg	6170 kg	38520
Inverters	619 kgCO2/	3.00	1856