PVsyst

PHOTOVOLTAIC SOFTWARE

PVsyst - Simulation report

Grid-Connected System

Project: 10 MW solar project

Variant: 1st simulation of 10 MW solar plant

Sheds on ground

System power: 10.00 MWp

Katgun - India

Author

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Project summary

Geographical Site
Katgun
India

Situation
Latitude	17.70 °N
Longitude	74.37 °E
Altitude	816 m
Time zone	UTC+5.5

Project settings
Albedo	0.20

Meteo data
Katgun
Meteonorm 8.1 (1996-2015), Sat=100% - Synthetic

System summary

Grid-Connected System   **Sheds on ground**

PV Field Orientation
Fixed plane
Tilt/Azimuth   25 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information
PV Array		**Inverters**	
Nb. of modules	29412 units	Nb. of units	154 units
Pnom total	10.00 MWp	Pnom total	7700 kWac
		Pnom ratio	1.299

Results summary

Produced Energy	15964610 kWh/year	Specific production	1596 kWh/kWp/year	Perf. Ratio PR	80.04 %

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General parameters

Grid-Connected System

Sheds on ground

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth   25 / 0 °

Sheds configuration

Nb. of sheds	1490 units

Sizes

Sheds spacing	5.00 m
Collector width	4.02 m
Ground Cov. Ratio (GCR)	80.4 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Shading limit angle

Limit profile angle	51.9 °

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

Linear shadings : Fast (table)

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer	Generic
Model	CS3U-340P-AG 1500V
	(Original PVsyst database)
Unit Nom. Power	340 Wp
Number of PV modules	29412 units
Nominal (STC)	10.00 MWp
Modules	1634 string x 18 In series

At operating cond. (50°C)

Pmpp	9055 kWp
U mpp	624 V
I mpp	14509 A

Inverter

Manufacturer	Generic
Model	SG50CX-P2
	(Original PVsyst database)
Unit Nom. Power	50.0 kWac
Number of inverters	154 units
Total power	7700 kWac
Operating voltage	160-1000 V
Max. power (=>40°C)	55.0 kWac
Pnom ratio (DC:AC)	1.30
Power sharing within this inverter	

Total PV power

Nominal (STC)	10000 kWp
Total	29412 modules
Module area	58353 m²
Cell area	52010 m²

Total inverter power

Total power	7700 kWac
Max. power	8470 kWac
Number of inverters	154 units
Pnom ratio	1.30

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

DC wiring losses

Global array res.	0.72 mΩ
Loss Fraction	1.5 % at STC

Module Quality Loss

Loss Fraction	-0.4 %

Module mismatch losses

Loss Fraction	2.0 % at MPP

Strings Mismatch loss

Loss Fraction	0.2 %

IAM loss factor

Incidence effect (IAM): User defined profile

10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

System losses

Auxiliaries loss

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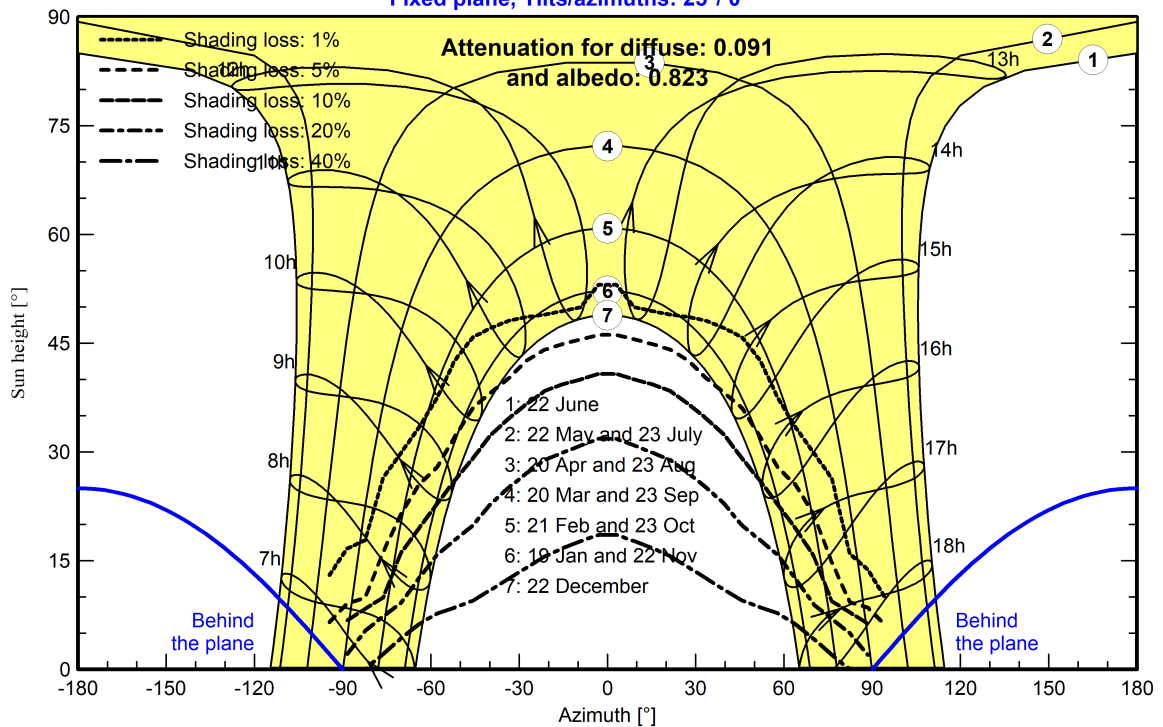07/01/24 15:47
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Near shadings parameter

Perspective of the PV-field and surrounding shading scene
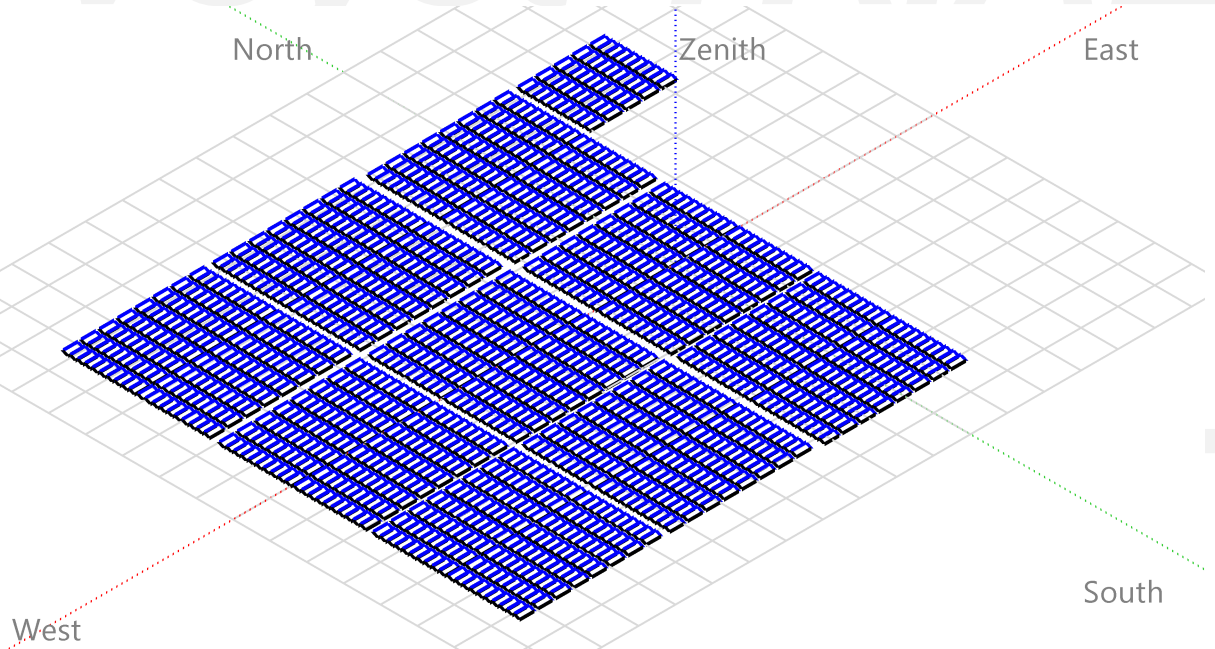
Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 25°/ 0°

- Shading loss: 1%
- Shading loss: 5%
- Shading loss: 10%
- Shading loss: 20%
- Shading loss: 40%

**Attenuation for diffuse: 0.091
and albedo: 0.823**

1: 22 June
2: 22 May and 23 July
3: 20 Apr and 23 Aug
4: 20 Mar and 23 Sep
5: 21 Feb and 23 Oct
6: 19 Jan and 22 Nov
7: 22 December

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Main results

System Production

Produced Energy	15964610 kWh/year	Specific production	1596 kWh/kWp/year
		Perf. Ratio PR	80.04 %

Normalized productions (per installed kWp)

Lc: Collection Loss (PV-array losses)   1 kWh/kWp/day
Ls: System Loss (inverter, ...)   0.09 kWh/kWp/day
Yf: Produced useful energy (inverter output)   4.37 kWh/kWp/day

Performance Ratio PR

PR: Performance Ratio (Yf / Yr) : 0.800
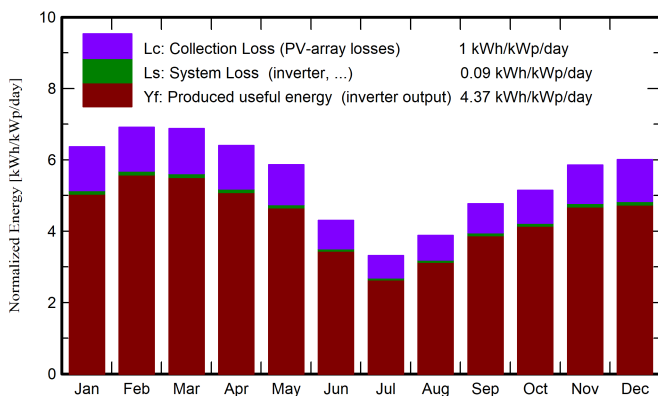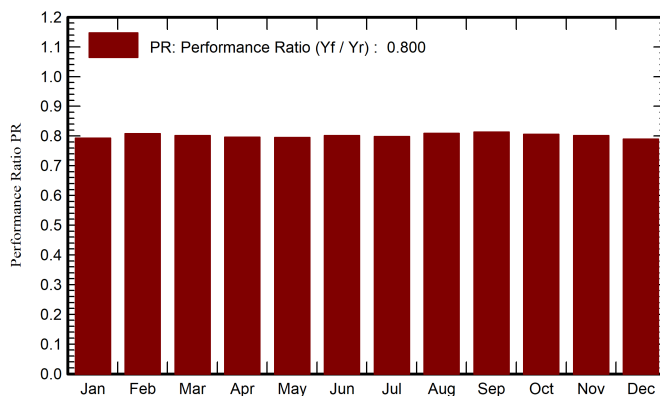
Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m²	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	ratio
January	155.5	45.18	20.37	197.4	179.9	1596006	1564745	0.793
February	163.3	47.55	23.20	193.6	181.9	1594556	1563538	0.807
March	199.3	64.24	26.82	213.3	201.3	1743647	1709973	0.802
April	198.7	72.98	29.30	192.1	180.5	1557690	1527954	0.796
May	202.4	82.76	29.73	181.7	169.2	1471574	1444200	0.795
June	146.6	81.46	25.84	128.9	117.8	1053880	1033968	0.802
July	114.4	82.98	24.59	102.8	92.2	836046	820047	0.798
August	129.3	84.14	23.81	120.2	109.2	991315	972341	0.809
September	140.9	68.96	23.88	143.1	132.8	1187236	1163916	0.813
October	144.2	66.81	24.43	159.6	148.3	1311367	1286280	0.806
November	143.0	49.45	22.18	175.6	161.9	1435374	1407373	0.801
December	143.6	42.54	20.36	186.2	168.0	1499761	1470274	0.790
Year	1881.1	789.05	24.54	1994.5	1842.8	16278451	15964610	0.800

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			

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Loss diagram
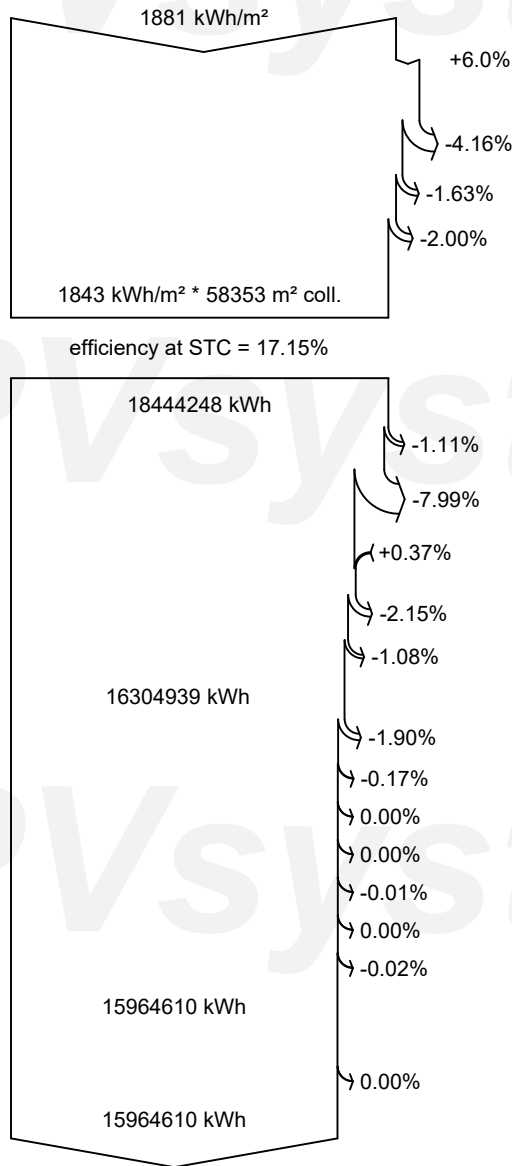
1881 kWh/m²	**Global horizontal irradiation**
+6.0%	**Global incident in coll. plane**
-4.16%	Near Shadings: irradiance loss
-1.63%	IAM factor on global
-2.00%	Soiling loss factor
1843 kWh/m² * 58353 m² coll.	**Effective irradiation on collectors**
efficiency at STC = 17.15%	PV conversion
18444248 kWh	**Array nominal energy (at STC effic.)**
-1.11%	PV loss due to irradiance level
-7.99%	PV loss due to temperature
+0.37%	Module quality loss
-2.15%	Mismatch loss, modules and strings
-1.08%	Ohmic wiring loss
16304939 kWh	**Array virtual energy at MPP**
-1.90%	Inverter Loss during operation (efficiency)
-0.17%	Inverter Loss over nominal inv. power
0.00%	Inverter Loss due to max. input current
0.00%	Inverter Loss over nominal inv. voltage
-0.01%	Inverter Loss due to power threshold
0.00%	Inverter Loss due to voltage threshold
-0.02%	Night consumption
15964610 kWh	**Available Energy at Inverter Output**
0.00%	Auxiliaries (fans, other)
15964610 kWh	**Energy injected into grid**

Predef. graphs

Daily Input/Output diagram
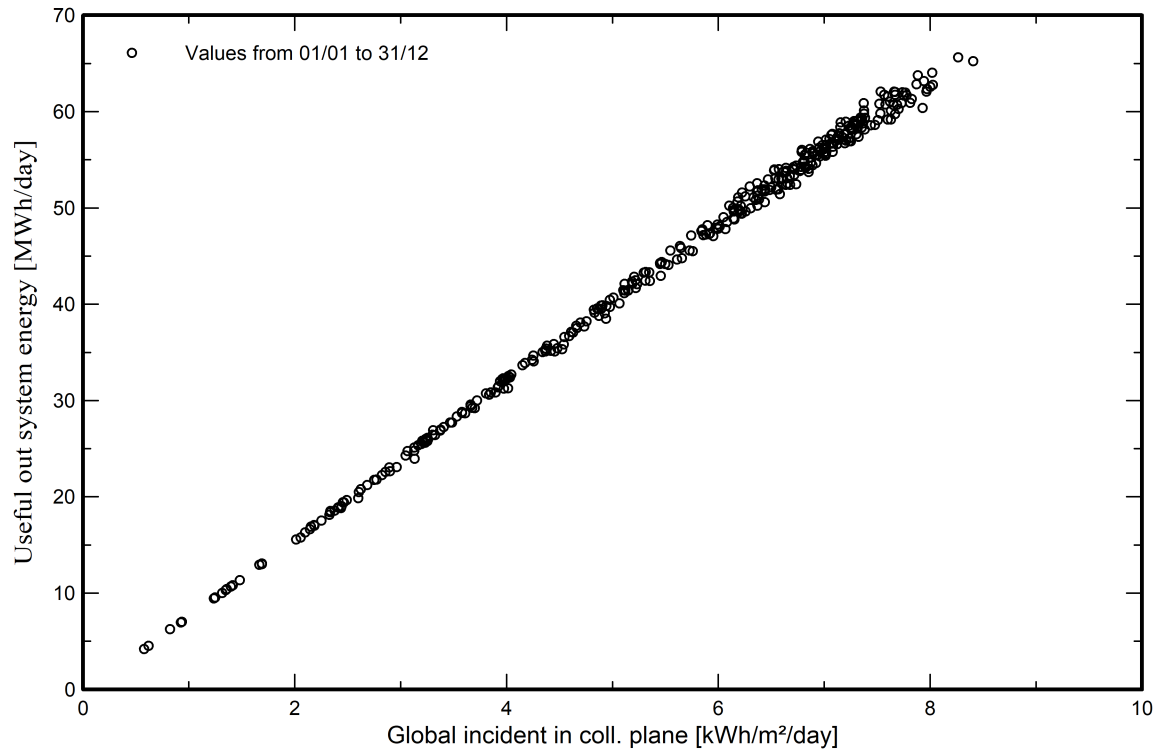
System Output Power Distribution
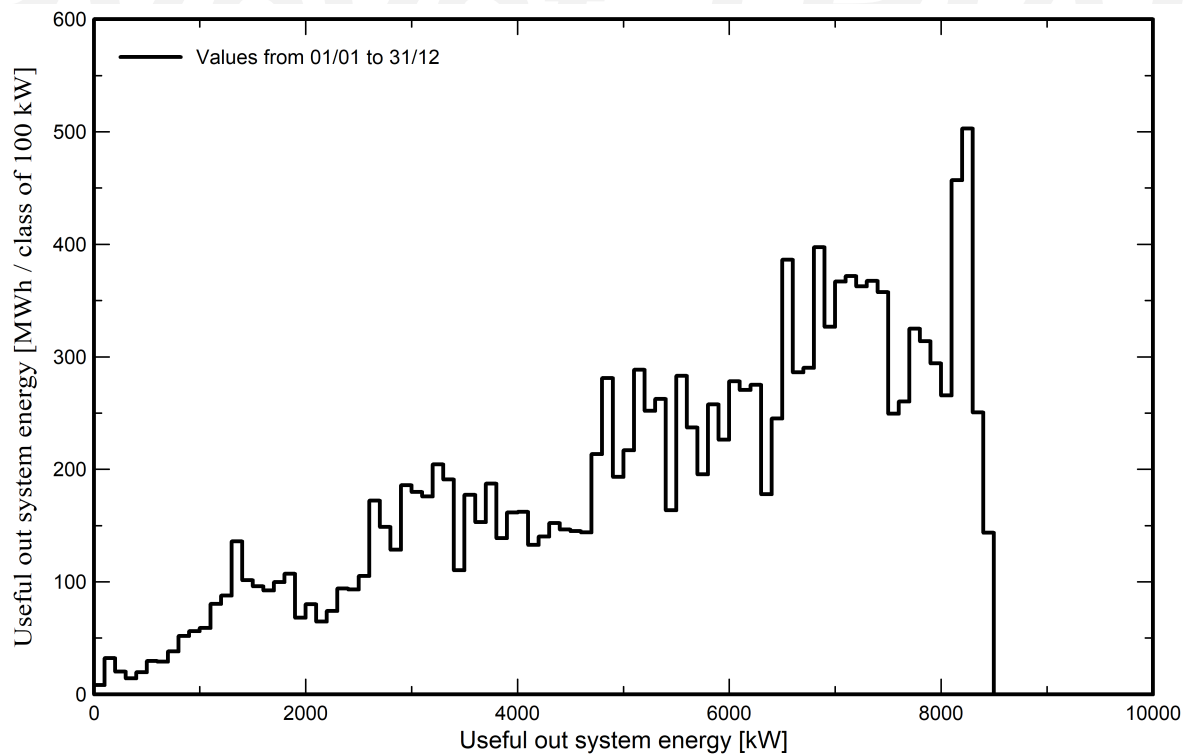
Single-line diagram

18 x CS3U-340P-AG 1500V
10 Strings

60 Inverter (3000 kVA)

18 x CS3U-340P-AG 1500V
11 Strings

94 Inverter (4700 kVA)

kWh

Injection point
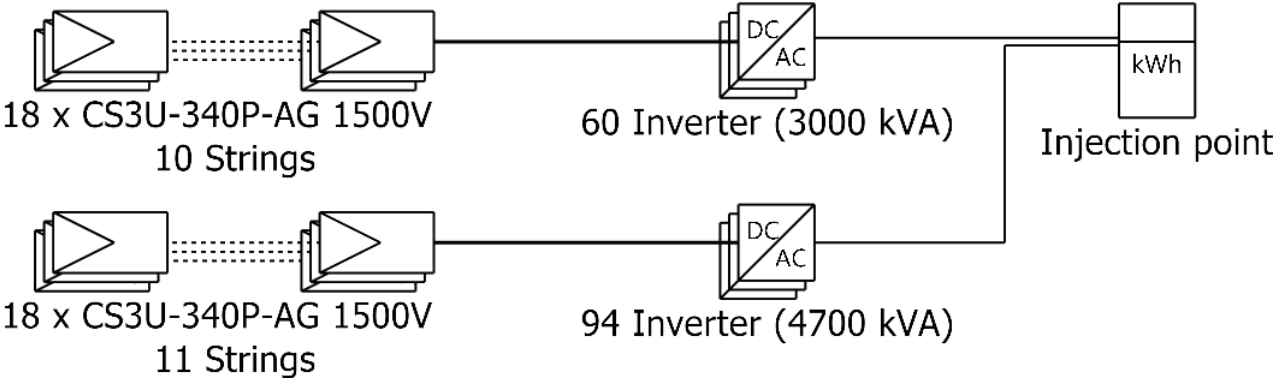
PV module	CS3U-340P-AG 1500V
Inverter	SG50CX-P2
String	18 x CS3U-340P-AG 1500V

10 MW solar project	
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