

PVsyst - Simulation report

Grid-Connected System

Project: Kopellis_ 2 Axis

Variant: 114 kW pitch 10m ns individual

Trackers single array

System power: 114 kWp

Thessaloniki/Livadákion - Greece

**PVsyst V7.2.16**

VC2, Simulation date:
15/07/22 00:17
with v7.2.16

Project summary**Geographical Site**

Thessaloniki/Livadákion
Greece

Situation

Latitude 40.52 °N
Longitude 22.97 °E
Altitude 4 m
Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Thessaloniki/Livadákion
Meteonorm 8.0 (1994-2006), Sat=14% - Synthetic

System summary**Grid-Connected System****PV Field Orientation****Orientation**

Tracking two axis, frame E-W

Trackers single array**Tracking algorithm**

Astronomic calculation

Near Shadings

Linear shadings

System information**PV Array**

Nb. of modules 216 units
Pnom total 114 kWp

Inverters

Nb. of units 1 unit
Pnom total 111 kWac
Pnom ratio 1.031

User's needs

Unlimited load (grid)

Results summary

Produced Energy 226.0 MWh/year Specific production 1974 kWh/kWp/year Perf. Ratio PR 84.18 %

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General parameters**Grid-Connected System****Trackers single array****PV Field Orientation****Orientation**

Tracking two axis, frame E-W

Tracking algorithm

Astronomic calculation

Trackers configuration

Nb. of trackers 108 units

Single array

Sizes

Tracker Spacing 10.00 m

Collector width 4.57 m

Ground Cov. Ratio (GCR) 45.7 %

Phi on frame min / max 0.0 / 80.0 °

Frame tilt min./ max -/+ 60.0 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 7.4 °

Near Shadings

Linear shadings

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer Generic
Model JKM-530M-72HL4-V
(Custom parameters definition)

Unit Nom. Power 530 Wp
Number of PV modules 216 units
Nominal (STC) 114 kWp
Modules 8 Strings x 27 In series

At operating cond. (50°C)

Pmpp 104 kWp
U mpp 1002 V
I mpp 104 A

Total PV power

Nominal (STC) 114 kWp
Total 216 modules
Module area 557 m²

Inverter

Manufacturer Generic
Model SG111-HV
(Original PVsyst database)

Unit Nom. Power 111 kWac
Number of inverters 1 unit
Total power 111 kWac
Operating voltage 780-1450 V
Pnom ratio (DC:AC) 1.03

Total inverter power

Total power 111 kWac
Number of inverters 1 unit
Pnom ratio 1.03

Array losses**Array Soiling Losses**

Loss Fraction 1.5 %

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. 106 mΩ
Loss Fraction 1.0 % at STC

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction 0.6 % 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



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System losses

Auxiliaries loss

Proportionnal to Power 4.0 W/kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 540 Vac tri
Loss Fraction 0.21 % at STC

Inverter: SG111-HV

Wire section (1 Inv.) Copper 1 x 3 x 240 mm²
Wires length 70 m

AC losses in transformers

MV transfo

Grid voltage 20 kV

Operating losses at STC

Nominal power at STC 113 kVA
Iron loss (24/24 Connexion) 0.11 kW
Loss Fraction 0.10 % at STC
Coils equivalent resistance 3 x 25.76 mΩ
Loss Fraction 1.00 % at STC



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Horizon definition

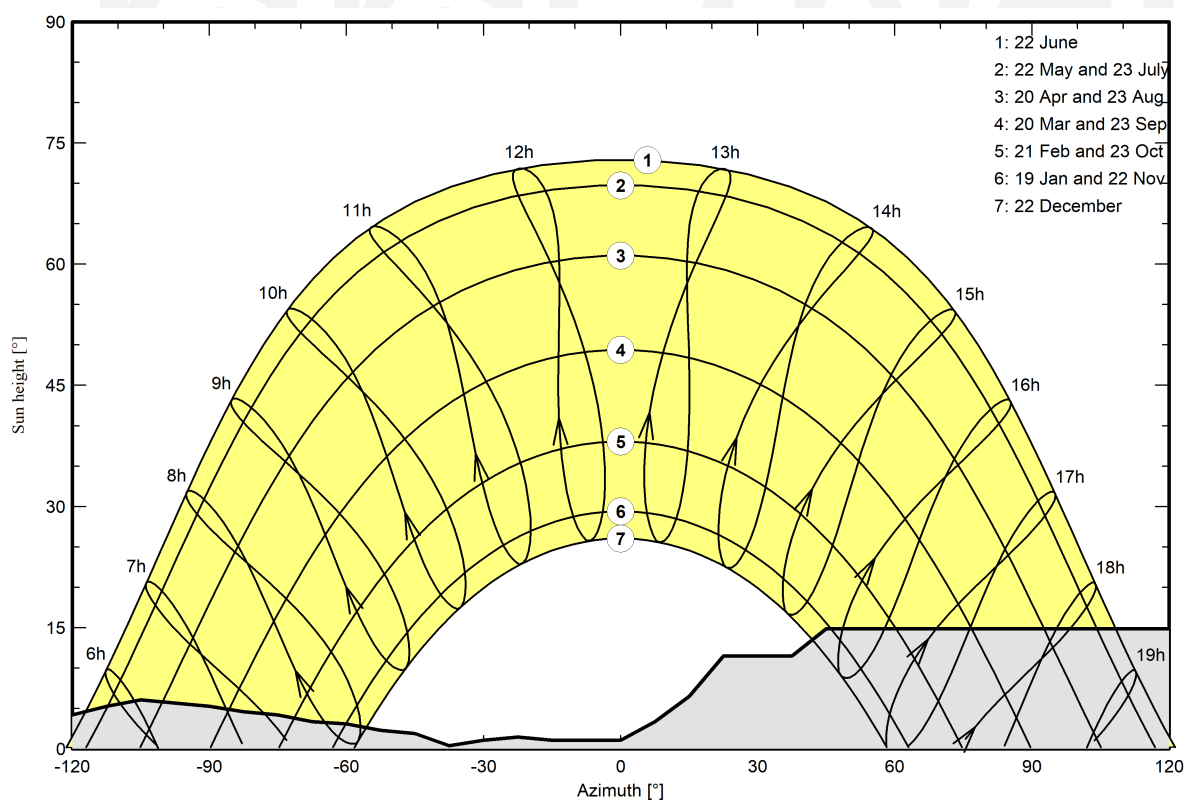
Horizon from PVGIS website API, Lat=39°37'58", Long=22°13'41", Alt=153m

Average Height	7.4 °	Albedo Factor	0.38
Diffuse Factor	0.75	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-128	-120	-113	-105	-98	-90
Height [°]	1.9	3.4	4.6	5.7	7.3	6.5	4.6	4.2	5.3	6.1	5.7	5.3
Azimuth [°]	-83	-75	-68	-60	-53	-45	-38	-30	-23	-15	0	8
Height [°]	4.6	4.2	3.4	3.1	2.3	1.9	0.4	1.1	1.5	1.1	1.1	3.4
Azimuth [°]	15	23	38	45	135	143	150	158	165	173	180	
Height [°]	6.5	11.5	11.5	14.9	14.9	8.0	8.0	5.3	1.9	1.5	1.9	

Sun Paths (Height / Azimuth diagram)



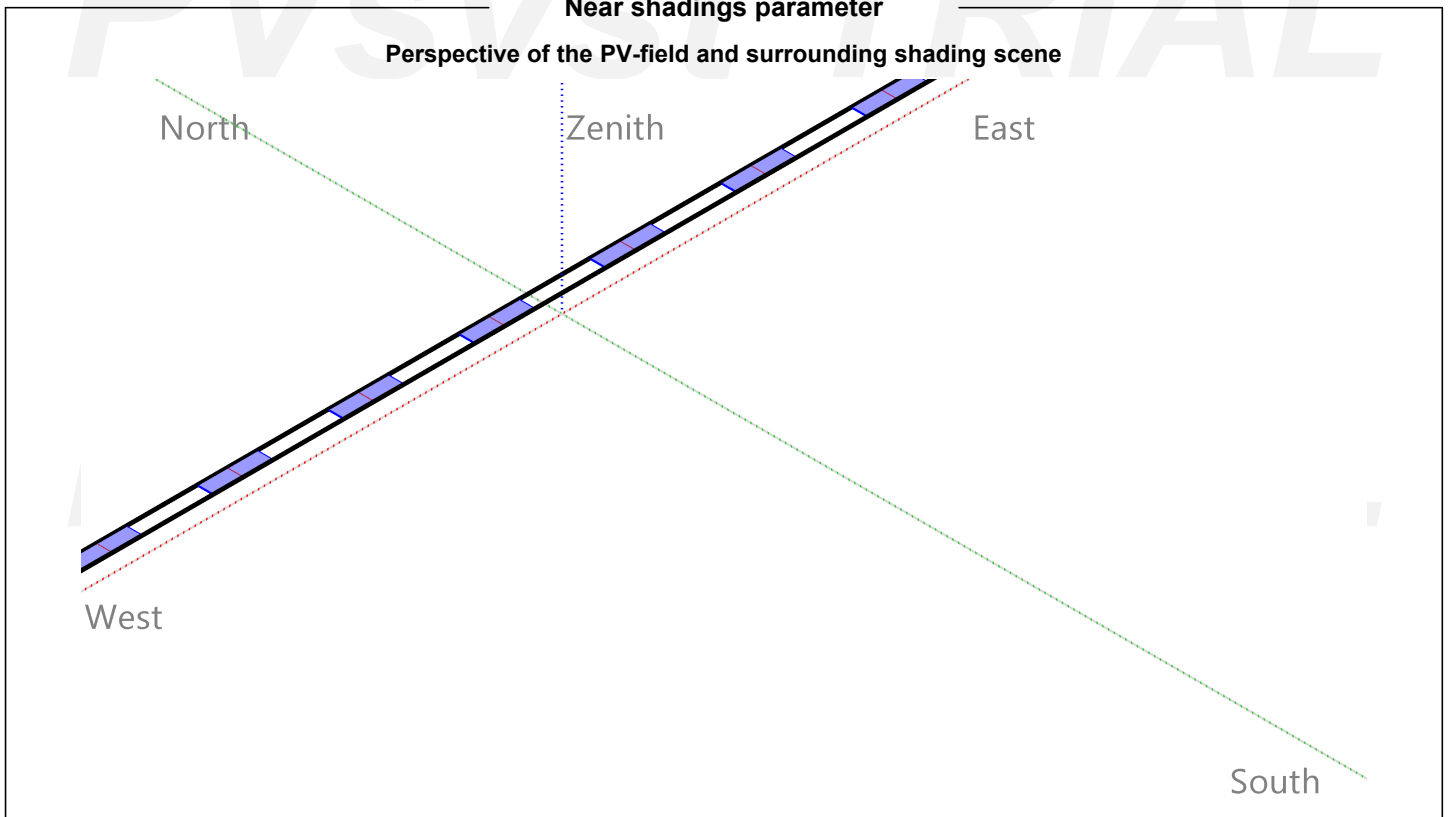


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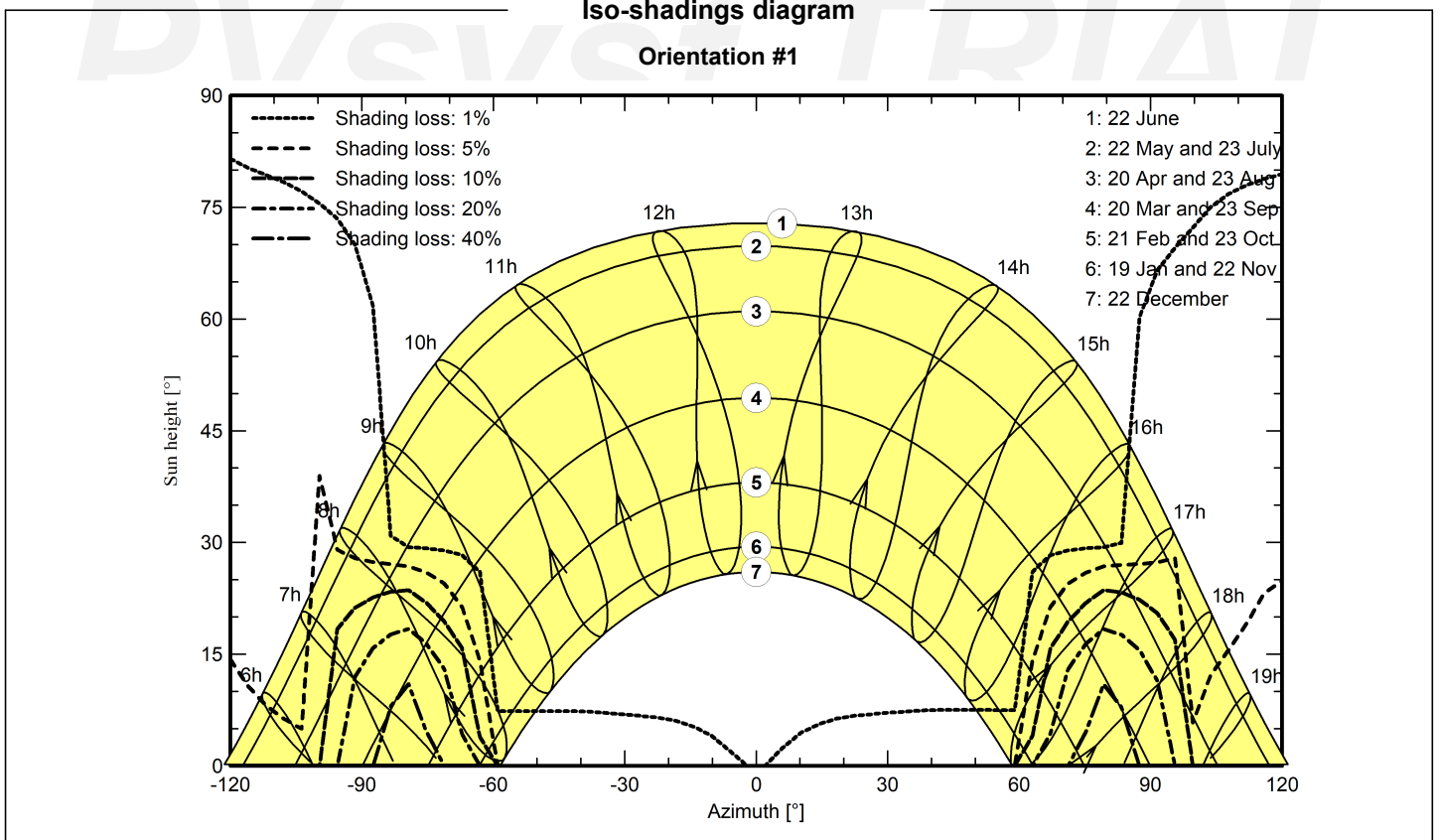
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





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Main results

System Production

Produced Energy

226.0 MWh/year

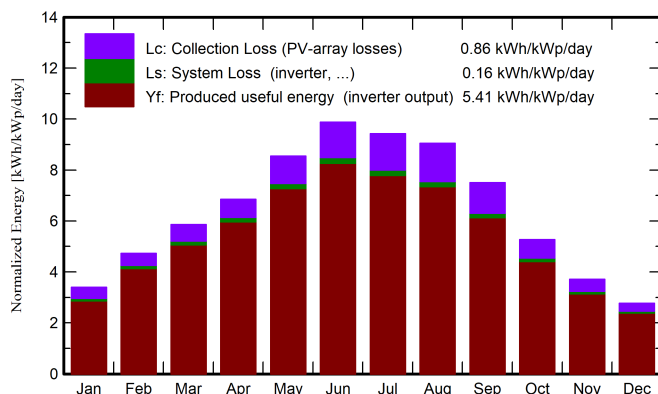
Specific production

1974 kWh/kWp/year

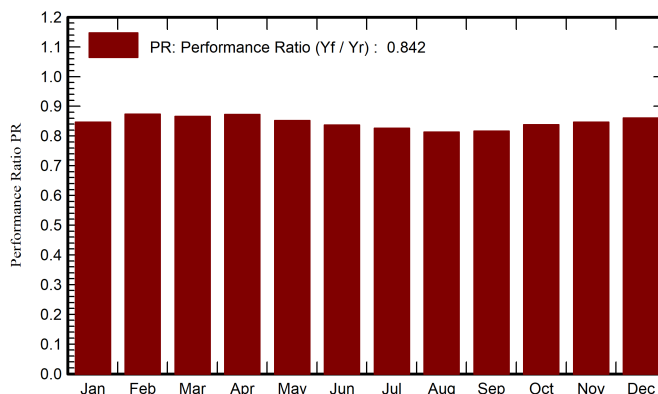
Performance Ratio PR

84.18 %

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	52.6	29.21	4.95	105.2	93.2	10.54	10.20	0.847
February	76.4	39.36	6.71	132.5	121.7	13.65	13.25	0.874
March	118.0	57.36	9.91	181.6	167.7	18.53	18.01	0.866
April	150.3	77.02	13.73	205.5	193.6	21.11	20.53	0.872
May	195.0	84.41	19.52	264.8	250.1	26.56	25.84	0.852
June	218.4	75.24	24.54	296.2	281.9	29.19	28.39	0.837
July	214.7	82.15	27.83	292.4	277.3	28.41	27.64	0.826
August	194.0	76.29	27.71	280.5	261.4	26.83	26.11	0.813
September	144.2	53.93	21.67	225.2	206.6	21.66	21.05	0.816
October	94.1	43.87	16.53	163.3	149.4	16.14	15.67	0.838
November	57.9	29.79	11.46	111.4	101.2	11.15	10.79	0.847
December	43.4	24.96	6.66	86.0	78.0	8.77	8.47	0.861
Year	1559.1	673.58	15.99	2344.5	2182.0	232.54	225.95	0.842

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

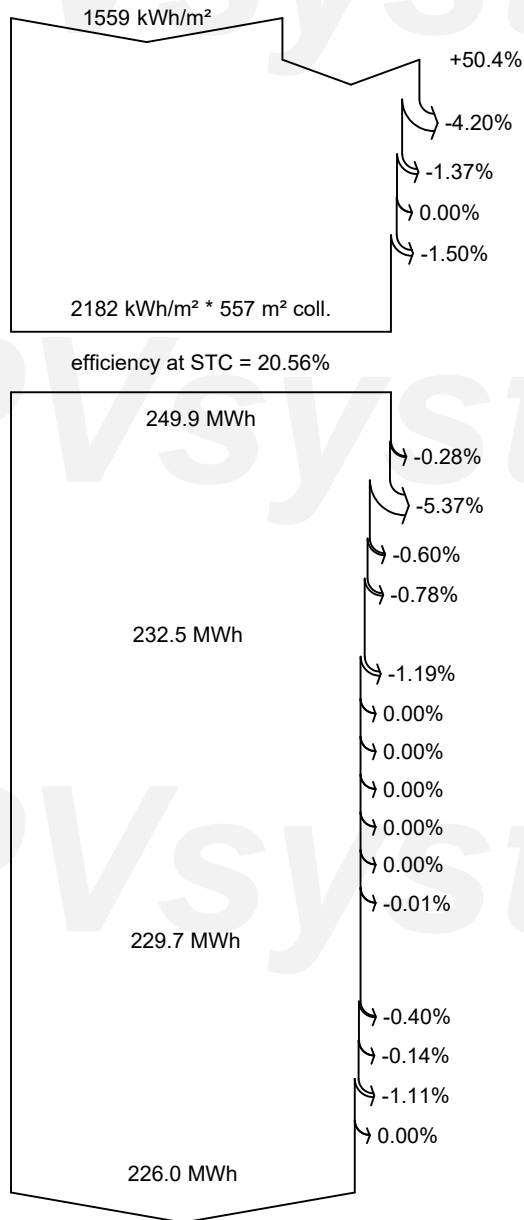
PR Performance Ratio



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module array mismatch loss

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)

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid

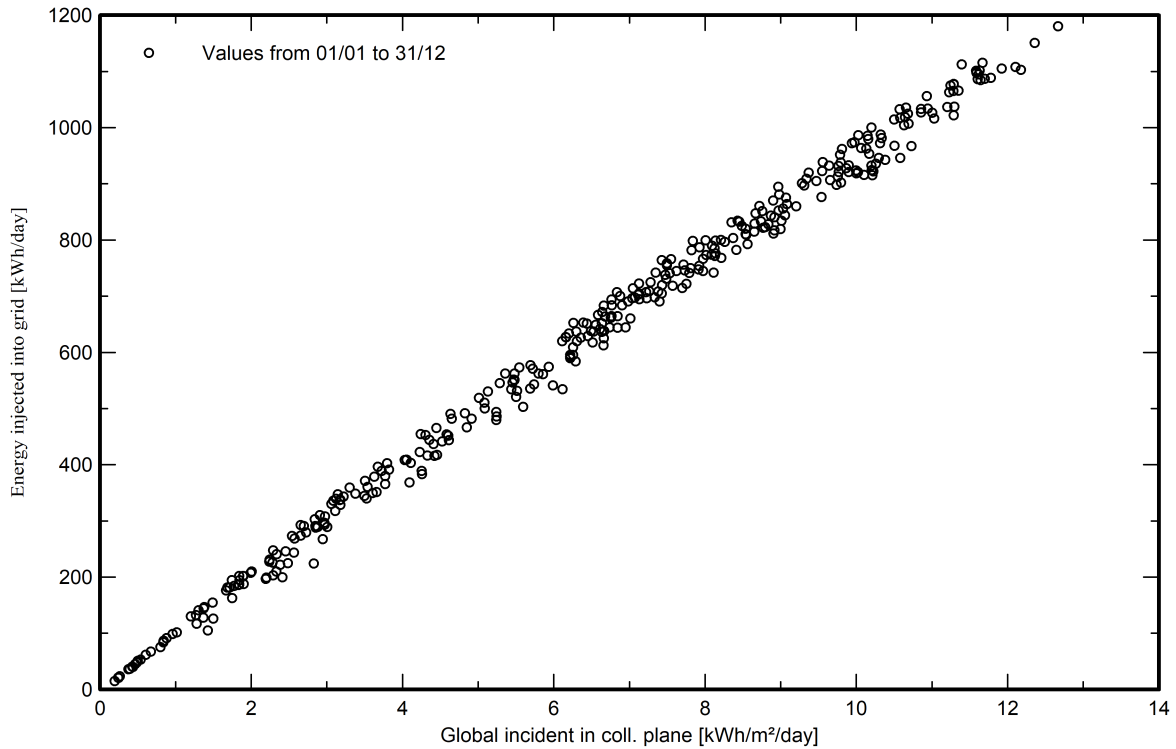


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Special graphs

Daily Input/Output diagram



System Output Power Distribution

