Version 7.2.15

PVsyst - Simulation report

Grid-Connected System

Project: Kopellis_ 1 Axis

Variant: 114 kW 1 axis

Trackers single array, with backtracking

System power: 114 kWp

Thessaloniki/Livadákion - Greece

Author

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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

Trackers single array, with backtracking

PV Field Orientation
Orientation
Tracking plane, horizontal E-W axis
Normal azimuth to axis 0 °

Tracking algorithm
Astronomic calculation
Backtracking activated

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	178.1 MWh/year	Specific production	1556 kWh/kWp/year	Perf. Ratio PR	86.69 %

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General parameters

Grid-Connected System — **Trackers single array, with backtracking**

PV Field Orientation

Orientation
Tracking plane, horizontal E-W axis
Normal azimuth to axis 0 °

Tracking algorithm
Astronomic calculation
Backtracking activated

Backtracking array
Nb. of trackers 4 units
Single array

Sizes
Tracker Spacing 8.00 m
Collector width 4.57 m
Ground Cov. Ratio (GCR) 57.1 %
Tilt min / max. 20.0 / 50.0 °

Backtracking strategy
Phi limits +/- 55.1 °
Backtracking pitch 8.00 m
Backtracking width 4.57 m

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 JKM530M-72HL4-BDVP
(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 105 kWp
U mpp 995 V
I mpp 105 A

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 PV power
Nominal (STC) 114 kWp
Total 216 modules
Module area 557 m²
Cell area 514 m²

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. 104 mΩ
Loss Fraction 1.0 % at STC

Module Quality Loss
Loss Fraction 0.0 %

Module mismatch losses
Loss Fraction 0.6 % at MPP

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Array losses

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.989	0.967	0.924	0.729	0.000

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

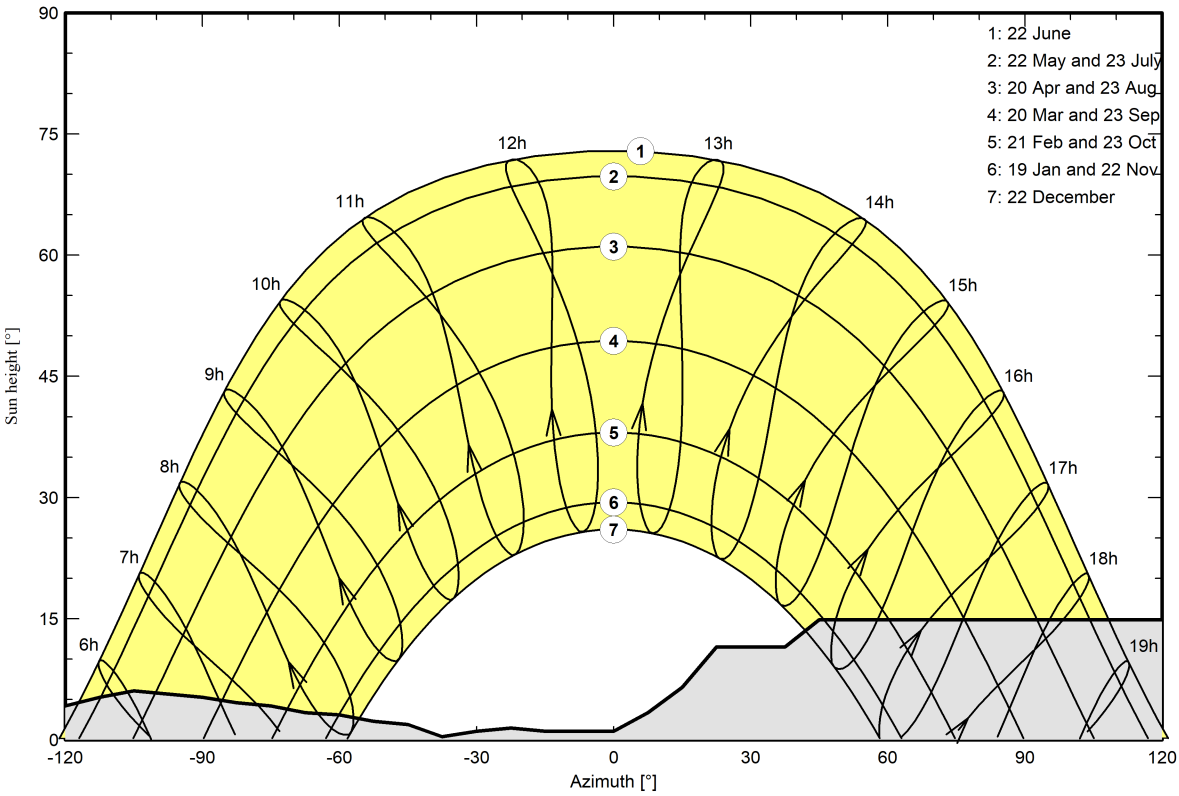
Horizon from PVGIS website API, Lat=39°37"58', Long=22°13"41', Alt=153m

Average Height	7.4 °	Albedo Factor	0.72
Diffuse Factor	0.93	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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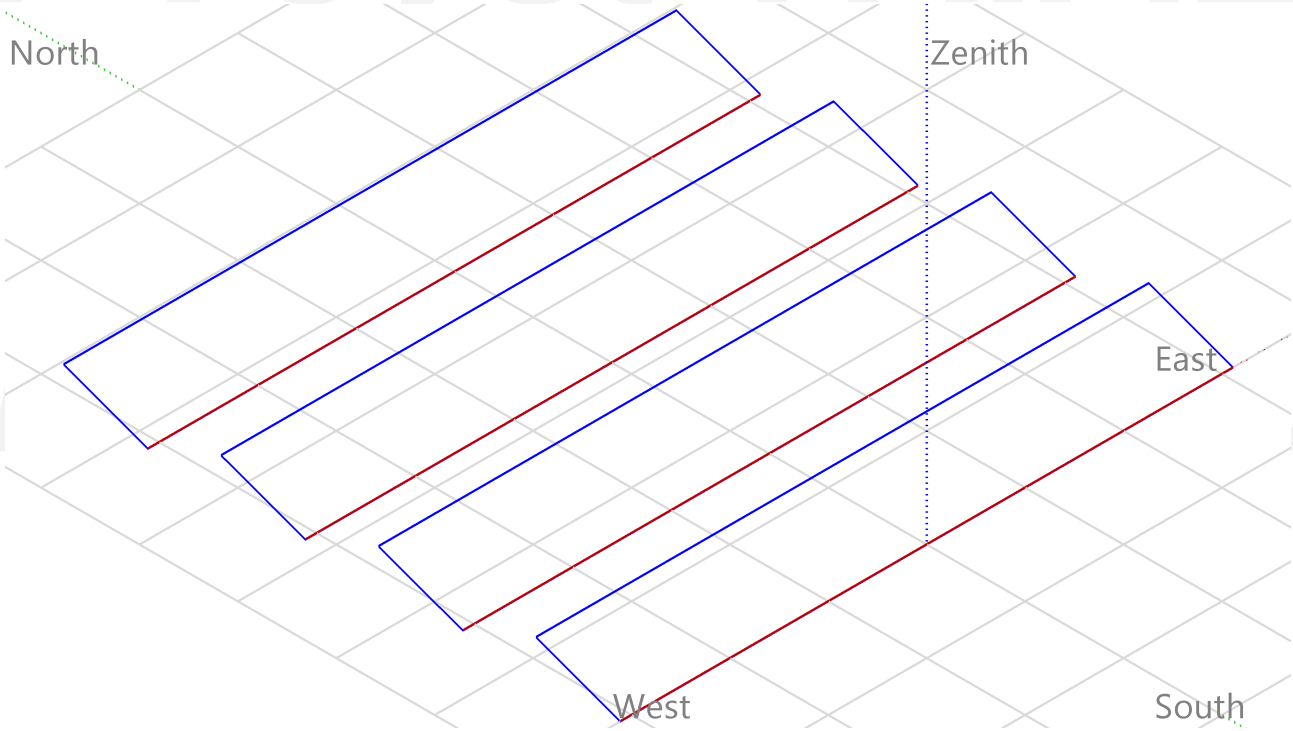
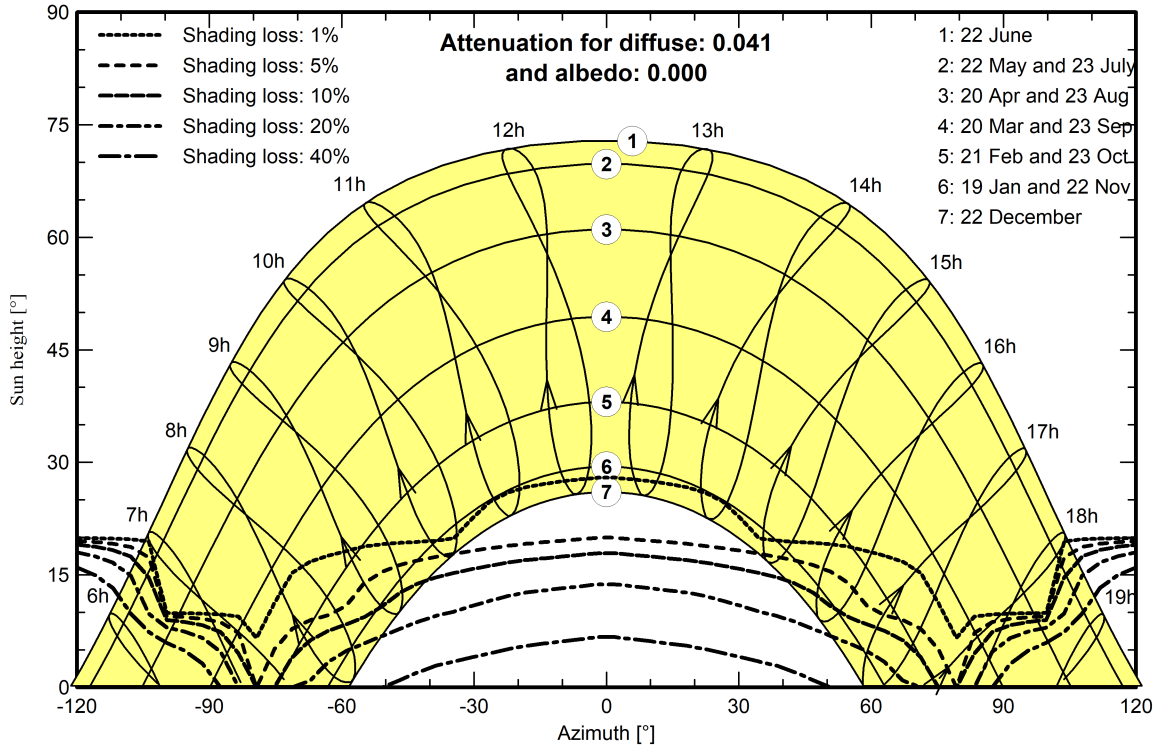
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1



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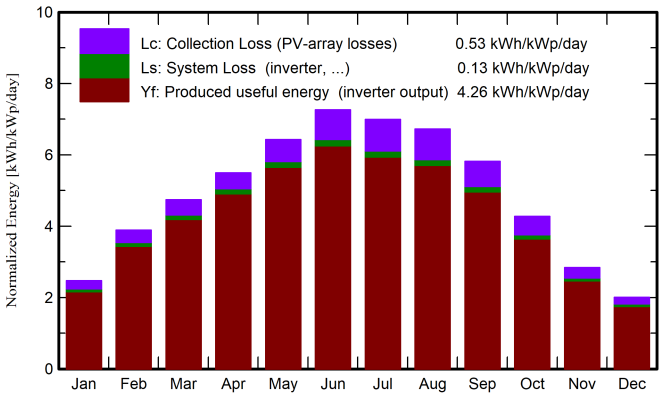
Main results

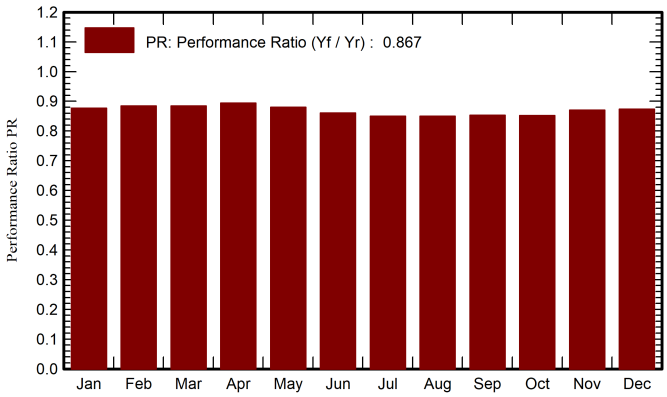
System Production

Produced Energy	178.1 MWh/year	Specific production	1556 kWh/kWp/year
		Performance Ratio PR	86.69 %

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 MWh	E_Grid MWh	PR ratio
January	52.6	29.21	4.95	76.7	68.8	7.97	7.70	0.877
February	76.4	39.36	6.71	109.0	99.8	11.38	11.03	0.884
March	118.0	57.36	9.91	146.9	136.3	15.32	14.87	0.884
April	150.3	77.02	13.73	164.8	156.4	17.35	16.86	0.894
May	195.0	84.41	19.52	199.3	191.3	20.66	20.09	0.880
June	218.4	75.24	24.54	218.0	209.8	22.09	21.48	0.861
July	214.7	82.15	27.83	216.8	208.2	21.68	21.08	0.850
August	194.0	76.29	27.71	208.4	199.8	20.84	20.27	0.850
September	144.2	53.93	21.67	174.7	164.4	17.56	17.06	0.853
October	94.1	43.87	16.53	132.6	121.5	13.35	12.94	0.852
November	57.9	29.79	11.46	85.2	77.9	8.78	8.49	0.871
December	43.4	24.96	6.66	62.3	56.0	6.47	6.23	0.873
Year	1559.1	673.58	15.99	1794.7	1690.3	183.45	178.10	0.867

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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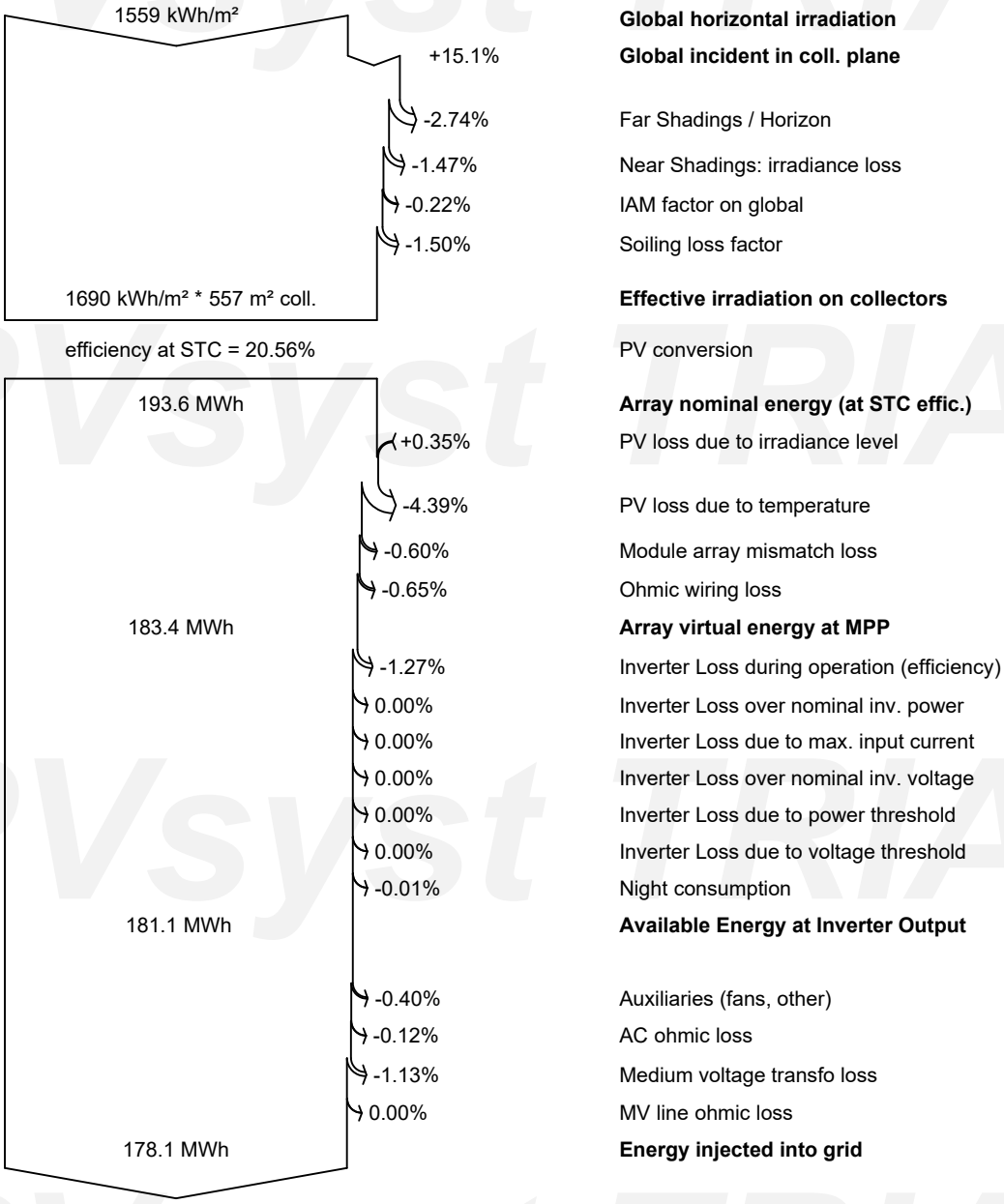
Loss diagram



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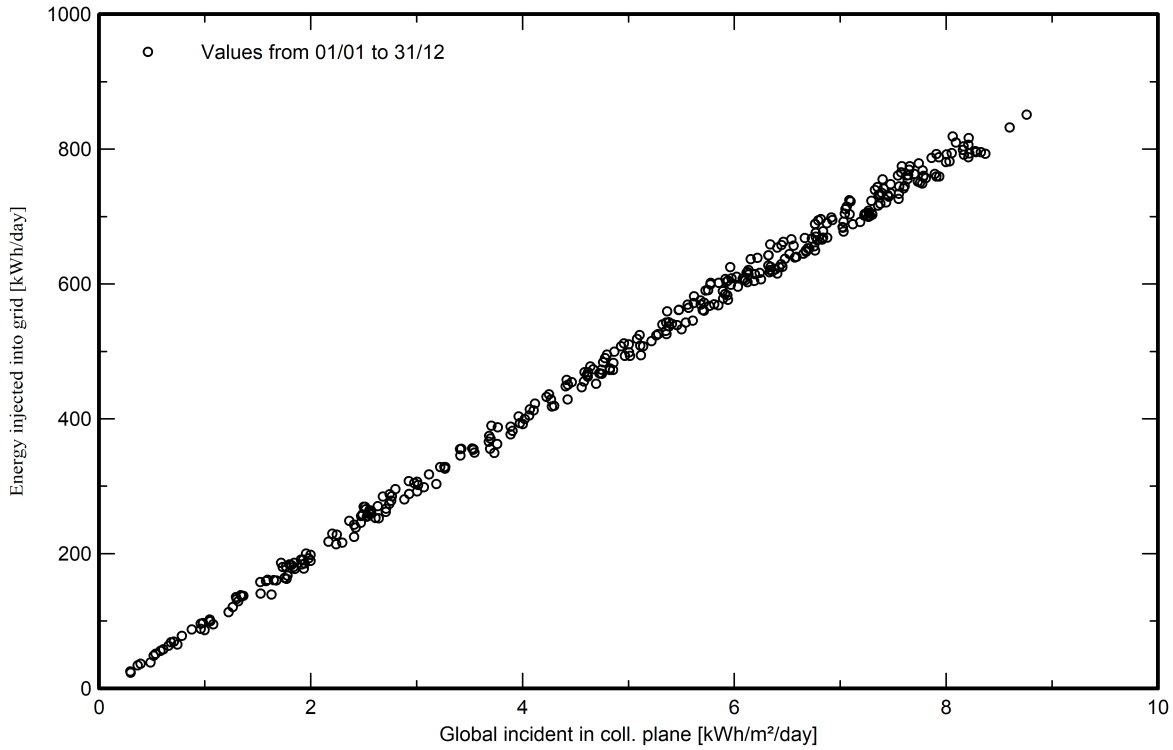
Special graphs

Daily Input/Output diagram



System Output Power Distribution