Version 7.2.16

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

PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
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
Trackers single array, with backtracking

PV Field Orientation
Orientation
Tracking plane, horizontal N-S axis
Axis azimuth 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	199.9 MWh/year	Specific production	1746 kWh/kWp/year	Perf. Ratio PR	82.95 %

Table of contents

PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
with v7.2.16

General parameters

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

PV Field Orientation

Orientation
Tracking plane, horizontal N-S axis
Axis azimuth 0 °

Tracking algorithm
Astronomic calculation
Backtracking activated

Backtracking array
Nb. of trackers 4 units
Single array

Sizes
Tracker Spacing 50.0 m
Collector width 4.57 m
Ground Cov. Ratio (GCR) 9.1 %
Phi min / max. -/+ 60.0 °

Backtracking strategy
Phi limits +/- 79.9 °
Backtracking pitch 50.0 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 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

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

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

PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
with v7.2.16

Array losses

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

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

PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
with v7.2.16

Horizon definition

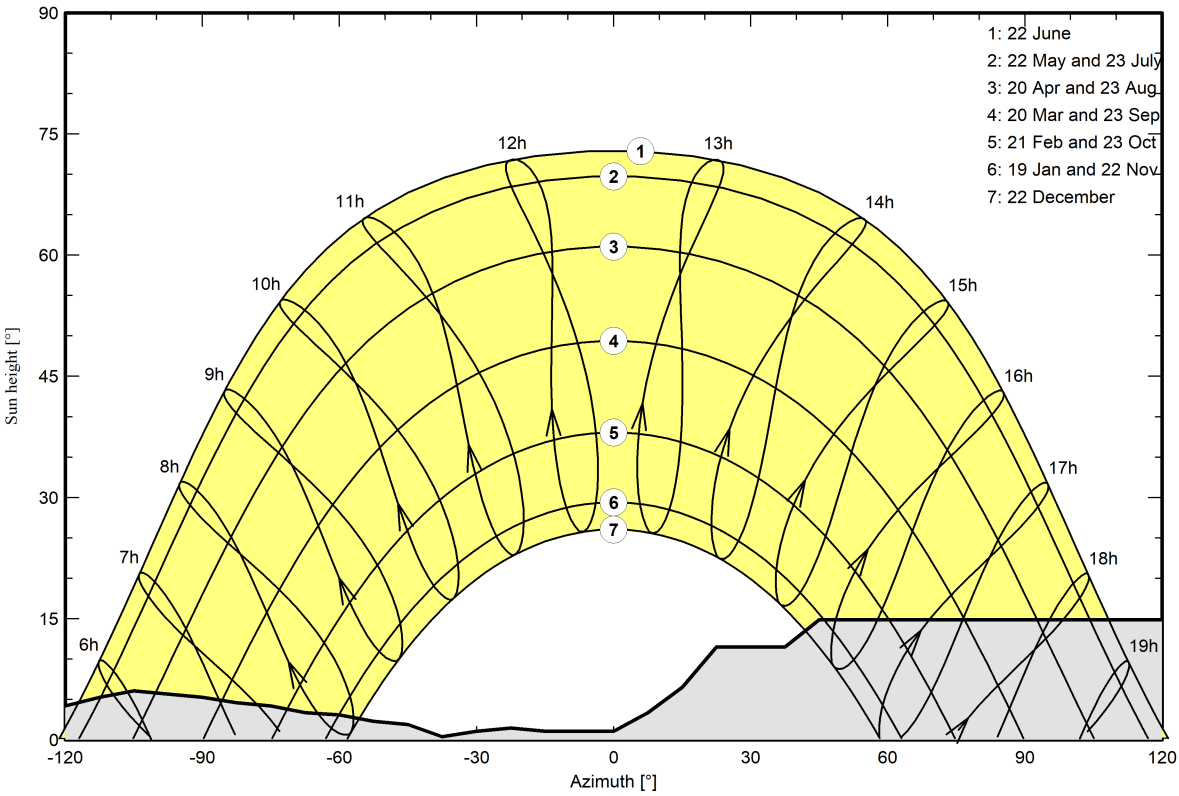
Horizon from PVGIS website API, Lat=39°37"58', Long=22°13"41', Alt=153m

Average Height	7.4 °	Albedo Factor	0.31
Diffuse Factor	0.82	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	

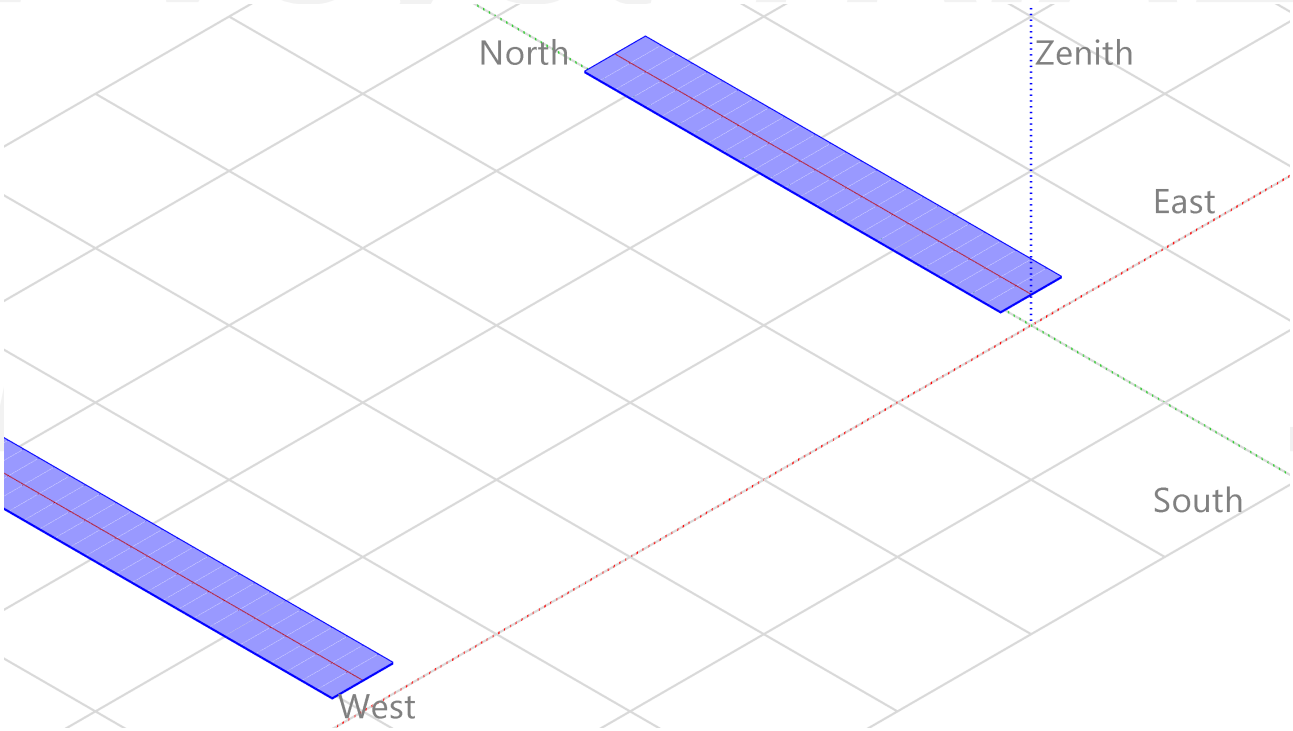
Sun Paths (Height / Azimuth diagram)



PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
with v7.2.16

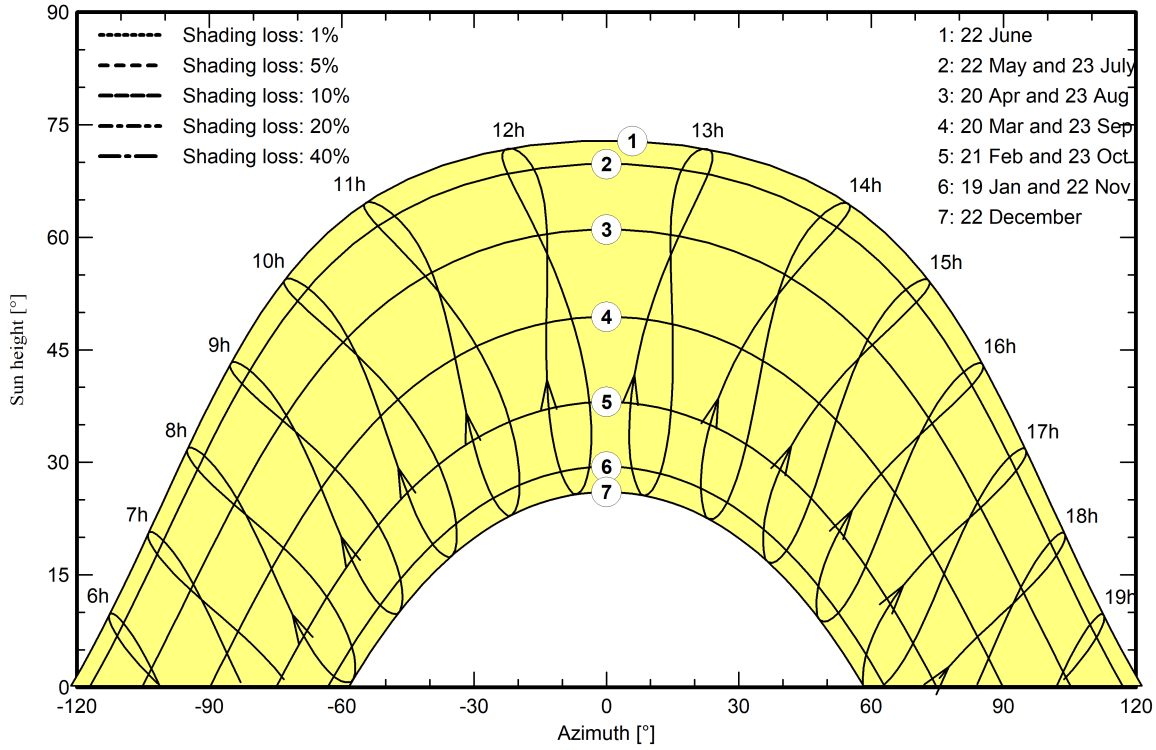
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1



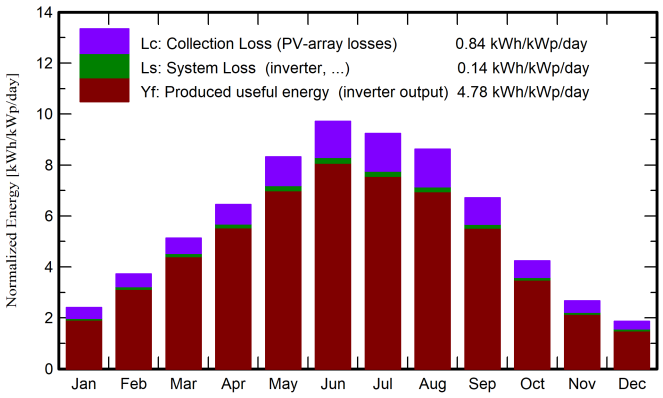
PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
with v7.2.16

Main results

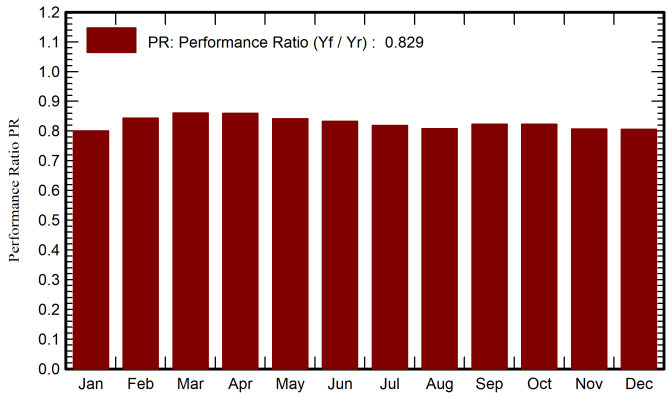
System Production

Produced Energy	199.9 MWh/year	Specific production	1746 kWh/kWp/year
		Performance Ratio PR	82.95 %

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	74.5	61.7	7.08	6.83	0.800
February	76.4	39.36	6.71	104.2	91.1	10.36	10.05	0.843
March	118.0	57.36	9.91	158.9	144.0	16.10	15.65	0.861
April	150.3	77.02	13.73	193.3	178.1	19.57	19.03	0.860
May	195.0	84.41	19.52	258.1	239.7	25.56	24.87	0.842
June	218.4	75.24	24.54	291.3	274.7	28.53	27.75	0.832
July	214.7	82.15	27.83	286.3	268.3	27.58	26.85	0.819
August	194.0	76.29	27.71	267.4	245.8	25.40	24.73	0.808
September	144.2	53.93	21.67	201.5	183.8	19.52	18.98	0.823
October	94.1	43.87	16.53	131.5	116.2	12.77	12.39	0.823
November	57.9	29.79	11.46	80.1	68.4	7.66	7.39	0.807
December	43.4	24.96	6.66	58.0	48.9	5.57	5.34	0.806
Year	1559.1	673.58	15.99	2104.9	1920.9	205.71	199.87	0.829

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

PVsyst V7.2.16
VC0, Simulation date:
15/07/22 00:38
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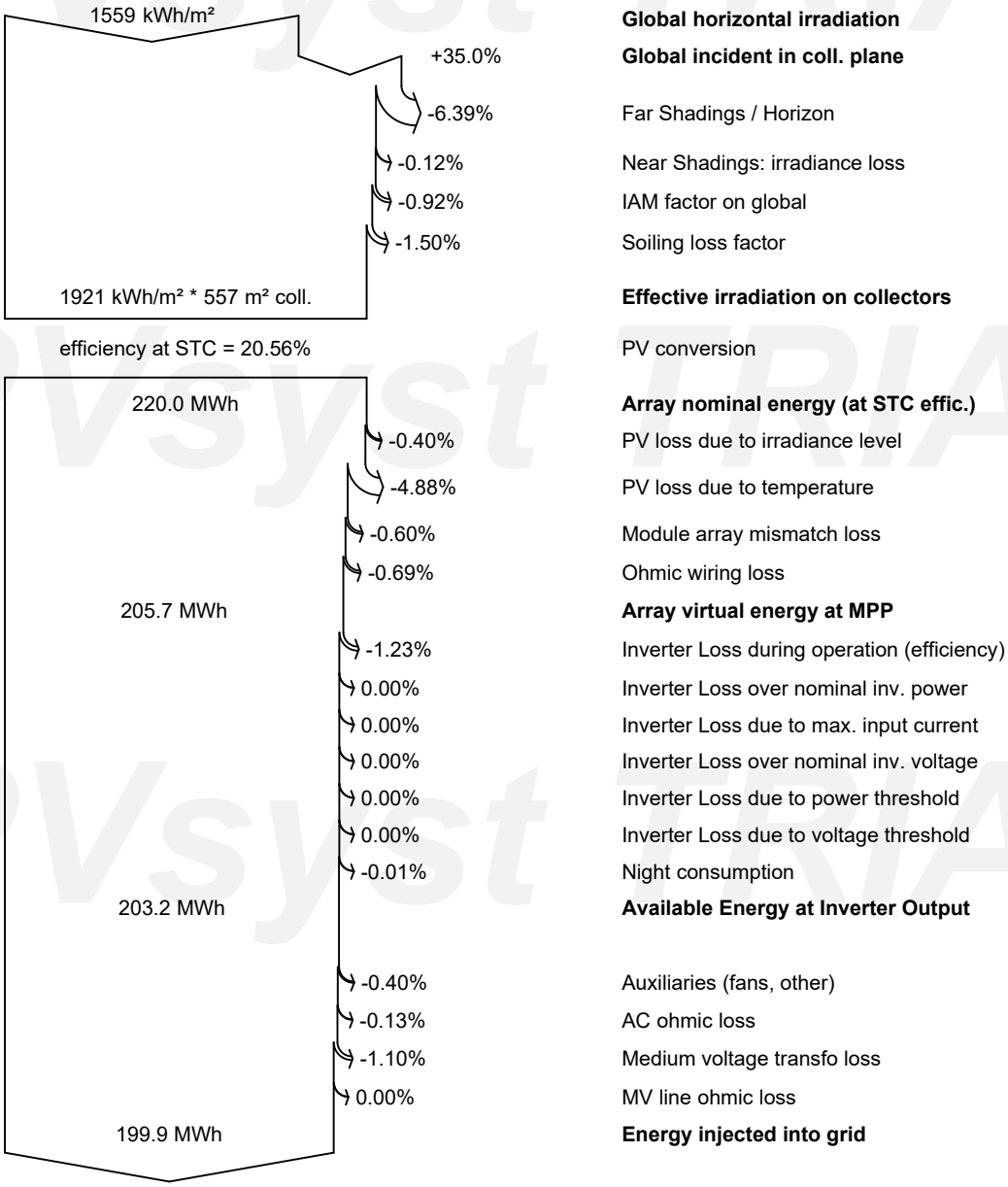
Loss diagram



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VC0, Simulation date:
15/07/22 00:38
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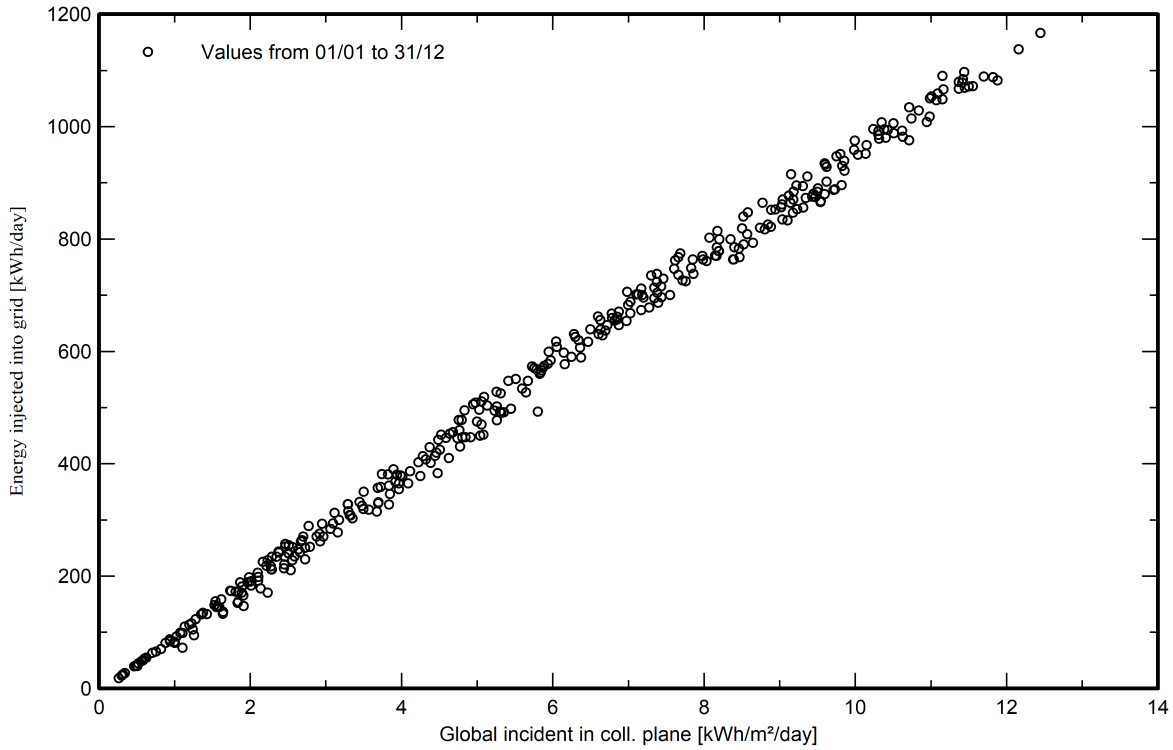
Special graphs

Daily Input/Output diagram



System Output Power Distribution