



COMUNE DI GROTTOLE
PROVINCIA DI MATERA
REGIONE BASILICATA

**PROGETTO DEFINITIVO DI UN IMPIANTO AGRI-FOTOVOLTAICO DI
 POTENZA DI PICCO P=15'146,04 kWp CON SISTEMA DI
 ACCUMULO PER UNA POTENZA IN IMMISSIONE COMPLESSIVA
 PARI A P=19'999,80 kW**

Proponente

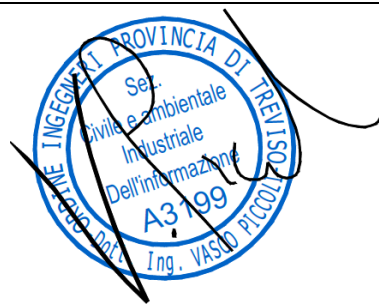
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Progettazione



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PROGETTAZIONE DEFINITIVA

Titolo elaborato

**IMPIANTO FOTOVOLTAICO "GROTTOLE MATINA"
 STIMA PRODUCIBILITÀ IMPIANTO FV**

Elaborato N.

A.16

Data emissione

29/11/21

Nome file

PVSystem REPORT

N. Progetto

SOL019a

Pagina

COVER

00

REV.

29/11/21

DATA

PRIMA EMISSIONE

DESCRIZIONE

PVsyst - Simulation report

Grid-Connected System

Project: SOL 019 - Grottole A

Variant: Layout rev.0

Trackers single array, with backtracking

System power: 15.00 MWp

Borgo Picciano B - Italy

Author

New Engineering s.r.l. (Italy)



PVsyst V7.2.6

VC0, Simulation date:
04/11/21 14:56
with v7.2.6

New Engineering s.r.l. (Italy)

Project summary

Geographical Site Borgo Picciano B Italy	Situation Latitude 40.67 °N Longitude 16.41 °E Altitude 155 m Time zone UTC+1	Project settings Albedo 0.20
Meteo data Borgo Picciano B PVGIS-SARAH - 2016		

System summary

Grid-Connected System	Trackers single array, with backtracking		
PV Field Orientation Tracking plane, horizontal N-S axis Axis azimuth 0 °	Near Shadings According to strings Electrical effect 80 %	User's needs Unlimited load (grid)	
System information			
PV Array		Inverters	
Nb. of modules 26312 units		Nb. of units 54 units	
Pnom total 15.00 MWp		Pnom total 12.15 MWac	
		Pnom ratio 1.234	

Results summary

Produced Energy 27599 MWh/year	Specific production 1840 kWh/kWp/year	Perf. Ratio PR 87.23 %
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PVsyst V7.2.6

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General parameters

Grid-Connected System		Trackers single array, with backtracking	
PV Field Orientation		Backtracking strategy	
Orientation		Nb. of trackers	44 units
Tracking plane, horizontal N-S axis		Single array	
Axis azimuth	0 °	Sizes	
		Tracker Spacing	10.00 m
		Collector width	4.84 m
		Ground Cov. Ratio (GCR)	48.4 %
		Phi min / max.	-/+ 60.0 °
		Backtracking limit angle	
		Phi limits	+/- 60.9 °
Horizon		Near Shadings	
Average Height	4.2 °	According to strings	
		Electrical effect	80 %
Bifacial system		User's needs	
Model	2D Calculation	Unlimited load (grid)	
	unlimited trackers		
Bifacial model geometry		Bifacial model definitions	
Tracker Spacing	10.00 m	Ground albedo	0.20
Tracker width	4.84 m	Bifaciality factor	71 %
GCR	48.4 %	Rear shading factor	5.0 %
Axis height above ground	2.10 m	Rear mismatch loss	10.0 %
		Module transparency	0.0 %

PV Array Characteristics

PV module		Inverter	
Manufacturer	Jinkosolar	Manufacturer	Sungrow
Model	JKM570M-7RL4-TV	Model	SG250HX
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	570 Wp	Unit Nom. Power	225 kWac
Number of PV modules	26312 units	Number of inverters	54 units
Nominal (STC)	15.00 MWp	Total power	12150 kWac
Modules	1012 Strings x 26 In series	Operating voltage	600-1500 V
At operating cond. (50°C)		Max. power (=>30°C)	250 kWac
Pmpp	13.69 MWp	Pnom ratio (DC:AC)	1.23
U mpp	1043 V		
I mpp	13120 A		
Total PV power		Total inverter power	
Nominal (STC)	14998 kWp	Total power	12150 kWac
Total	26312 modules	Nb. of inverters	54 units
Module area	71939 m²	Pnom ratio	1.23
Cell area	67768 m²		

**PVsyst V7.2.6**

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Array losses**Array Soiling Losses**

Loss Fraction 2.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²KUv (wind) 0.0 W/m²K/m/s**DC wiring losses**

Global array res. 1.3 mΩ

Loss Fraction 1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 1.2 %

Module Quality Loss

Loss Fraction -0.6 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

Incidence effect (IAM): User defined profile

0°	32°	56°	60°	72°	75°	80°	84°	90°
1.000	1.000	1.000	0.999	0.970	0.963	0.930	0.870	0.000

System losses**Auxiliaries loss**

Proportionnal to Power 5.0 W/kW

0.0 kW from Power thresh.

AC wiring losses**Inv. output line up to MV transfo**

Inverter voltage 800 Vac tri

Loss Fraction 0.45 % at STC

Inverter: SG250HXWire section (54 Inv.) Alu 54 x 3 x 300 mm²

Average wires length 100 m

MV line up to Injection

MV Voltage 30 kV

Wires Copper 3 x 400 mm²

Length 1000 m

Loss Fraction 0.08 % at STC

AC losses in transformers**MV transfo**

Grid voltage 30 kV

Operating losses at STC

Nominal power at STC 14778 kVA

Iron loss (24/24 Connexion) 22.17 kW

Loss Fraction 0.15 % at STC

Coils equivalent resistance 3 x 0.35 mΩ

Loss Fraction 0.80 % at STC



Horizon definition

Horizon from PVGIS website API, Lat=40°39'55', Long=16°24'23', Alt=155m

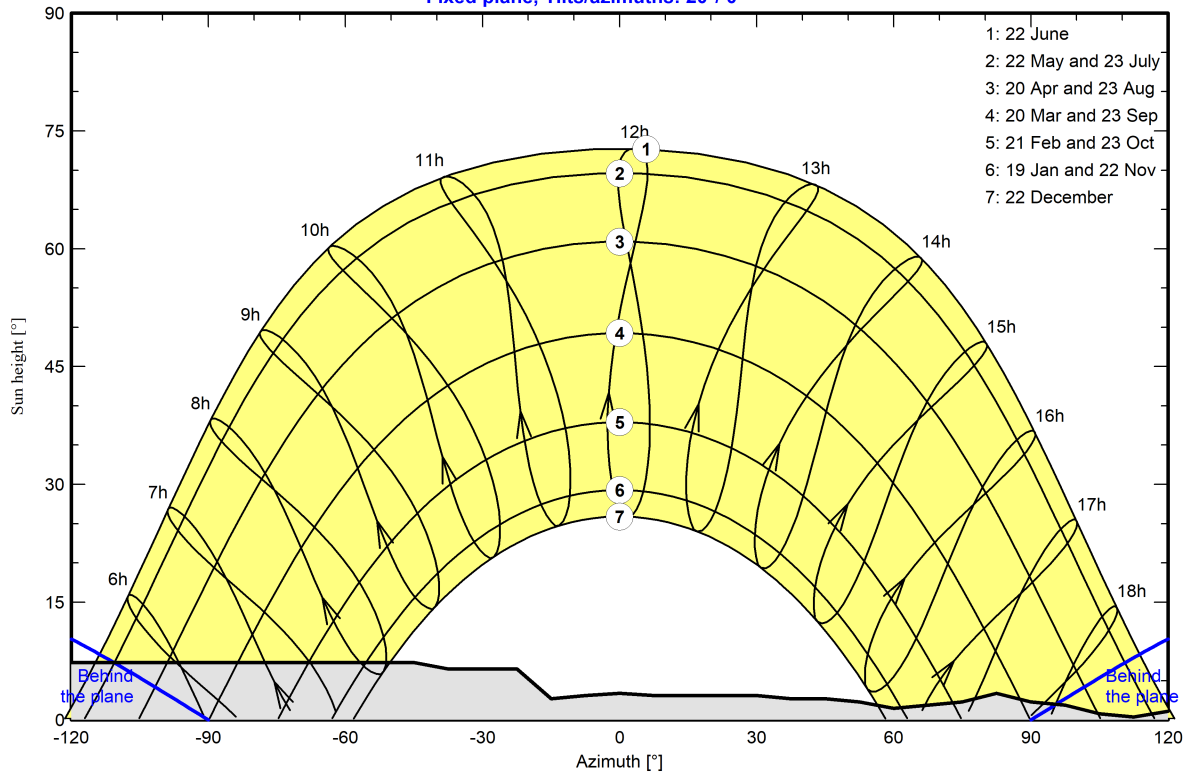
Average Height	4.2 °	Albedo Factor	0.91
Diffuse Factor	0.97	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-150	-143	-135	-45	-38	-23	-15	-8
Height [°]	3.1	3.4	5.3	5.7	5.7	6.1	7.3	7.3	6.5	6.5	2.7	3.1
Azimuth [°]	0	8	30	38	45	53	60	68	75	83	90	98
Height [°]	3.4	3.1	3.1	2.7	2.7	2.3	1.5	1.9	2.3	3.4	2.3	1.9
Azimuth [°]	105	113	120	128	143	150	158	165	173	180		
Height [°]	0.8	0.4	1.1	1.5	0.8	0.8	1.9	2.7	3.1	3.1		

Sun Paths (Height / Azimuth diagram)

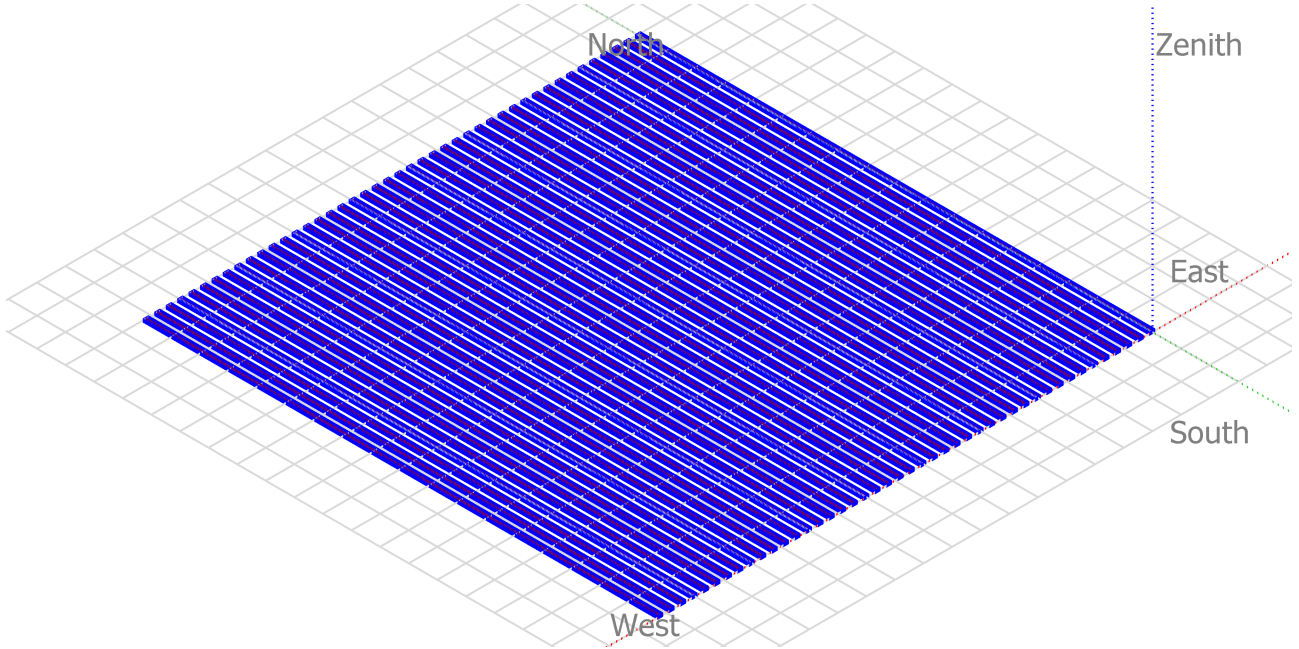
Fixed plane, Tilts/azimuths: 20°/ 0°





Near shadings parameter

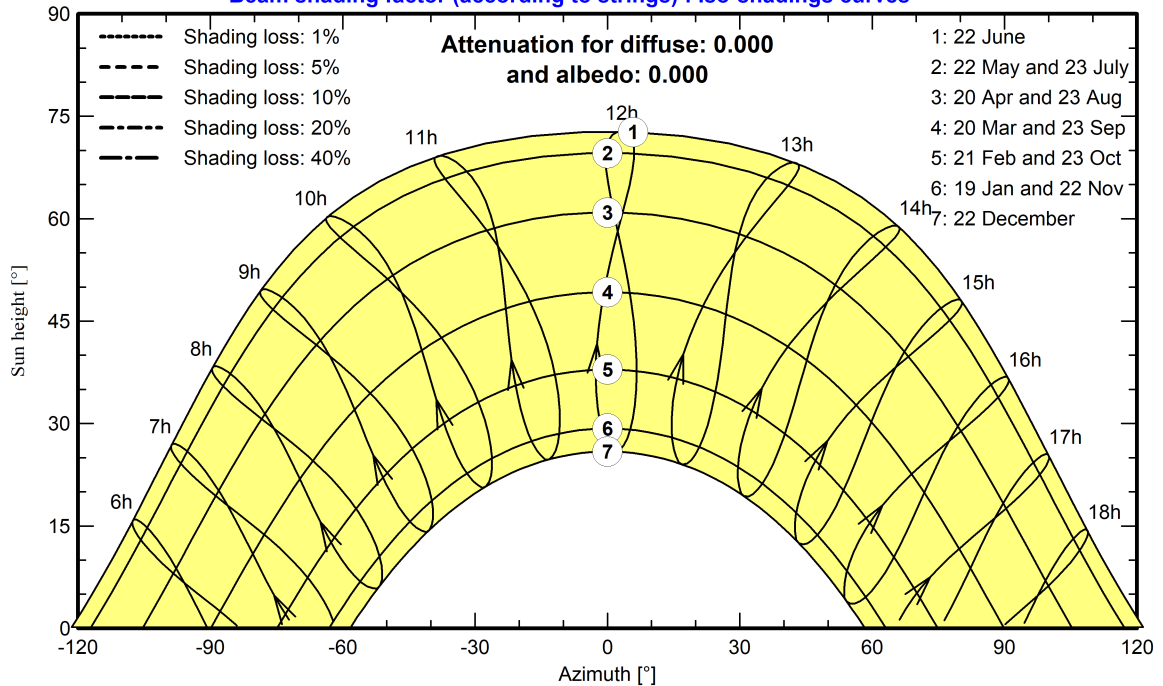
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

SOL 019 - Grottole A - Legal Time

Beam shading factor (according to strings) : Iso-shadings curves





Main results

System Production

Produced Energy 27599 MWh/year

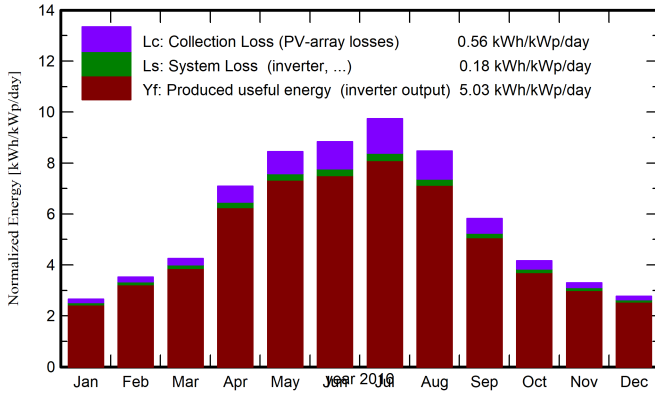
Specific production

1840 kWh/kWp/year

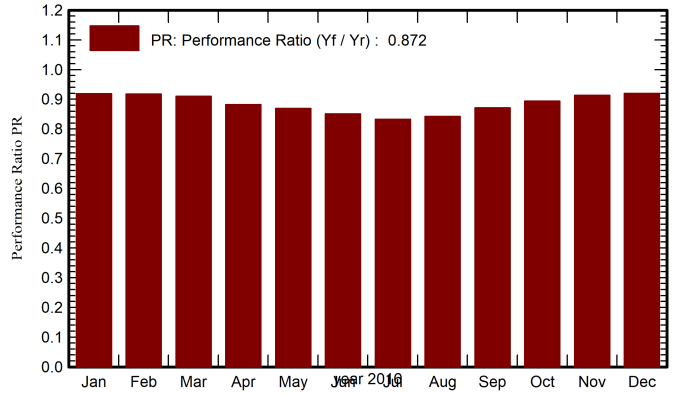
Performance Ratio PR

87.23 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

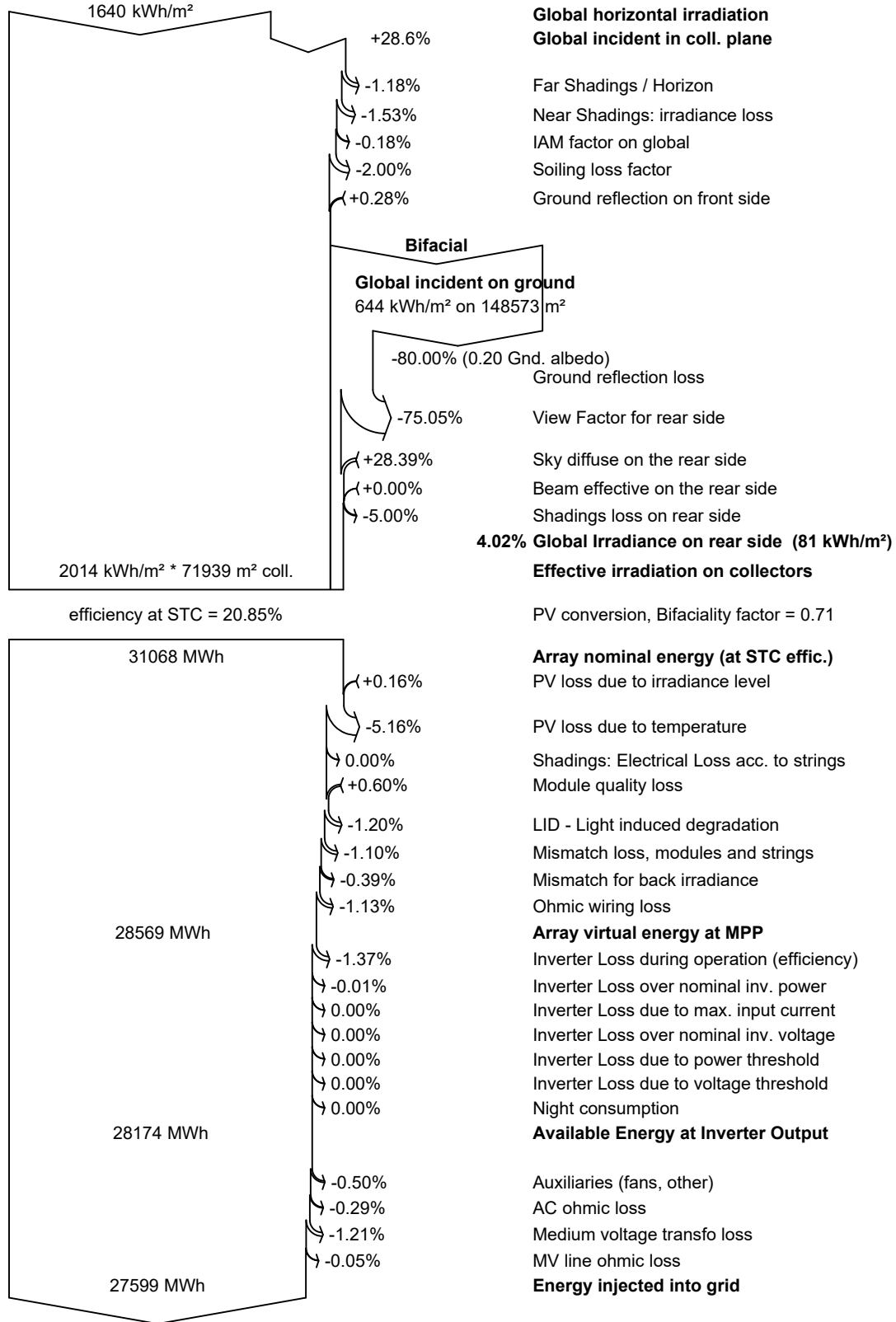
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
Jan. 16	63.7	25.27	8.34	82.4	77.7	1180	1135	0.919
Feb. 16	80.1	36.51	11.09	102.1	96.7	1455	1405	0.918
Mar. 16	105.7	47.00	10.64	132.0	125.4	1865	1800	0.910
Apr. 16	169.1	68.81	15.89	212.8	203.0	2911	2815	0.882
May 16	204.8	72.72	17.72	261.8	250.8	3529	3412	0.869
June 16	208.5	72.59	23.31	265.2	254.1	3502	3384	0.851
July 16	232.8	62.64	27.80	302.1	290.8	3903	3771	0.832
Aug. 16	200.5	61.11	25.93	262.6	251.6	3433	3320	0.843
Sep. 16	135.3	54.44	21.38	174.8	166.9	2364	2285	0.872
Oct. 16	100.0	40.39	17.11	128.9	122.6	1789	1728	0.894
Nov. 16	75.7	29.98	13.06	99.0	93.7	1405	1356	0.913
Dec. 16	63.7	23.90	7.25	86.0	80.7	1230	1187	0.920
Year	1639.9	595.35	16.64	2109.7	2014.0	28565	27599	0.872

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



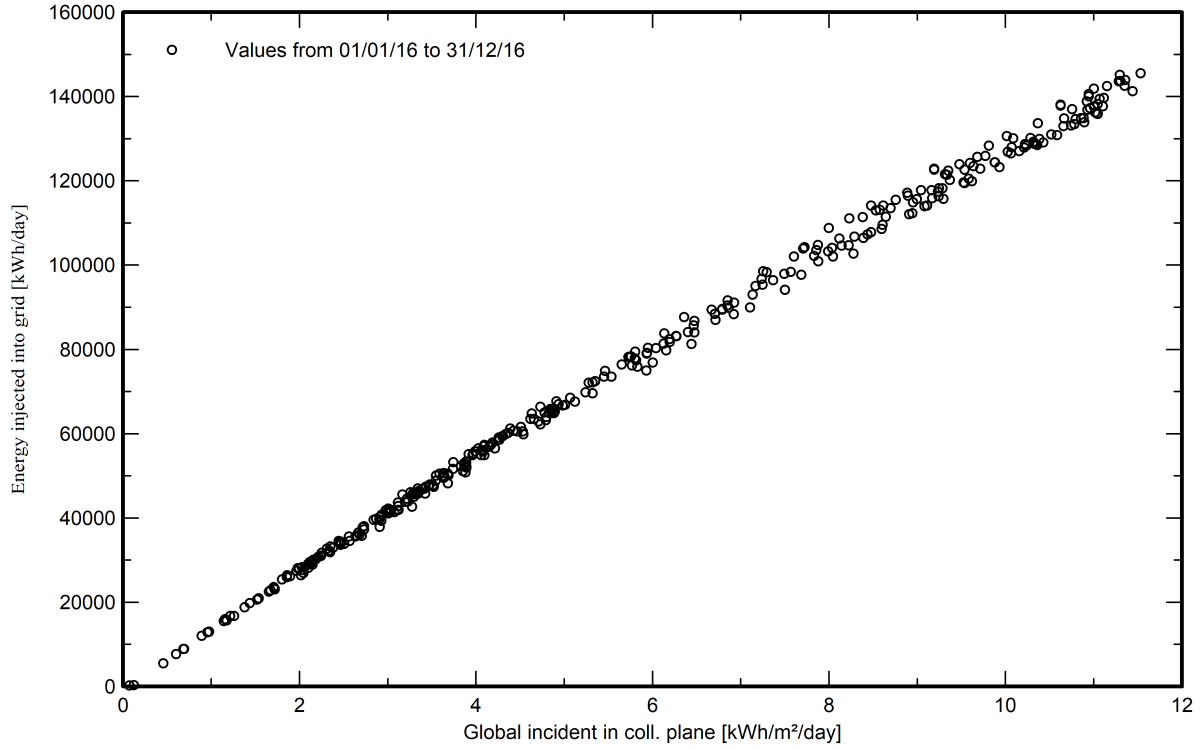
Loss diagram





Special graphs

Daily Input/Output diagram



System Output Power Distribution

