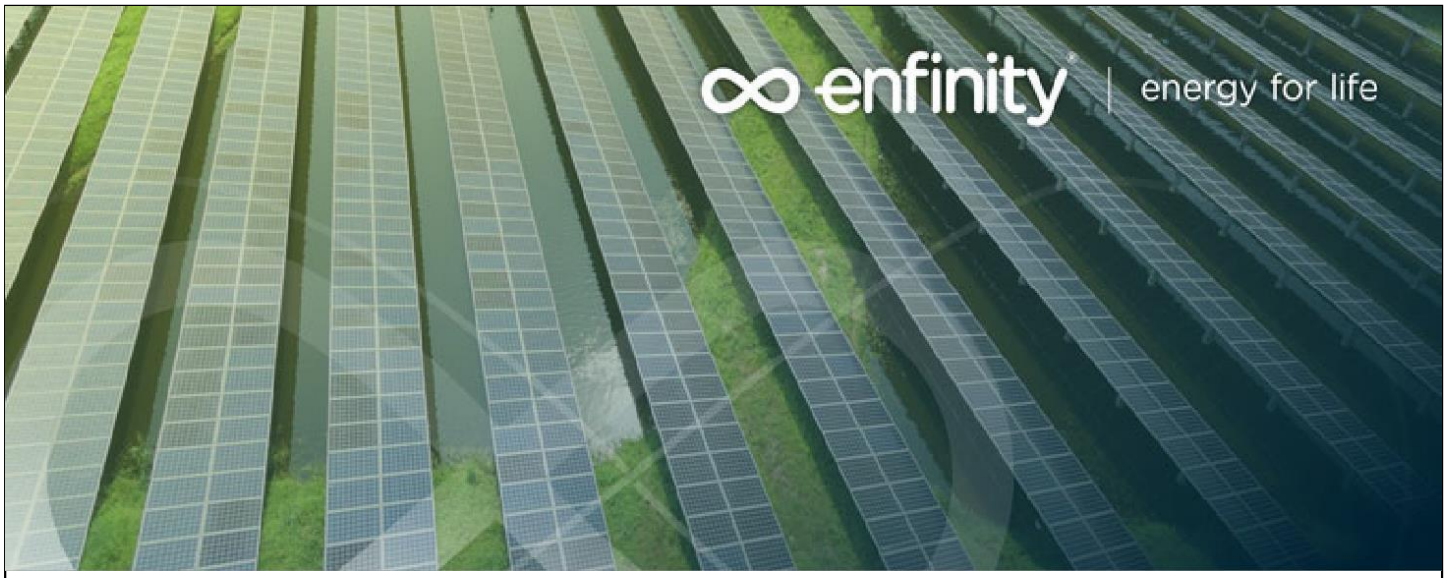

IMPIANTO FOTOVOLTAICO EG GAROFANO SRL E OPERE CONNESSE

POTENZA IMPIANTO 70,89 MW - COMUNE DI FISCAGLIA (FE)

Proponente

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Titolo Elaborato

STIMA DELLA PRODUCIBILITÀ

LIVELLO PROGETTAZIONE	CODICE ELABORATO	FILE NAME	DATA
DEFINITIVO	PD_REL04	23SOL14_PD_REL04.00-Stima producibilità.docx	22/12/2023

Revisioni

REV.	DATA	DESCRIZIONE	ESEGUITO	VERIFICATO	APPROVATO
0	22/12/2023	EMISSIONE PER PERMITTING	LBO	LST	ARU

COMUNE DI FISCAGLIA (FE)

REGIONE EMILIA ROMAGNA

STIMA DELLA PRODUCIBILITÀ

Version 7.4.4

PVsyst - Simulation report

Grid-Connected System

Project: SOIT23919 (IT ENF PLANOS FOR PROGETTO DEFINITIVO AU) Migliarino

Variant: 2P tracker 8m CS7N-695TB-AG SG1100UD 70.889MWp_V03

Tracking system with backtracking

System power: 70.89 MWp

Migliaro - Italy

Author

Solida Energias Renovables (Spain)

Project: SOIT23919 (IT ENF PLANOS FOR PROGETTO DEFINITIVO AU) Migliarino

Variant: 2P tracker 8m CS7N-695TB-AG SG1100UD 70.889MWp_V03

Solida Energias Renovables (Spain)

Project summary

Geographical Site
Migliaro
Italy

Situation

Latitude	44.80 °N
Longitude	11.97 °E
Altitude	8 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Migliaro
SolarGIS Monthly aver. , period not spec. - Synthetic

System summary

Grid-Connected System

Tracking system with backtracking

PV Field Orientation

Orientation	
Tracking plane, horizontal N-S axis	
Avg axis azim.	0 °

Tracking algorithm	
Astronomic calculation	
Backtracking activated	

Near Shadings

According to strings : Fast (table)	
Electrical effect	100 %
Diffuse shading	Automatic

System information

PV Array

Nb. of modules	101998 units
Pnom total	70.89 MWp

Inverters

Nb. of units	61 units
Pnom total	67.10 MWac
Grid power limit	66.00 MWac
Grid lim. Pnom ratio	1.074

User's needs
Unlimited load (grid)

Results summary

Produced Energy	109967939 kWh/year	Specific production	1551 kWh/kWp/year	Perf. Ratio PR	88.86 %
Apparent energy	111700338 kVAh/year				

Table of contents

General parameters

Grid-Connected System

Tracking system with backtracking

PV Field Orientation

Orientation

Tracking plane, horizontal N-S axis
Avg axis azim. 0 °

Tracking algorithm

Astronomic calculation
Backtracking activated

Backtracking array

Nb. of trackers 1547 units

Sizes

Tracker Spacing 8.00 m
Collector width 4.92 m
Ground Cov. Ratio (GCR) 61.5 %
Phi min / max. -/+ 60.0 °

Backtracking strategy

Phi limits for BT -/+ 52.0 °
Backtracking pitch 8.00 m
Backtracking width 4.92 m
Mode Automatic

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Free Horizon

Near Shadings

According to strings : Fast (table)
Electrical effect 100 %
Diffuse shading Automatic

User's needs

Unlimited load (grid)

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 8.00 m
Tracker width 4.92 m
GCR 61.5 %
Axis height above ground 2.40 m

Bifacial model definitions

Ground albedo average 0.15
Bifaciality factor 80 %
Rear shading factor 4.0 %
Rear mismatch loss 3.5 %
Shed transparent fraction 4.0 %

Monthly ground albedo values

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
0.12	0.15	0.16	0.16	0.17	0.17	0.17	0.17	0.15	0.13	0.12	0.12	0.15

Grid injection point

Grid power limitation

Active power 66.00 MWac
Pnom ratio 1.074

Power factor

Cos(phi) (lagging) 0.985

PV Array Characteristics

PV module

Manufacturer CSI Solar Co., Ltd.
Model CS7N-695TB-AG 1500V
(Custom parameters definition)
Unit Nom. Power 695 Wp
Number of PV modules 101998 units
Nominal (STC) 70.89 MWp
Modules 3923 string x 26 In series

PV Array Characteristics

PV module

At operating cond. (50°C)

Pmpp	65.61 MWp
U mpp	945 V
I mpp	69395 A

Inverter

Manufacturer	Sungrow
Model	SG1100UD
(Custom parameters definition)	
Unit Nom. Power	1100 kWac
Number of inverters	61 units
Total power	67100 kWac
Operating voltage	895-1500 V
Max. power (=>22°C)	1265 kWac
Pnom ratio (DC:AC)	1.06

Total PV power

Nominal (STC)	70889 kWp
Total	101998 modules
Module area	316842 m²

Total inverter power

Total power	67100 kWac
Max. power	77165 kWac
Number of inverters	61 units
Pnom ratio	1.06

Inverter PNom limit defined as active power

Array losses

Array Soiling Losses

Loss Fraction 1.5 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const)	30.0 W/m²K
Uv (wind)	1.2 W/m²K/m/s

DC wiring losses

Global array res.	0.22 mΩ
Loss Fraction	1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 0.5 %

Module Quality Loss

Loss Fraction -0.4 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

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

20.0 kW from Power thresh.

Night aux. cons. 5.00 kW

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage	630 Vac tri
Loss Fraction	0.40 % at STC

Inverter: SG1100UD

Wire section (61 Inv.)	Alu 61 x 3 x 1000 mm²
Average wires length	43 m

AC wiring losses

MV line up to Injection

MV Voltage	30	kV
Average each inverter		
Wires	Alu 3 x 500	mm²
Length	12690	m
Loss Fraction	0.40	% at STC

AC losses in transformers

MV transfo

Medium voltage	30	kV

One transfo parameters

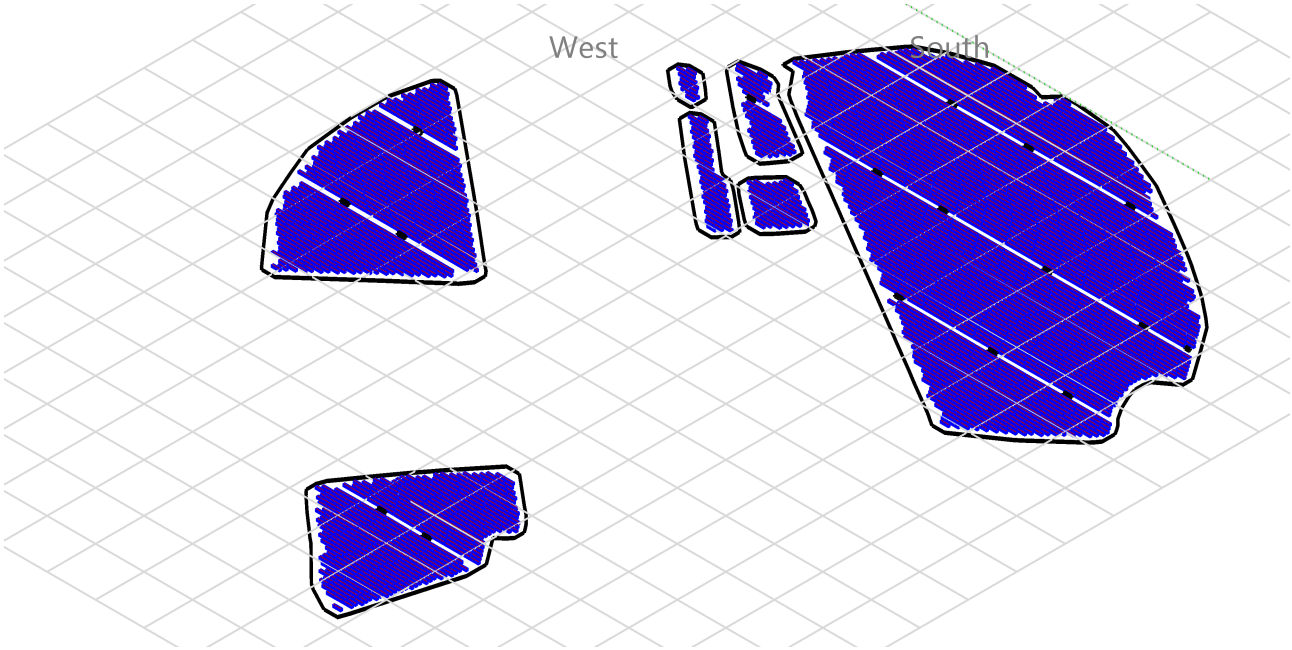
Nominal power at STC	4.35	MVA
Iron Loss (night disconnect)	4.31	kVA
Iron loss fraction	0.10	% at STC
Copper loss	48.16	kVA
Copper loss fraction	1.11	% at STC
Coils equivalent resistance	3 x 1.01	mΩ

Operating losses at STC (full system)

Nb. identical MV transfos	16	
Nominal power at STC	69.67	MVA
Iron loss (night disconnect)	68.97	kVA
Copper loss	770.50	kVA

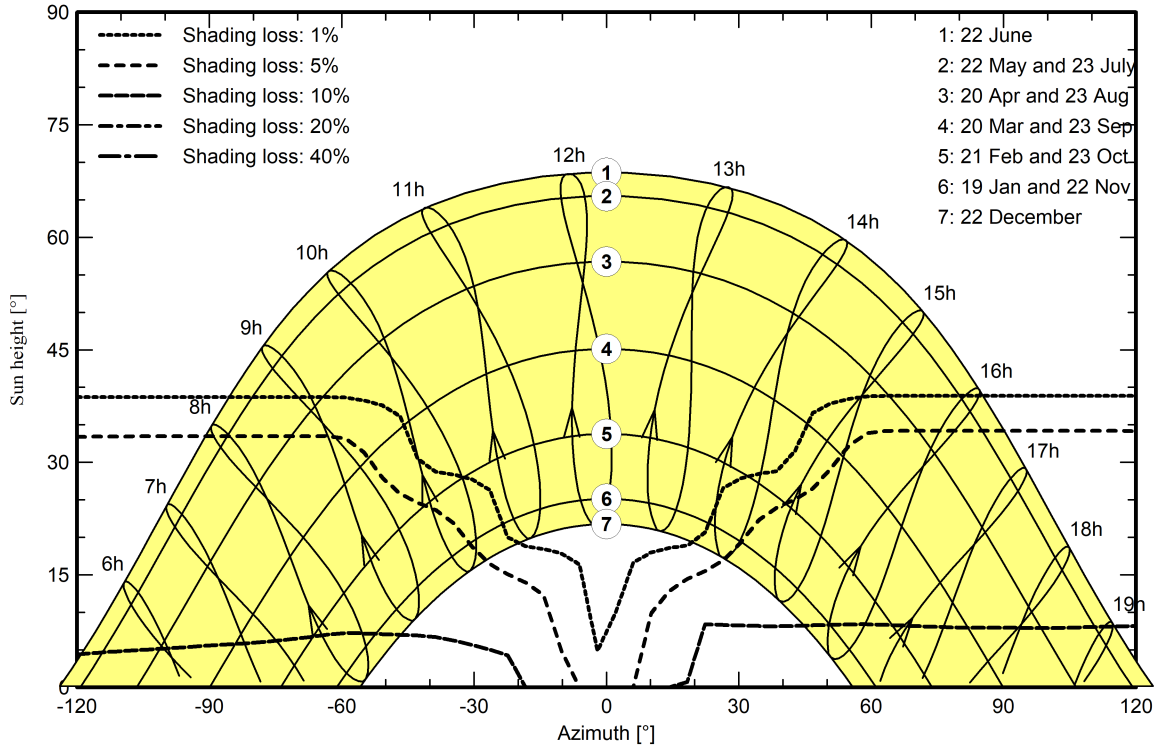
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1



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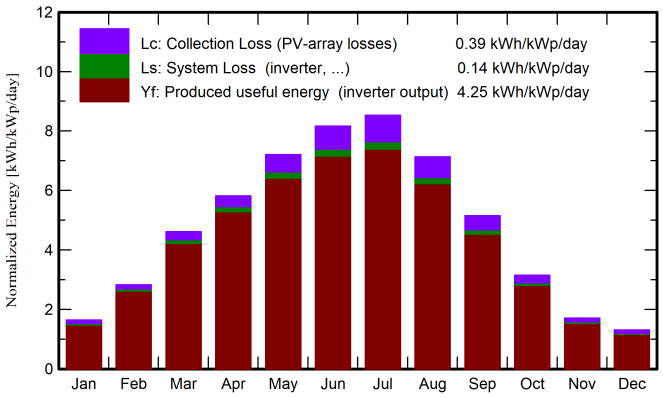
Solida Energias Renovables (Spain)

Main results

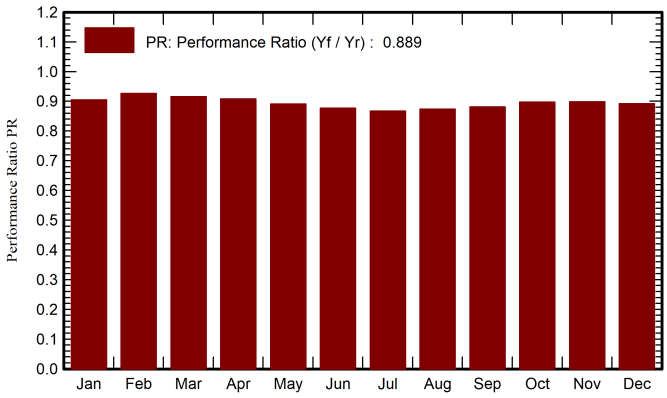
System Production

Produced Energy	109967939 kWh/year	Specific production	1551 kWh/kWp/year
Apparent energy	111700338 kVAh/year	Perf. Ratio PR	88.86 %

Normalized productions (per installed kWp)



Performance Ratio PR



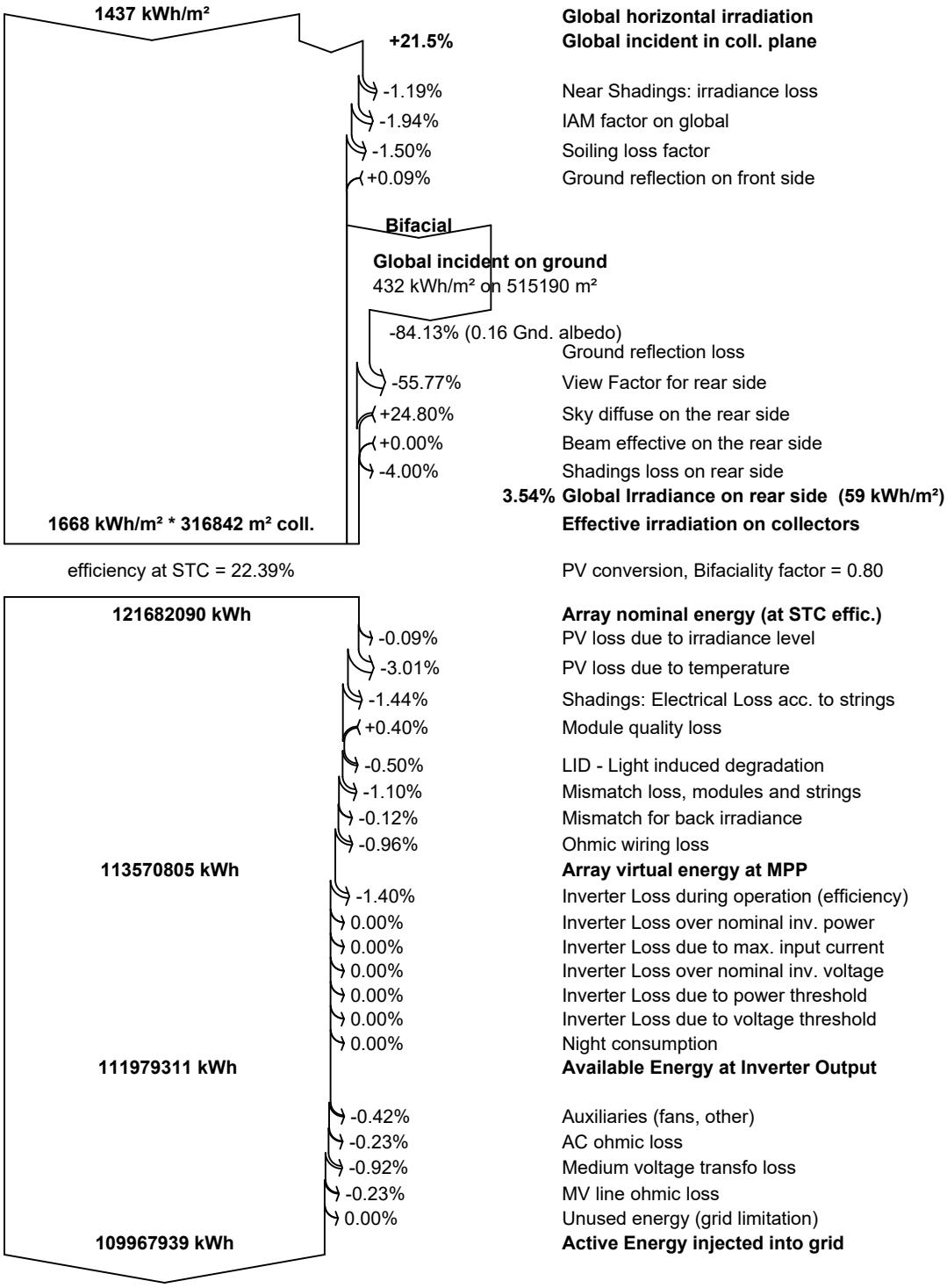
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray kWh	E_Grid kWh	PR ratio
January	42.5	23.00	4.80	50.8	46.6	3362256	3259274	0.905
February	65.4	30.70	6.40	79.2	74.7	5360303	5201266	0.927
March	116.8	50.00	10.30	143.1	136.3	9570580	9283325	0.915
April	144.0	63.20	14.30	174.6	167.5	11611290	11244932	0.908
May	184.6	78.10	19.50	223.4	214.6	14586695	14116569	0.891
June	202.0	81.50	24.30	245.0	236.2	15746215	15228597	0.877
July	214.3	76.80	26.50	264.6	255.1	16814987	16257717	0.867
August	180.8	69.80	25.80	221.2	213.0	14149814	13698239	0.873
September	127.5	55.10	21.00	154.6	147.4	9959756	9655072	0.881
October	81.4	41.70	16.00	97.5	91.9	6385623	6197284	0.897
November	43.7	24.40	10.70	51.3	47.7	3378271	3267440	0.898
December	34.1	18.80	5.70	40.4	36.7	2644775	2558224	0.892
Year	1437.1	613.10	15.49	1745.8	1667.8	113570565	109967939	0.889

Legends

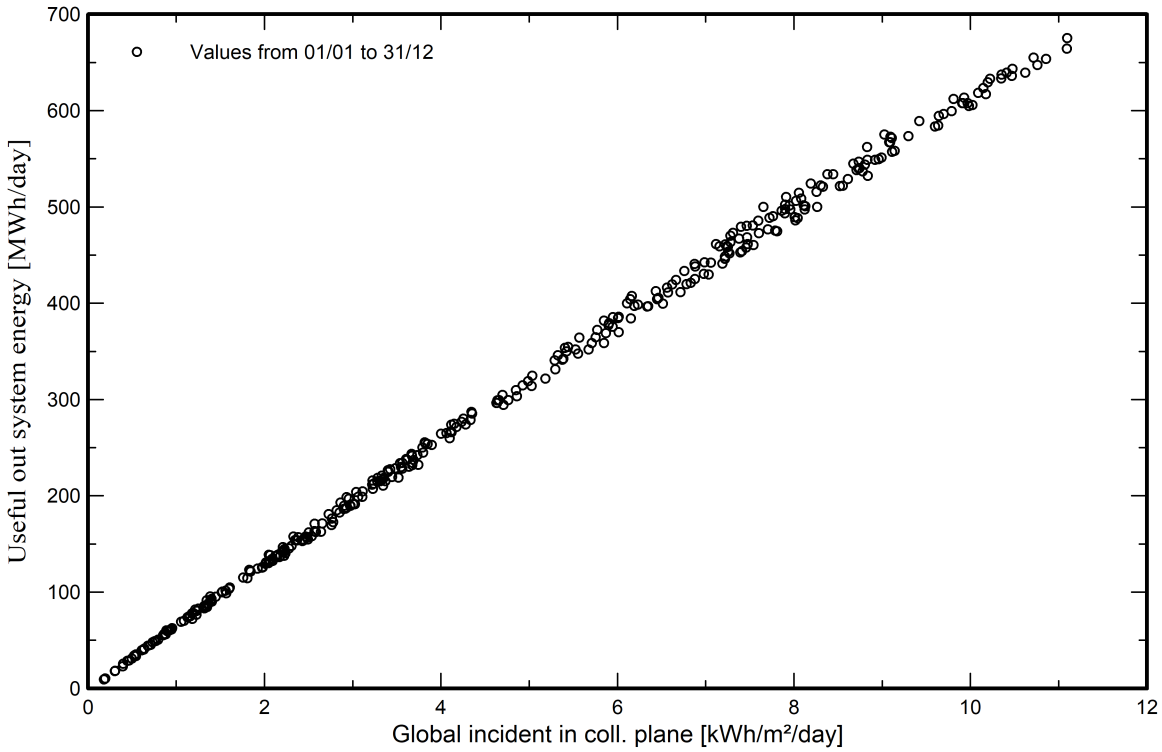
GlobHor	Global horizontal irradiation
DiffHor	Horizontal diffuse irradiation
T_Amb	Ambient Temperature
GlobInc	Global incident in coll. plane
GlobEff	Effective Global, corr. for IAM and shadings
EArray	Effective energy at the output of the array
E_Grid	Energy injected into grid
PR	Performance Ratio

Loss diagram



Predef. graphs

Daily Input/Output diagram



System Output Power Distribution