COMUNE DI SPINAZZOLA

PROVINCIA DI BARLETTA ANDRIA TRANI

REGIONE PUGLIA

COMUNE DI GENZANO DI LUCANIA

PROVINCIA DI POTENZA

REGIONE BASILICATA

IMPIANTO SOLARE FOTOVOLTAICO "SAVINETTA" CONNESSO ALLA RTN DELLA POTENZA DI PICCO P=20'659.08 kWp E POTENZA IN IMMISSIONE PARI A 20'000 kW, DELLE RELATIVE OPERE DI CONNESSIONE ALLA RTN E PIANO AGRONOMICO PER L'UTILIZZO A SCOPI AGRICOLI DELL'AREA

Proponente

SOLAR ENERGY DIECI S.R.L.

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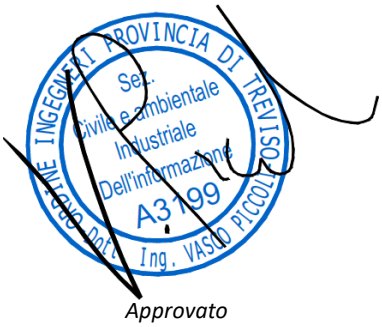
Progettazione



Preparato	*Verificato*	*Approvato*
Dario Bertani	**Gianandrea Ing. Bertinazzo**	**Vasco Ing. Piccoli**

PROGETTAZIONE DEFINITIVA

Codice Autorizzazione Unica A3EBD54

Titolo elaborato

IMPIANTO FOTOVOLTAICO "SAVINETTA"
STIMA PRODUCIBILITÀ ENERGETICA IMPIANTO FV

Elaborato N. **15DS**	*Data emissione* 06/08/21			
	Nome file PVSyst REPORT			
		01	29/09/23	REVISIONE
N. Progetto **SOL027**	*Pagina* COVER	00	06/08/21	PRIMA EMISSIONE
		REV.	DATA	DESCRIZIONE

Version 7.4.2

PVsyst - Simulation report

Grid-Connected System

Project: SOL 027 – Spinazzola

Variant: Rev.09-23

Trackers single array, with backtracking

System power: 20.66 MWp

Spinazzola - Italy

Author

GSB Consulting Srl (Italy)

PVsyst V7.4.2
VC9, Simulation date:
26/09/23 12:42
with v7.4.2

Project summary

Geographical Site
Spinazzola
Italy

Situation

Latitude	40.93 °N
Longitude	16.12 °E
Altitude	433 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Spinazzola
Meteonorm 7.2 (1986-2005), Sat=100% - 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	
Wind Speed threshold	0 m/s
Wind stow position	0 °

Near Shadings

According to strings : Fast (table)	
Electrical effect	80 %
Diffuse shading	Automatic

System information

PV Array		**Inverters**	
Nb. of modules	33592 units	Nb. of units	5 units
Pnom total	20.66 MWp	Pnom total	20.48 MWac
		Pnom ratio	1.009

User's needs
Unlimited load (grid)

Results summary

Produced Energy	38.47 GWh/year	Specific production	1862 kWh/kWp/year	Perf. Ratio PR	87.13 %

Table of contents

PVsyst V7.4.2
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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
Wind Speed threshold 0 m/s
Wind stow position 0 °

Backtracking array
Nb. of trackers 75 units
Single array

Sizes

Tracker Spacing	5.00 m
Collector width	2.18 m
Ground Cov. Ratio (GCR)	43.6 %
Left inactive band	0.02 m
Right inactive band	0.02 m
Phi min / max.	-/+ 55.0 °

Backtracking strategy

Phi limits for BT	-/+ 63.7 °
Backtracking pitch	5.00 m
Backtracking width	2.18 m

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
According to strings : Fast (table)
Electrical effect 80 %
Diffuse shading Automatic

User's needs
Unlimited load (grid)

Bifacial system
Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing	5.00 m
Tracker width	2.22 m
GCR	44.4 %
Axis height above ground	1.80 m

Bifacial model definitions

Ground albedo	0.20
Bifaciality factor	80 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

PV Array Characteristics

PV module

Manufacturer	Jinkosolar
Model	JKM-615N-66HL4M-BDV
(Original PVsyst database)	
Unit Nom. Power	615 Wp
Number of PV modules	33592 units
Nominal (STC)	20.66 MWp
Modules	1292 Strings x 26 In series
At operating cond. (50°C)	
Pmpp	19.16 MWp
U mpp	985 V
I mpp	19445 A

Inverter

Manufacturer	Gamesa Electric
Model	Proteus PV 4100
(Custom parameters definition)	
Unit Nom. Power	4095 kWac
Number of inverters	5 units
Total power	20475 kWac
Operating voltage	835-1500 V
Pnom ratio (DC:AC)	1.01

Total PV power

Nominal (STC)	20659 kWp
Total	33592 modules
Module area	90662 m²

Total inverter power

Total power	20475 kWac
Number of inverters	5 units
Pnom ratio	1.01

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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/m²K
Uv (wind) 0.0 W/m²K/m/s

DC wiring losses
Global array res. 0.55 mΩ
Loss Fraction 1.0 % at STC

LID - Light Induced Degradation
Loss Fraction 2.0 %

Module Quality Loss
Loss Fraction -0.3 %

Module mismatch losses
Loss Fraction 2.0 % 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 3.0 W/kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo
Inverter voltage 600 Vac tri
Loss Fraction 0.17 % at STC
Inverter: Proteus PV 4100
Wire section (5 Inv.) Copper 5 x 3 x 2500 mm²
Average wires length 20 m

MV line up to Injection
MV Voltage 30 kV
Wires Alu 3 x 400 mm²
Length 9400 m
Loss Fraction 1.69 % at STC

AC losses in transformers

MV transfo
Medium voltage 30 kV
Transformer parameters
Nominal power at STC 20.51 MVA
Iron Loss (24/24 Connexion) 48.19 kVA
Iron loss fraction 0.23 % at STC
Copper loss 349.30 kVA
Copper loss fraction 1.70 % at STC
Coils equivalent resistance 3 x 0.30 mΩ

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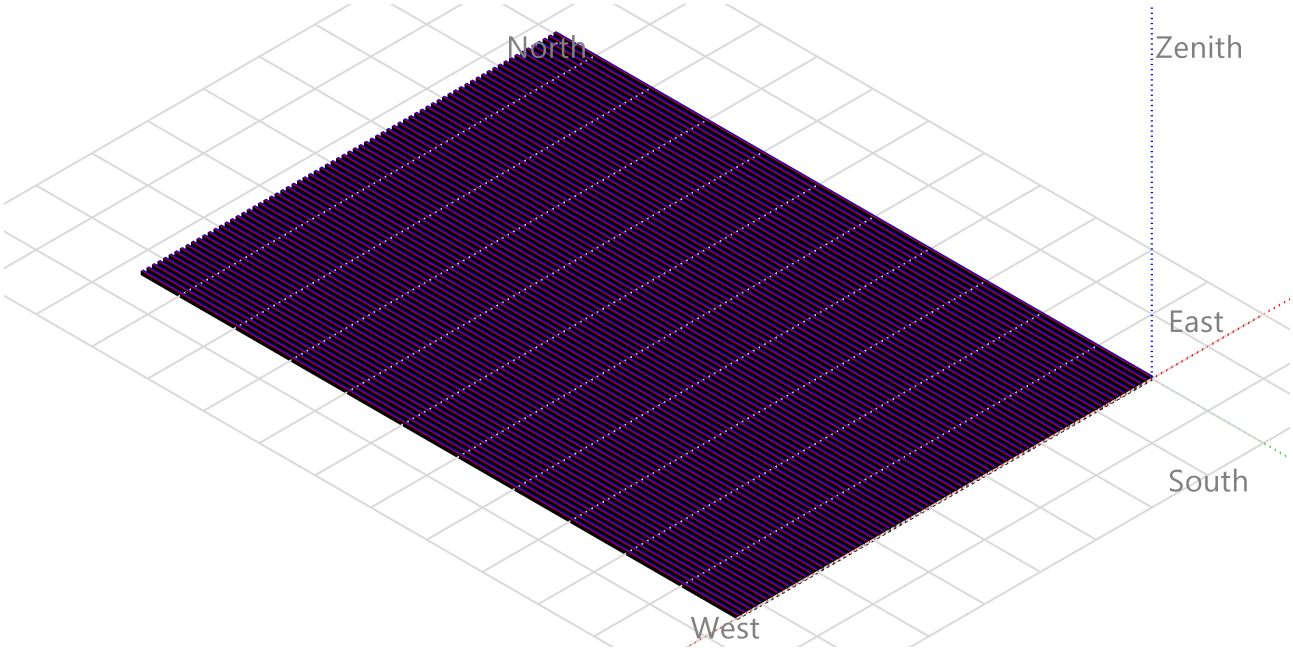
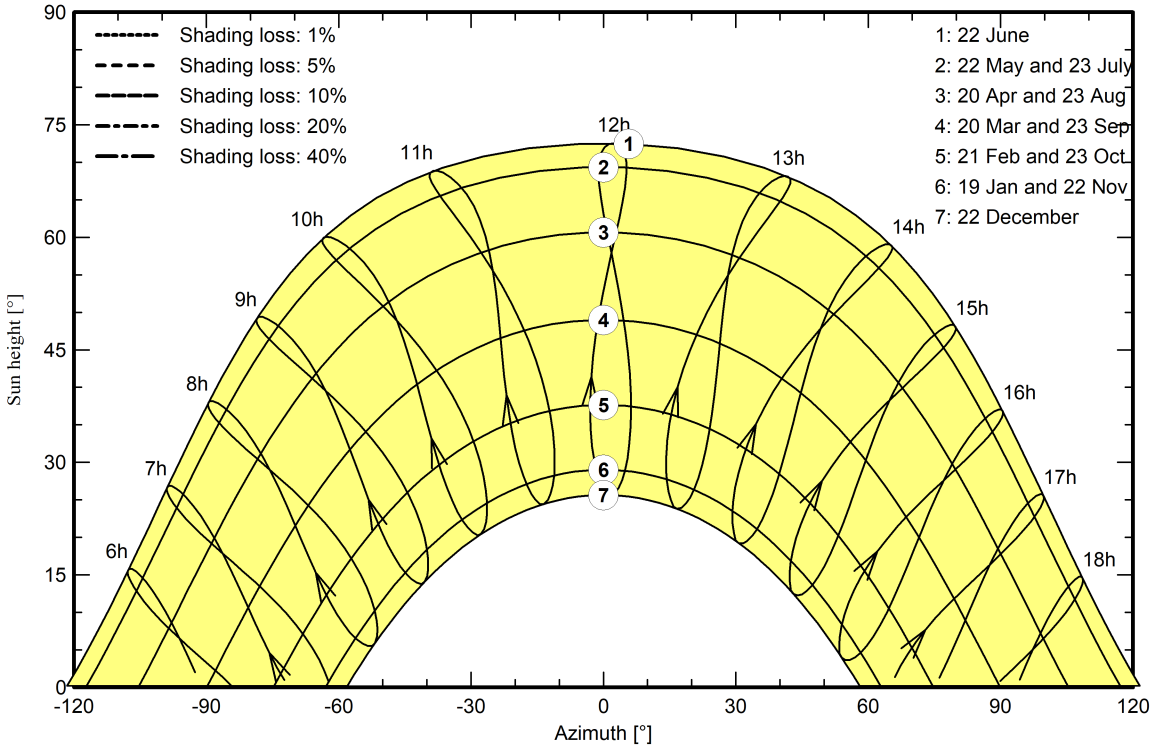
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

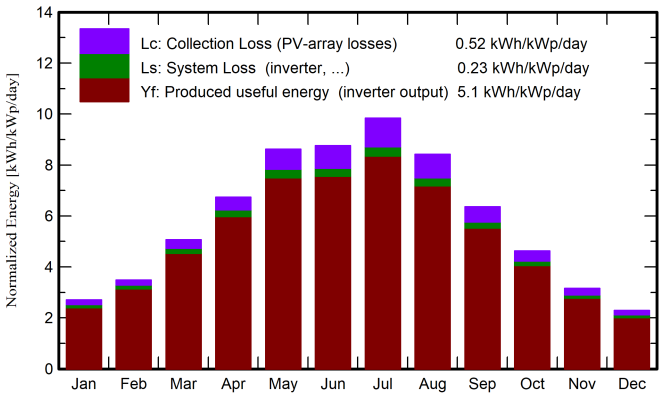


Main results

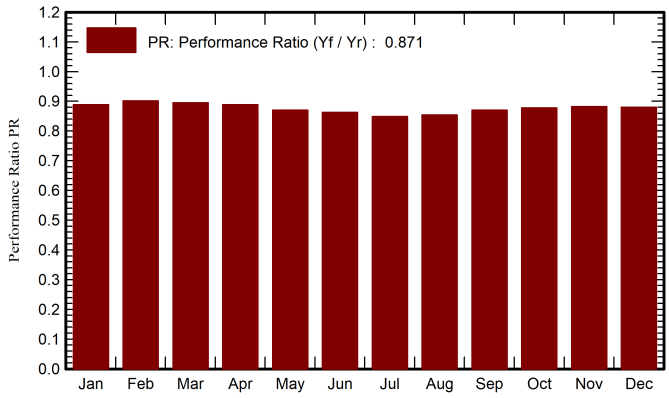
System Production

Produced Energy	38.47 GWh/year	Specific production	1862 kWh/kWp/year
		Perf. Ratio PR	87.13 %

Normalized productions (per installed kWp)



Performance Ratio PR



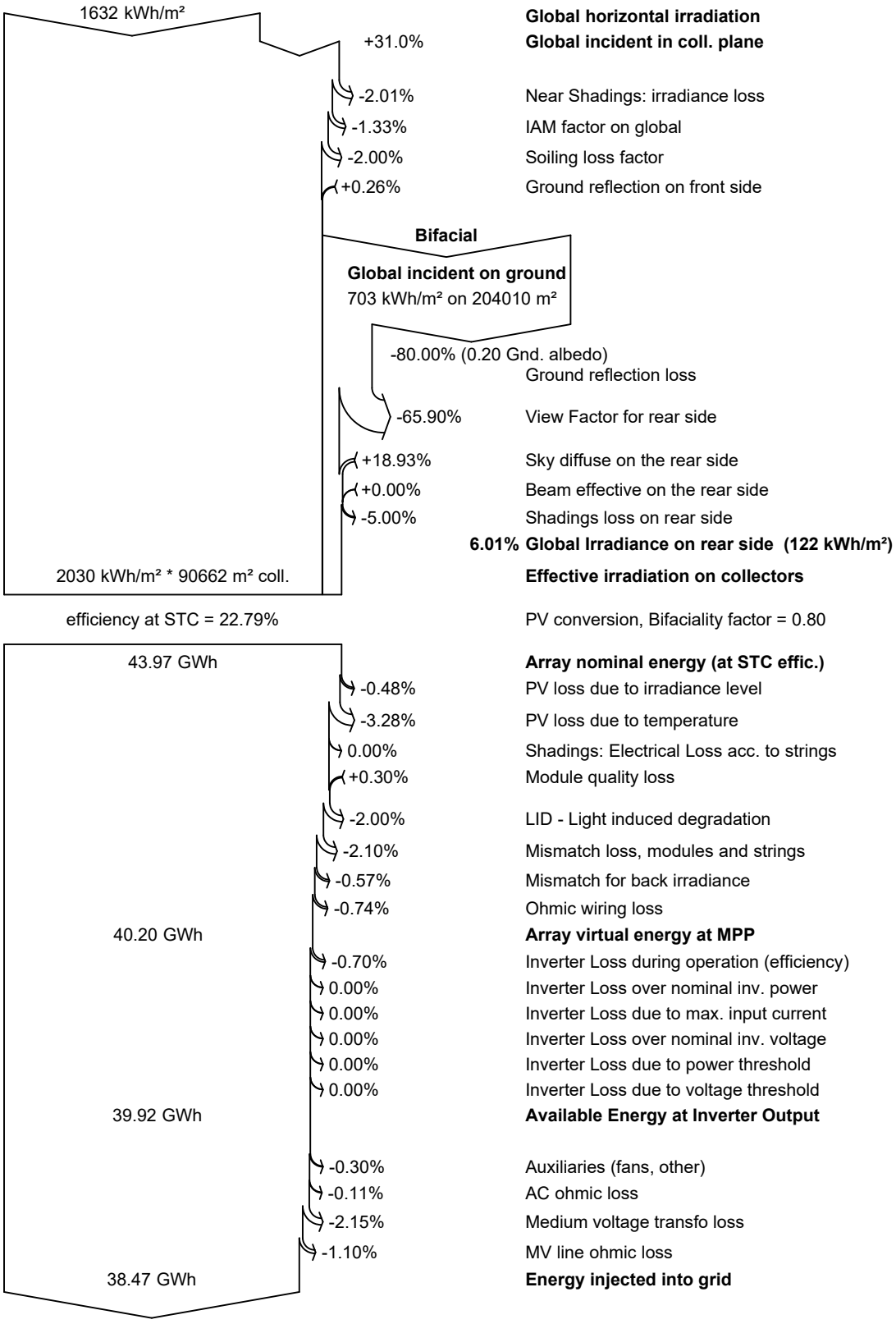
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray GWh	E_Grid GWh	PR ratio
January	61.2	22.26	6.29	83.9	78.1	1.619	1.541	0.889
February	74.8	32.68	6.32	97.6	91.7	1.904	1.819	0.902
March	121.6	48.18	9.22	157.3	149.1	3.040	2.908	0.895
April	157.1	64.90	12.17	202.0	192.1	3.871	3.707	0.888
May	205.5	74.75	17.53	267.3	255.2	5.020	4.808	0.871
June	207.4	80.65	21.71	263.0	251.0	4.888	4.687	0.863
July	230.9	64.16	24.86	305.2	292.4	5.585	5.349	0.848
August	198.4	65.74	24.43	261.0	249.8	4.806	4.604	0.854
September	143.6	51.83	19.05	190.9	181.5	3.580	3.431	0.870
October	107.4	39.23	15.76	143.4	135.5	2.715	2.600	0.878
November	70.1	27.09	11.04	94.6	88.3	1.805	1.725	0.882
December	53.7	24.39	7.72	71.2	65.6	1.363	1.294	0.880
Year	1631.7	595.86	14.73	2137.2	2030.3	40.195	38.472	0.871

Legends

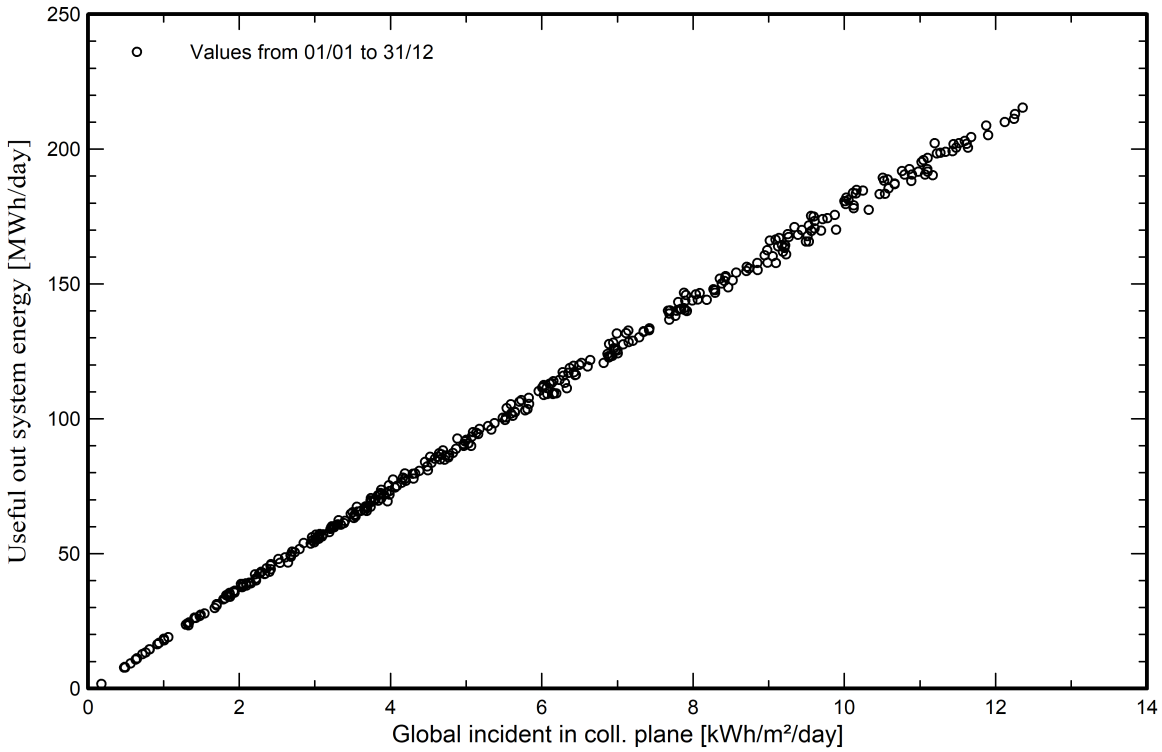
GlobHor	Global horizontal irradiation
DiffHor	Horizontal diffuse irradiation
T_Amb	Ambient Temperature
GlobInc	Global incident in coll. plane
GlobEff	Effective Global, corr. for IAM and shadings
EArray	Effective energy at the output of the array
E_Grid	Energy injected into grid
PR	Performance Ratio

Loss diagram



Predef. graphs

Daily Input/Output diagram



System Output Power Distribution