

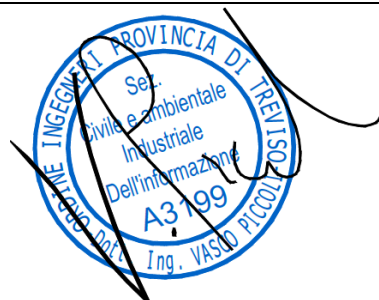
COMUNE DI SALANDRA
PROVINCIA DI MATERA
REGIONE BASILICATA

**PROGETTO DEFINITIVO DI UN IMPIANTO AGRI-FOTOVOLTAICO
 DI POTENZA DI PICCO P= 19'800 kWp
 E POTENZA NOMINALE E DI IMMISSIONE P=19'756,10 kW
 NEL COMUNE DI SALANDRA**

Proponente

SOLAR ENERGY TRENTUNO Srl
 VIA SEBASTIAN ALTMANN n. 9 - 39100 BOLZANO (BZ)
 n°REA: BZ-234087 - C.F.: 03123900213
 solareenergytrentuno@legalmail.it

Progettazione



Preparato
Dario Ing. Bertani

Verificato
Gianandrea Ing. Bertinazzo

Approvato
Vasco Ing. Piccoli

PROGETTAZIONE DEFINITIVA

Titolo elaborato

**IMPIANTO AGRI-FOTOVOLTAICO
 STIMA PRODUCIBILITA' IMPIANTO FV**

Elaborato N.

A.19

Data emissione

31/03/22

Nome file

PVSystem REPORT

N. Progetto

SOL025

Pagina

COVER

00

REV.

31/03/22

DATA

PRIMA EMISSIONE

DESCRIZIONE

PVsyst - Simulation report

Grid-Connected System

Project: SOL025 - Montagnola

Variant: Layout rev.0

Trackers single array, with backtracking

System power: 19.80 MWp

Località Montagnola - Italy

Author

GSB Consulting Srl (Italy)



PVsyst V7.2.11

VCO, Simulation date:
17/03/22 17:20
with v7.2.11

GSB Consulting Srl (Italy)

Project summary

Geographical Site Località Montagnola Italy	Situation Latitude 40.56 °N Longitude 16.32 °E Altitude 582 m Time zone UTC+1	Project settings Albedo 0.20
Meteo data Località Montagnola Meteonorm 8.0, Sat=100% - Synthetic		

System summary

Grid-Connected System	Trackers single array, with backtracking		
PV Field Orientation Tracking plane, horizontal N-S axis Axis azimuth 0 °	Near Shadings Linear shadings	User's needs Unlimited load (grid)	
System information		Inverters	
PV Array			
Nb. of modules	30000 units	Nb. of units	6 units
Pnom total	19.80 MWp	Pnom total	20.05 MWac
		Pnom ratio	0.988

Results summary

Produced Energy	34 GWh/year	Specific production	1703 kWh/kWp/year	Perf. Ratio PR	88.89 %
-----------------	-------------	---------------------	-------------------	----------------	---------

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	6
Main results	7
Loss diagram	8
Special graphs	9



PVsyst V7.2.11

VC0, Simulation date:
17/03/22 17:20
with v7.2.11

GSB Consulting Srl (Italy)

General parameters

Grid-Connected System

PV Field Orientation

Orientation

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

Horizon

Free Horizon

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 5.50 m
Tracker width 2.38 m
GCR 43.3 %
Axis height above ground 2.10 m

Trackers single array, with backtracking

Backtracking strategy

Nb. of trackers 99 units
Single array

Sizes

Tracker Spacing 5.50 m
Collector width 2.38 m
Ground Cov. Ratio (GCR) 43.3 %
Phi min / max. +/- 55.0 °

Backtracking limit angle

Phi limits +/- 64.1 °

Near Shadings

Linear shadings

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

User's needs

Unlimited load (grid)

Bifacial model definitions

Ground albedo 0.20
Bifaciality factor 70 %
Rear shading factor 5.0 %
Rear mismatch loss 10.0 %
Shed transparent fraction 0.0 %

PV Array Characteristics

Array #1 - Inv.4 MW

PV module

Manufacturer Risen Energy Co., Ltd
Model RSM132-8-660BMDG
(Custom parameters definition)

Unit Nom. Power 660 Wp
Number of PV modules 24150 units
Nominal (STC) 15.94 MWp
Modules 805 Strings x 30 In series

At operating cond. (50°C)

Pmpp 14.59 MWp
U mpp 1039 V
I mpp 14038 A

Inverter

Manufacturer Power Electronics
Model FS4010K_630V_4MPPT_20210422E_Preliminary
(Custom parameters definition)

Unit Nom. Power 4010 kWac
Number of inverters 4 units
Total power 16040 kWac
Operating voltage 891-1500 V
Pnom ratio (DC:AC) 0.99

Array #2 - Inv.2 MW

PV module

Manufacturer Risen Energy Co., Ltd
Model RSM132-8-660BMDG
(Custom parameters definition)

Unit Nom. Power 660 Wp
Number of PV modules 5850 units
Nominal (STC) 3861 kWp
Modules 195 Strings x 30 In series

At operating cond. (50°C)

Pmpp 3534 kWp
U mpp 1039 V
I mpp 3401 A

Inverter

Manufacturer Power Electronics
Model FS2005KU_630V_20210422E_Preliminary
(Custom parameters definition)

Unit Nom. Power 2005 kWac
Number of inverters 2 units
Total power 4010 kWac
Operating voltage 891-1500 V
Pnom ratio (DC:AC) 0.96

**PVsyst V7.2.11**

VC0, Simulation date:
17/03/22 17:20
with v7.2.11

GSB Consulting Srl (Italy)

PV Array Characteristics**Total PV power**

Nominal (STC) 19800 kWp
Total 30000 modules
Module area 93191 m²
Cell area 87318 m²

Total inverter power

Total power 20050 kWac
Number of inverters 6 units
Pnom ratio 0.99

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

LID - Light Induced Degradation

Loss Fraction 1.6 %

Module Quality Loss

Loss Fraction -0.5 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.992	0.978	0.946	0.850	0.000

DC wiring losses

Global wiring resistance 0.98 mΩ
Loss Fraction 1.5 % at STC

Array #1 - Inv.4 MW

Global array res. 1.2 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Inv.2 MW

Global array res. 5.0 mΩ
Loss Fraction 1.5 % at STC

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 630 Vac tri
Loss Fraction 0.11 % at STC

Inverters: FS4010K_630V_4MPPT_20210422E_Preliminary, FS2005KU_630V_20210422E_Preliminary

Wire section (6 Inv.) Copper 6 x 3 x 2500 mm²
Average wires length 20 m

MV line up to Injection

MV Voltage 30 kV
Wires Copper 3 x 300 mm²
Length 10200 m
Loss Fraction 1.39 % at STC



PVsyst V7.2.11

VC0, Simulation date:
17/03/22 17:20
with v7.2.11

AC losses in transformers

MV transfo

Grid voltage 30 kV

Operating losses at STC

Nominal power at STC 19509 kVA

Iron loss (24/24 Connexion) 19.51 kW

Loss Fraction 0.10 % at STC

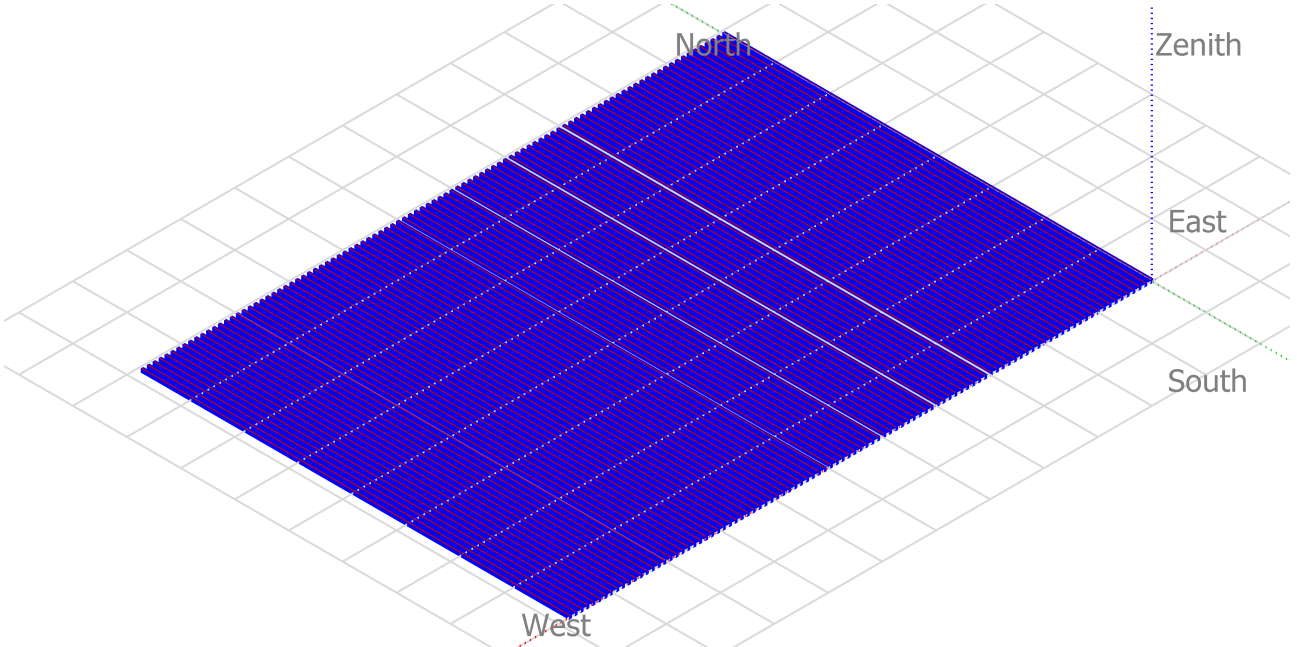
Coils equivalent resistance 3 x 0.20 mΩ

Loss Fraction 1.00 % at STC



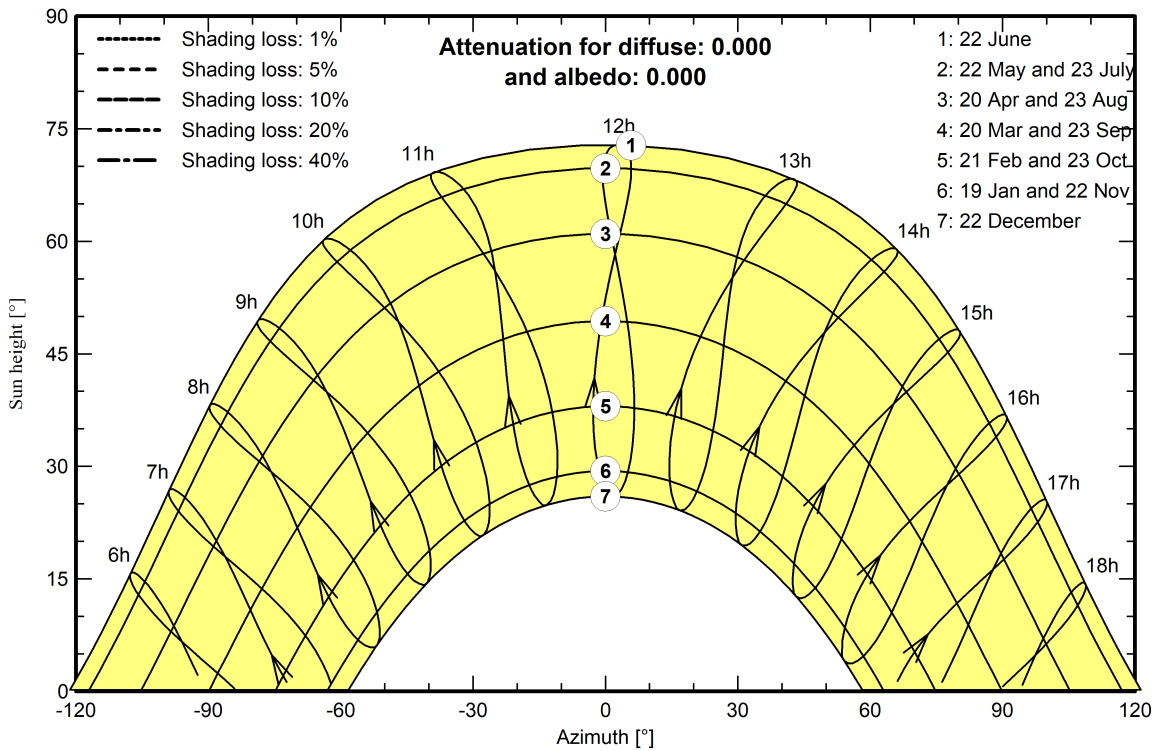
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy

34 GWh/year

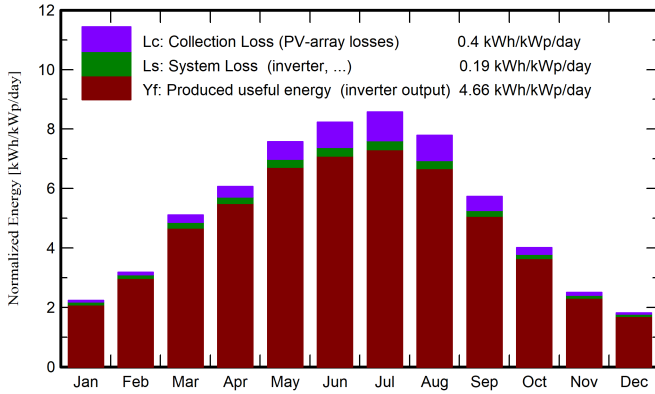
Specific production

1703 kWh/kWp/year

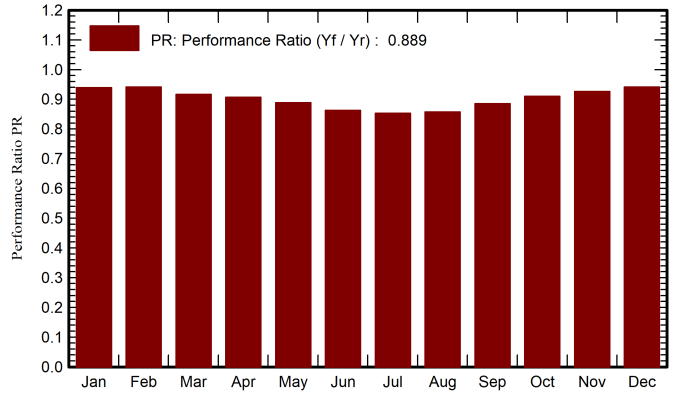
Performance Ratio PR

88.89 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

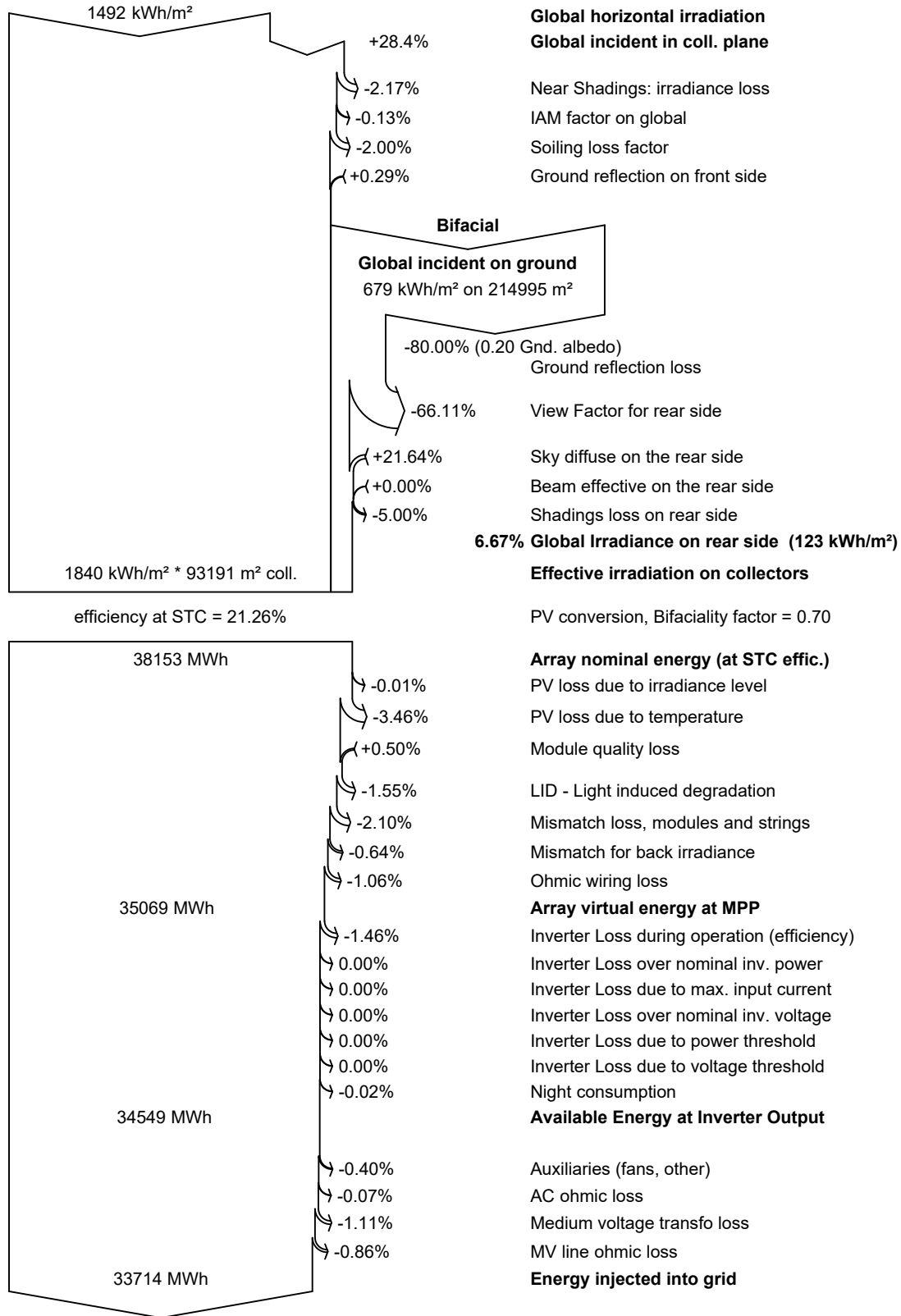
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray GWh	E_Grid GWh	PR ratio
January	52.9	24.36	5.20	69.3	66.2	1.343	1.288	0.940
February	69.9	35.44	5.54	89.0	85.1	1.723	1.659	0.942
March	121.1	47.72	8.35	158.3	152.0	2.988	2.871	0.916
April	145.4	67.04	11.36	182.1	174.6	3.401	3.271	0.907
May	185.1	83.31	15.97	234.7	225.6	4.293	4.128	0.888
June	193.6	69.07	20.75	247.1	237.9	4.391	4.218	0.862
July	203.7	72.58	23.97	265.8	256.2	4.674	4.493	0.854
August	184.5	65.01	23.75	241.6	232.7	4.265	4.100	0.857
September	133.2	54.37	18.53	171.9	165.2	3.133	3.014	0.885
October	98.2	49.37	14.86	124.4	119.0	2.329	2.243	0.911
November	58.3	31.33	10.51	75.2	71.7	1.436	1.380	0.927
December	46.1	29.06	6.58	56.2	53.3	1.093	1.048	0.941
Year	1491.9	628.66	13.83	1915.6	1839.5	35.069	33.714	0.889

Legends

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



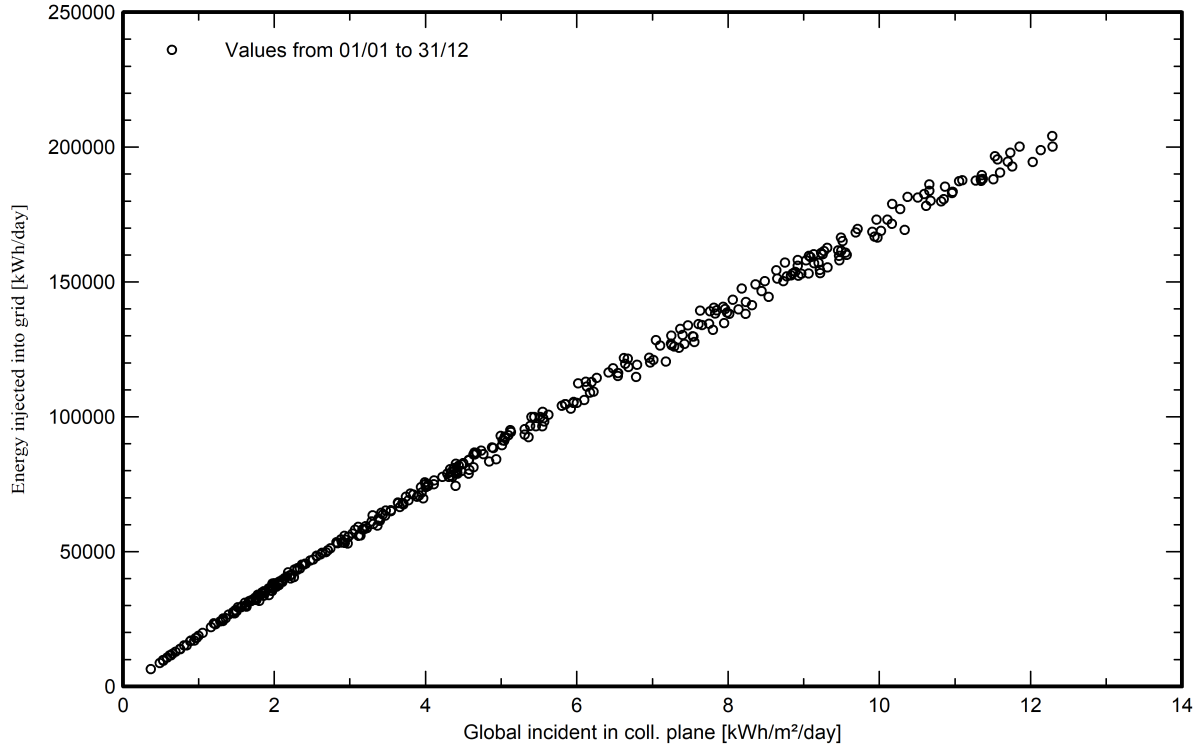
Loss diagram





Special graphs

Daily Input/Output diagram



System Output Power Distribution

