

IMPIANTO AGRIVOLTAICO EG ORTENSIA SRL E OPERE CONNESSE

POTENZA IMPIANTO 24,94 MWp - COMUNE DI VITERBO (VT)

Proponente

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Titolo Elaborato

STIMA PRODUCIBILITÀ

LIVELLO PROGETTAZIONE	CODICE ELABORATO	FILE NAME	DATA
DEFINITIVO	PD_REL04	IT-2021-0243_PD_REL04.00-Stima producibilità.docx	02/09/2022

Revisioni

REV.	DATA	DESCRIZIONE	ESEGUITO	VERIFICATO	APPROVATO
0	02/09/22	EMISSIONE PER PERMITTING	FTE	FTE	FTE



COMUNE DI VITERBO (VT)
REGIONE LAZIO



STIMA PRODUCIBILITÀ



PVsyst - Simulation report

Grid-Connected System

Project: Turo Fiorentino

Variant: Turo Fiorentino_CSI690W 11.3m 2VT 24.94MWp - 1836_18.7km 36kV_ALONE

Tracking system with backtracking

System power: 24.94 MWp

Turo Fiorentini - Viterbo - Italy

Author

Enfinity Iberia SLU (Spain)



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VC5, Simulation date:
18/07/22 17:27
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Project summary

Geographical Site
Turo Fiorentini - Viterbo
Italy

Situation
Latitude 42.47 °N
Longitude 11.93 °E
Altitude 256 m
Time zone UTC

Project settings
Albedo 0.20

Meteo data

Turo Fiorentini - Viterbo
SolarGIS Monthly aver. , period not spec. - Synthetic

System summary

Grid-Connected System

PV Field Orientation

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

Tracking system with backtracking

Tracking algorithm
Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings

System information

PV Array

Nb. of modules 36148 units
Pnom total 24.94 MWp

Inverters

Nb. of units 7 units
Pnom total 24.83 MWac
Grid power limit 22.40 MVA
Grid lim. Pnom ratio 1.113

User's needs

Unlimited load (grid)

Results summary

Produced Energy	46 GWh/year	Specific production	1836 kWh/kWp/year	Perf. Ratio PR	89.20 %
Apparent energy	45790 MVAh				

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General parameters

Grid-Connected System

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Orientation

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

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Free Horizon

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 11.30 m
Tracker width 4.92 m
GCR 43.5 %
Axis height above ground 2.10 m

Tracking system with backtracking

Tracking algorithm

Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings

Backtracking array

Nb. of trackers 506 units

Sizes

Tracker Spacing 11.3 m
Collector width 4.92 m
Ground Cov. Ratio (GCR) 43.5 %
Phi min / max. +/- 60.0 °

Backtracking strategy

Phi limits +/- 64.1 °
Backtracking pitch 11.3 m
Backtracking width 4.92 m

User's needs

Unlimited load (grid)

Bifacial model definitions

Ground albedo average 0.17
Bifaciality factor 80 %
Rear shading factor 4.0 %
Rear mismatch loss 3.0 %
Shed transparent fraction 4.0 %

Monthly ground albedo values

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year
0.16	0.16	0.17	0.19	0.19	0.18	0.18	0.17	0.15	0.15	0.15	0.16	0.17

Grid injection point

Grid power limitation

Apparent power 22.40 MVA
Pnom ratio 1.113

Power factor

Cos(phi) (leading) 1.000

PV Array Characteristics

PV module

Manufacturer CSI Solar Co., Ltd.
Model CS7N-690TB-AG 1500V
(Custom parameters definition)
Unit Nom. Power 690 Wp
Number of PV modules 36148 units
Nominal (STC) 24.94 MWp
Modules 1291 Strings x 28 In series

At operating cond. (50°C)

Pmpp 23.08 MWp
U mpp 1016 V
I mpp 22710 A

Inverter

Manufacturer Ingeteam
ModelS_3Power_3825TL_C640_IP65 [2021-12-03_up to 50°C]
(Custom parameters definition)
Unit Nom. Power 3547 kVA
Number of inverters 7 units
Total power 24829 kVA
Operating voltage 909-1300 V
Pnom ratio (DC:AC) 1.00



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PV Array Characteristics

Total PV power		Total inverter power	
Nominal (STC)	24942 kWp	Total power	24829 kVA
Total	36148 modules	Number of inverters	7 units
Module area	112288 m ²	Pnom ratio	1.00

Array losses

Array Soiling Losses		Thermal Loss factor		DC wiring losses				
Loss Fraction	1.5 %	Module temperature according to irradiance		Global array res.	0.73 mΩ			
		Uc (const)	30.0 W/m ² K	Loss Fraction	1.5 % at STC			
		Uv (wind)	1.2 W/m ² K/m/s					
LID - Light Induced Degradation		Module Quality Loss		Module mismatch losses				
Loss Fraction	1.5 %	Loss Fraction	-0.4 %	Loss Fraction	2.0 % at MPP			
Strings Mismatch loss								
Loss Fraction	0.1 %							
IAM loss factor								
Incidence effect (IAM): User defined profile								
20°	40°	60°	65°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.990	0.960	0.920	0.840	0.720	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	640 Vac tri
Loss Fraction	0.80 % at STC
Inverter: IS_3Power_3825TL_C640_IP65 [2021-12-03_up to 50°C]	
Wire section (7 Inv.)	Copper 7 x 3 x 2000 mm ²
Average wires length	100 m
MV line up to Injection	
MV Voltage	36 kV
Wires	Copper 3 x 400 mm ²
Length	18800 m
Loss Fraction	1.67 % at STC

AC losses in transformers

MV transfo	
Grid voltage	36 kV
Operating losses at STC	
Nominal power at STC	24522 kVA
Iron loss (night disconnect)	24.52 kW
Loss Fraction	0.10 % at STC
Coils equivalent resistance	3 x 0.18 mΩ
Loss Fraction	1.10 % at STC



Project: Turo Fiorentino

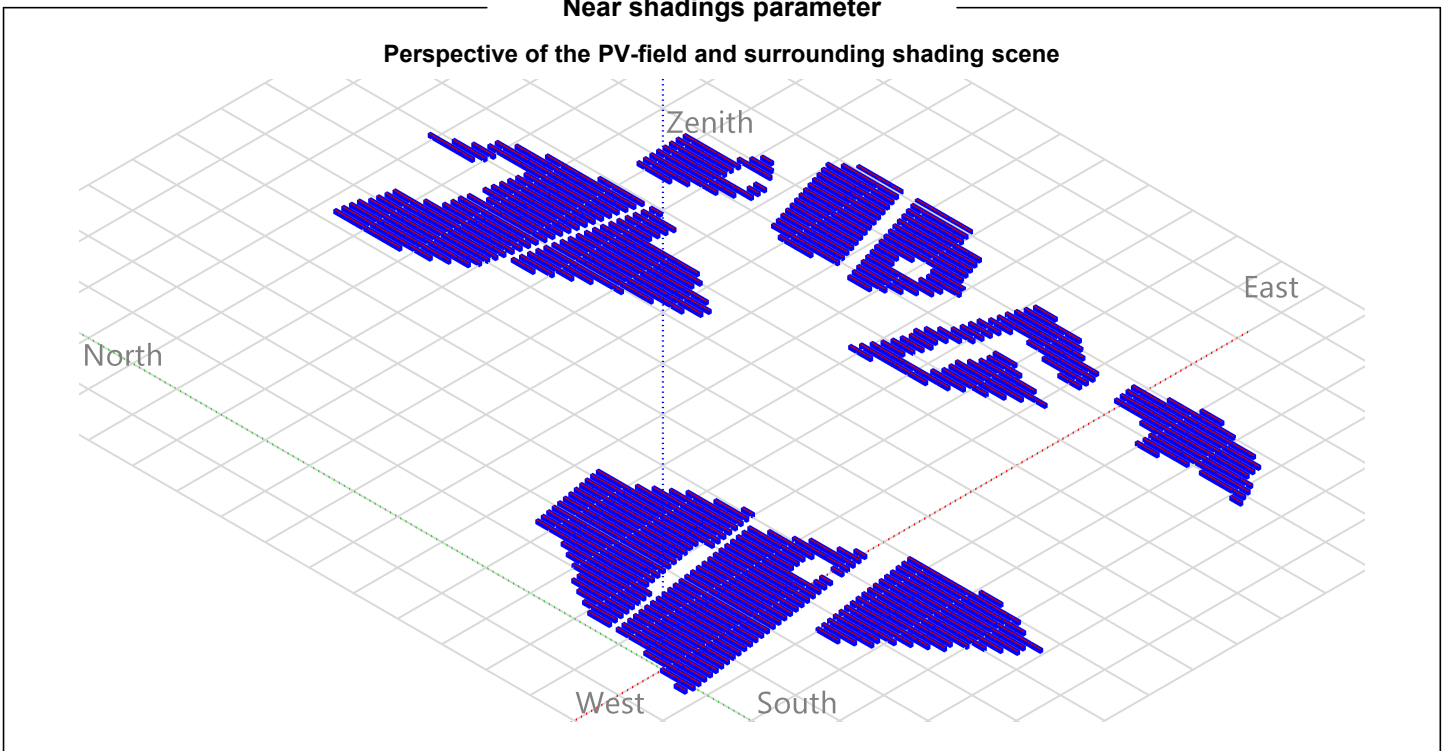
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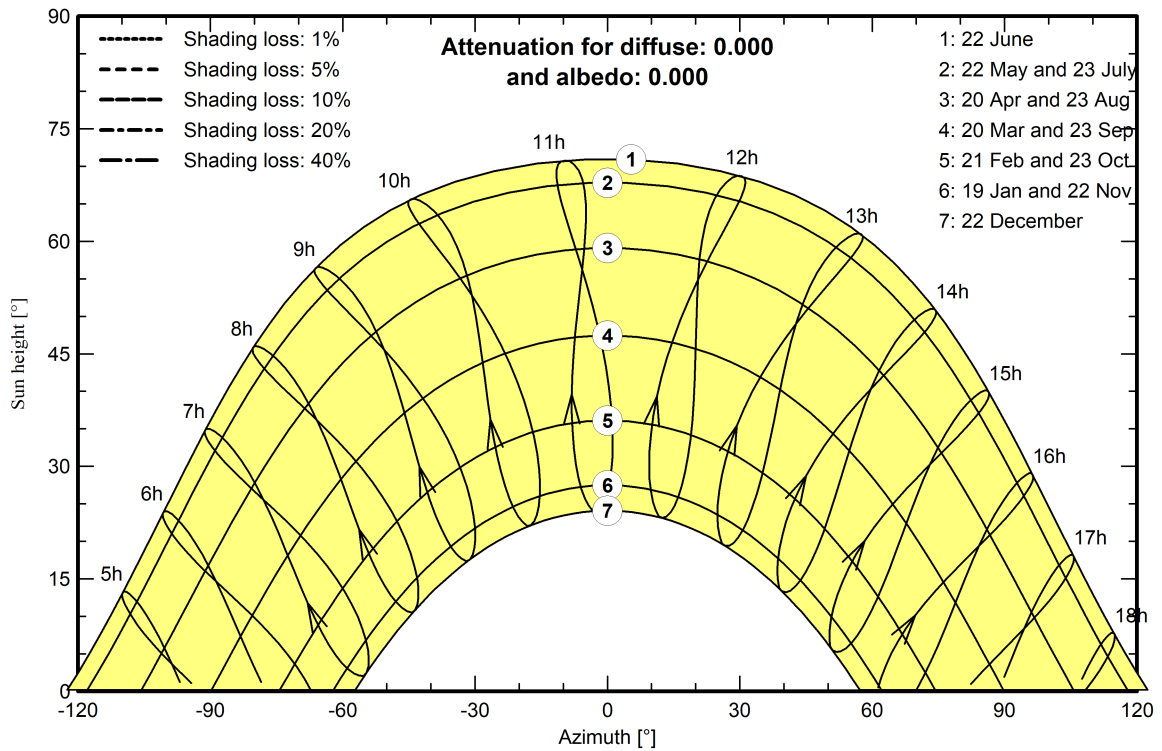
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Near shadings parameter



Iso-shadings diagram

Orientation #1





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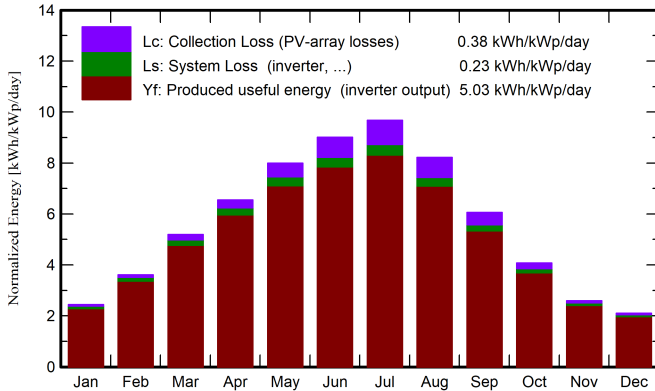
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Main results

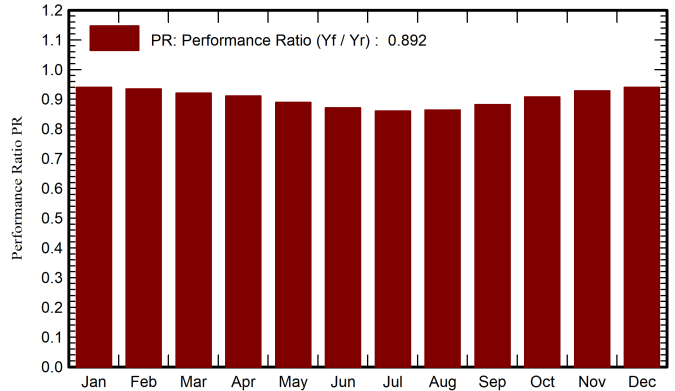
System Production

Produced Energy	46 GWh/year	Specific production	1836 kWh/kWp/year
Apparent energy	45790 MVAh	Performance Ratio PR	89.20 %

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	56.1	24.50	7.20	75.6	73.6	1.849	1.774	0.941
February	75.9	30.60	7.70	101.0	98.6	2.459	2.357	0.935
March	122.2	49.20	10.20	161.0	157.2	3.865	3.698	0.921
April	151.7	63.20	13.20	196.5	192.0	4.672	4.465	0.911
May	192.6	77.50	17.40	247.9	242.4	5.769	5.502	0.890
June	209.9	77.10	21.60	270.3	264.5	6.164	5.877	0.872
July	226.0	71.20	24.40	299.8	293.5	6.751	6.435	0.860
August	195.3	66.70	24.40	254.8	249.3	5.754	5.489	0.864
September	137.8	55.30	20.20	181.6	177.3	4.178	3.996	0.882
October	96.7	42.60	16.30	126.4	123.2	2.985	2.864	0.908
November	57.9	27.40	11.80	77.9	75.9	1.881	1.805	0.929
December	48.2	21.40	8.20	65.2	63.2	1.591	1.528	0.940
Year	1570.3	606.70	15.26	2058.1	2010.6	47.917	45.790	0.892

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		



Project: Turo Fiorentino

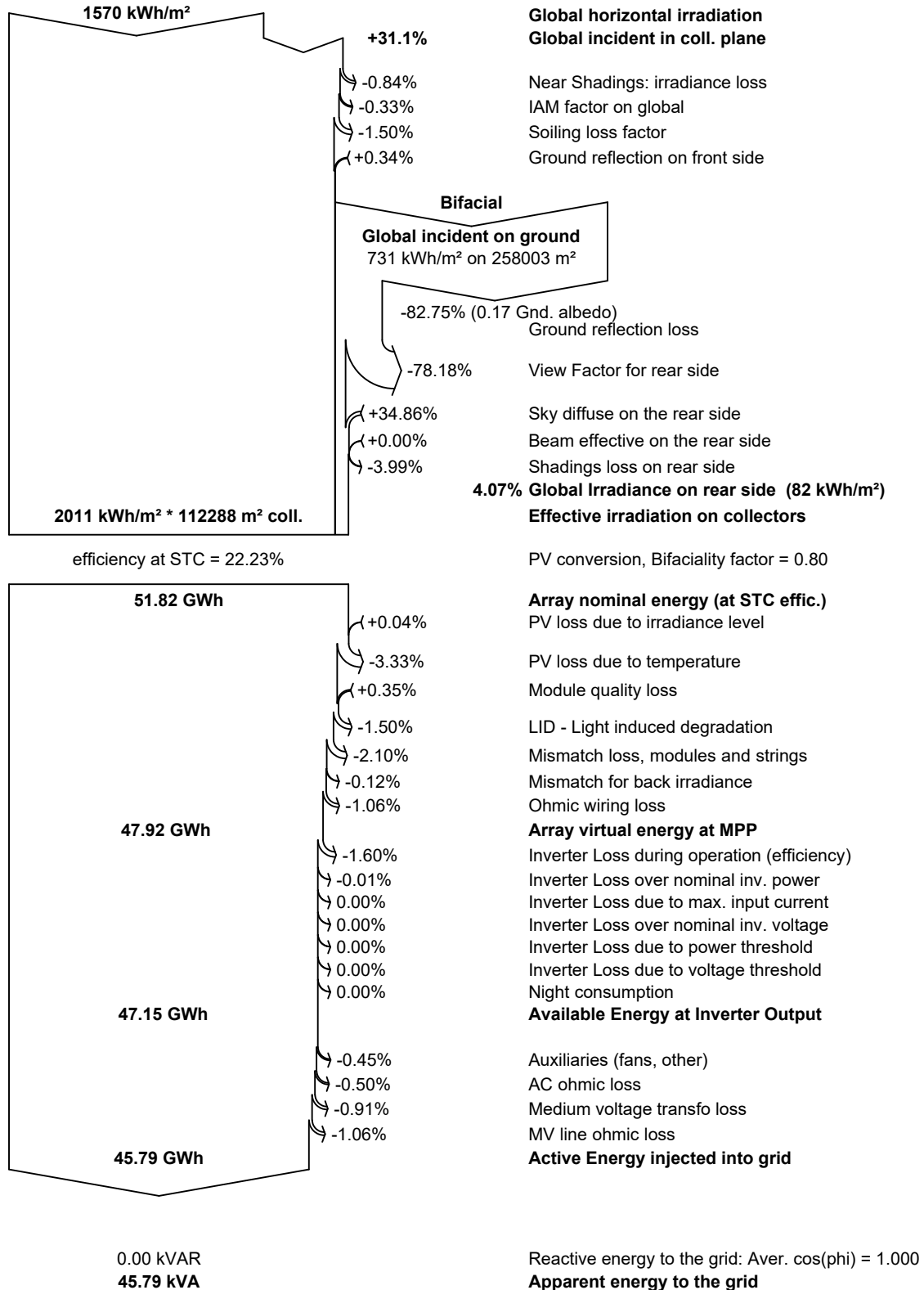
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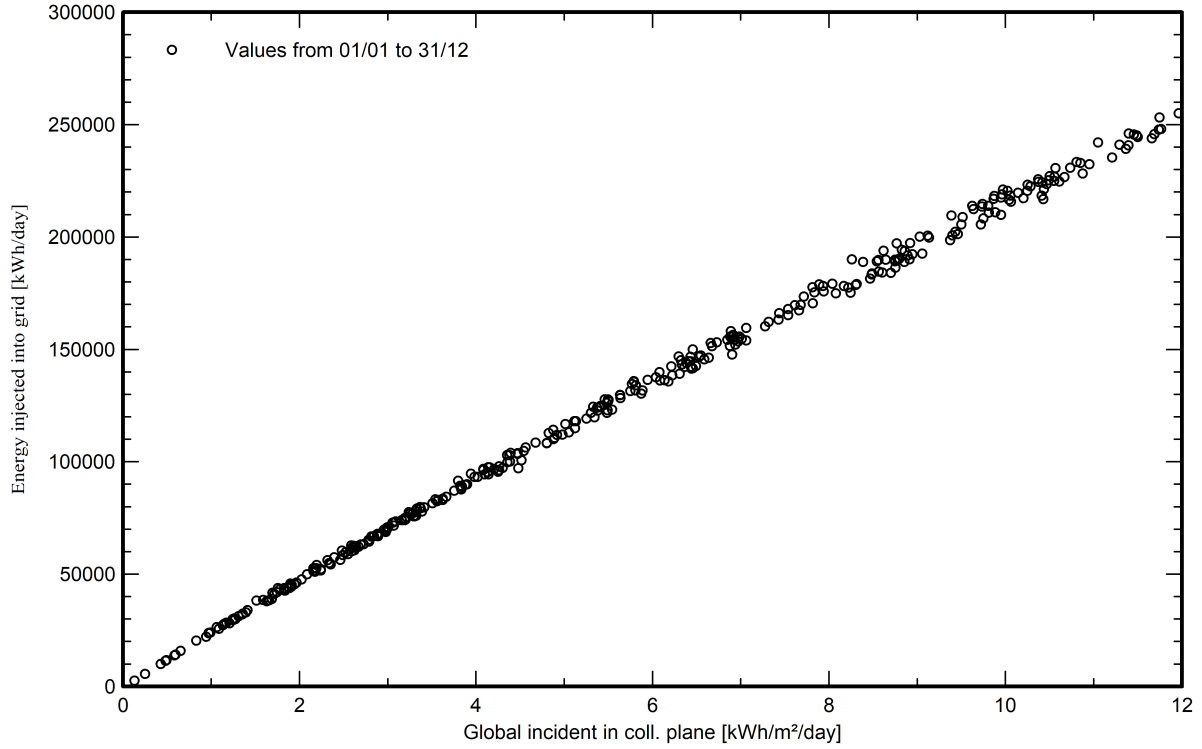
Loss diagram





Special graphs

Daily Input/Output diagram



System Output Power Distribution

