

Regione
Emilia Romagna



Provincia di
Bologna



Comune di
Ozzano dell'Emilia



PARCO FOTOVOLTAICO E RELATIVE OPERE DI CONNESSIONE ALLA RTN DI POTENZA PARI A 36 MW_p NEL COMUNE DI OZZANO DELL'EMILIA (BO).

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Scala

n.d.

Titolo elaborato:

Simulazione PVsyst

Formato

A4

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CODICE ELABORATO

PROGETTO	CLASSE	TIPO	PROG.
RVFVER30	VIA2	R	22

Rev.	Data	Descrizione	Redige	Verifica	Approva
00	11/23	Prima emissione	SR	RC	GC
01					
02					
03					
04					
05					
06					

Società proponente:

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PVsyst - Simulation report

Grid-Connected System

Project: Ozzano dell'emilia 1

Variant: Ozzano dell'Emilia

Tracking system with backtracking

System power: 35.94 MWp

Ponte Rizzoli - Italia



Project: Ozzano dell'emilia 1

Variant: Ozzano dell'Emilia

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24/08/23 15:08
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Project summary

Geographical Site

Ponte Rizzoli
Italia

Situation

Latitude 44.48 °N
Longitude 11.51 °E
Altitude 40 m
Time zone UTC+1

Project settings

Albedo 0.20

Meteo data

Cà Bassone
PVGIS api TMY

System summary

Grid-Connected System

PV Field Orientation

Tracking plane, horizontal N-S axis
Axis azimuth 22 °

Tracking system with backtracking

Near Shadings

Linear shadings

User's needs

Unlimited load (grid)

System information

PV Array

Nb. of modules 52472 units
Pnom total 35.94 MWp

Inverters

Nb. of units 100 units
Pnom total 32.00 MWac
Pnom ratio 1.123

Results summary

Produced Energy 60230 MWh/year Specific production 1676 kWh/kWp/year Perf. Ratio PR 89.17 %

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General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Tracking plane, horizontal N-S axis
Axis azimuth 22 °

Horizon

Average Height 0.8 °

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 6.00 m
Tracker width 2.38 m
GCR 39.7 %
Axis height above ground 2.40 m

Tracking system with backtracking**Backtracking strategy**

Nb. of trackers 1891 units
Sizes
Tracker Spacing 6.00 m
Collector width 2.38 m
Ground Cov. Ratio (GCR) 39.7 %
Phi min / max. +/- 60.0 °

Backtracking limit angle

Phi limits +/- 66.4 °

Near Shadings

Linear shadings

Models used

Transposition Perez
Diffuse Imported
Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer Risen Energy Co., Ltd
Model RSM132-8-685BNDG

(Original PVsyst database)

Unit Nom. Power 685 Wp
Number of PV modules 52472 units
Nominal (STC) 35.94 MWp
Modules 1874 Strings x 28 In series

At operating cond. (50°C)

Pmpp 33.08 MWp
U mpp 1018 V
I mpp 32500 A

Total PV power

Nominal (STC) 35943 kWp
Total 52472 modules
Module area 162997 m²
Cell area 152725 m²

Inverter

Manufacturer Sungrow
Model SG350HX-20A-Preliminary

(Original PVsyst database)

Unit Nom. Power 320 kWac
Number of inverters 100 units
Total power 32000 kWac
Operating voltage 500-1500 V
Max. power (=>30°C) 352 kWac
Pnom ratio (DC:AC) 1.12

Total inverter power

Total power 32000 kWac
Nb. of inverters 100 units
Pnom ratio 1.12



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Array losses

Array Soiling Losses

Loss Fraction 1.0 %

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. 0.45 mΩ
Loss Fraction 1.3 % 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): 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

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 800 Vac tri
Loss Fraction 2.00 % at STC

Inverter: SG350HX-20A-Preliminary

Wire section (100 Inv.) Alu 100 x 3 x 240 mm²
Average wires length 275 m

MV line up to Injection

MV Voltage 36 kV
Average each inverter
Wires Alu 3 x 185 mm²
Length 600 m
Loss Fraction 0.03 % at STC

AC losses in transformers

MV transfo

Grid voltage 36 kV

Operating losses at STC

Nominal power at STC 35417 kVA
Iron loss (24/24 Connexion) 3.54 kW/Inv.
Loss Fraction 0.10 % at STC
Coils equivalent resistance 3 x 1.81 mΩ/inv.
Loss Fraction 1.00 % at STC



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Horizon definition

Horizon from PVGIS website API, Lat=44°28'34", Long=11°30'37", Alt=33m

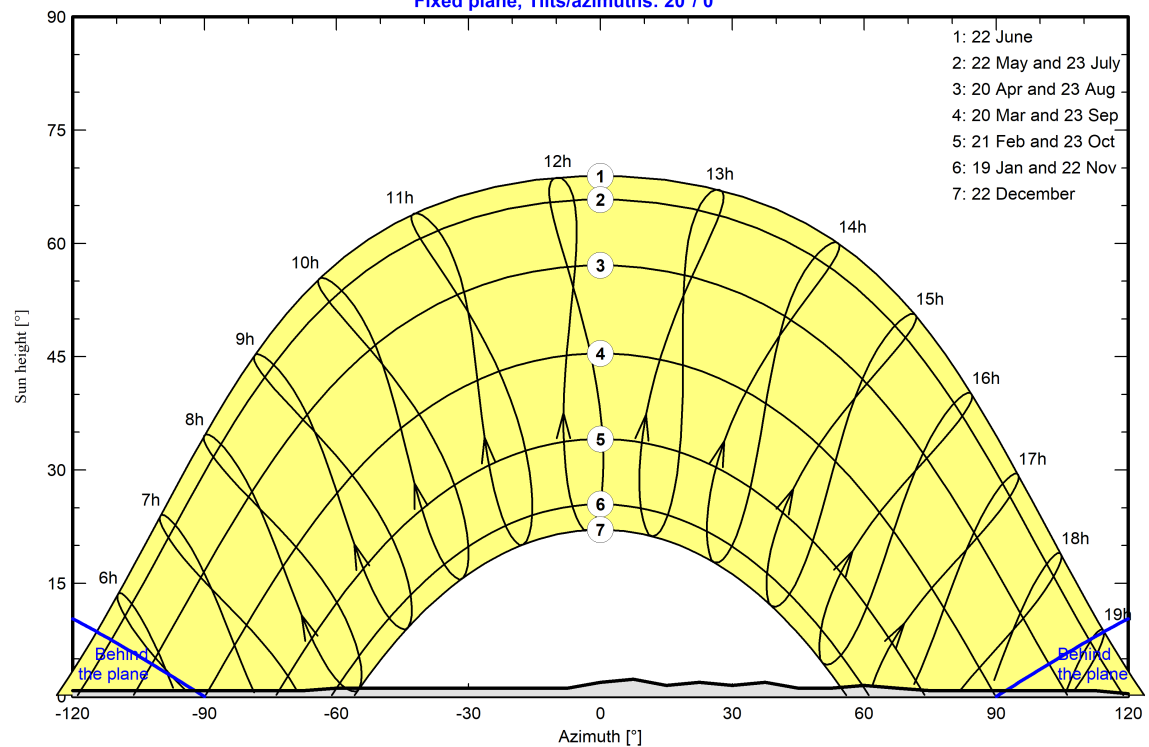
Average Height	0.8 °	Albedo Factor	0.97
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-150	-143	-68	-60	-8	0	8	15	23	30	38	45
Height [°]	0.0	0.0	0.8	0.8	1.1	1.1	1.9	2.3	1.5	1.9	1.5	1.9	1.1
Azimuth [°]	53	60	68	75	113	128	135	150	158	165	173	180	
Height [°]	1.1	1.5	1.1	0.8	0.8	0.0	0.4	0.4	0.0	0.4	0.4	0.0	

Sun Paths (Height / Azimuth diagram)

Fixed plane, Tilts/azimuths: 20°/ 0°





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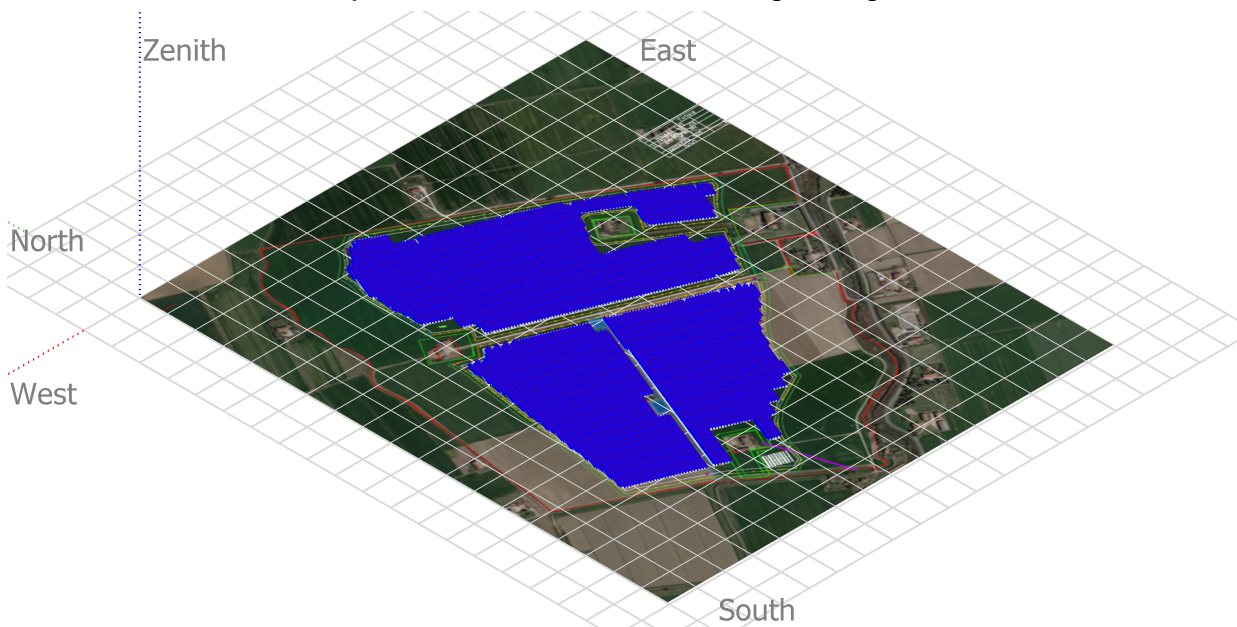
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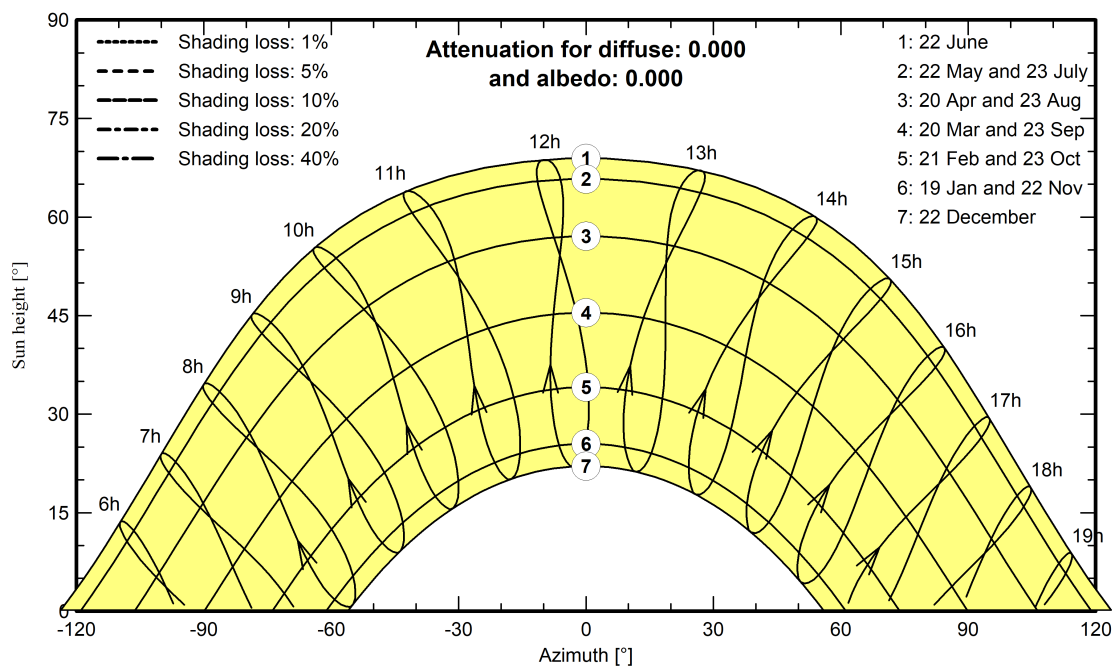
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Ozzano dell'emilia 1 - Legal Time





Project: Ozzano dell'emilia 1

Variant: Ozzano dell'Emilia

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Main results

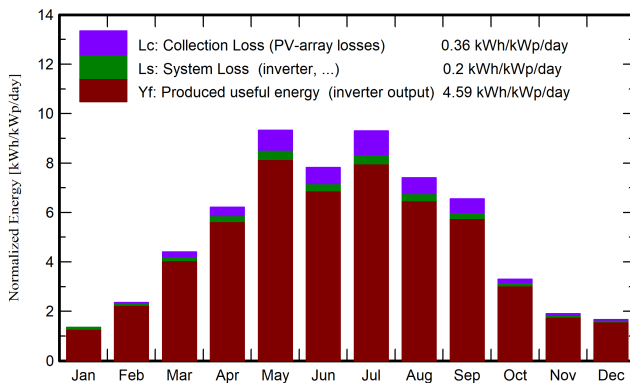
System Production

Produced Energy 60230 MWh/year

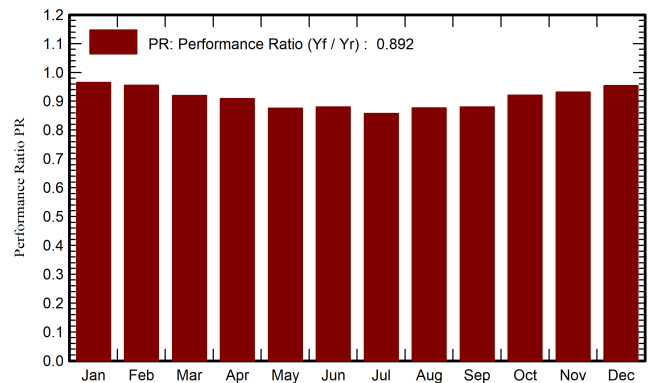
Specific production
Performance Ratio PR

1676 kWh/kWp/year
89.17 %

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
January	34.7	25.83	2.52	41.4	39.4	1505	1436	0.965
February	52.1	29.13	4.01	66.0	63.6	2366	2269	0.956
March	104.1	46.99	10.66	136.7	132.5	4714	4521	0.920
April	147.8	65.26	14.62	186.2	180.8	6344	6083	0.909
May	219.6	65.20	19.50	289.0	281.9	9508	9092	0.875
June	187.4	79.81	22.65	234.5	228.2	7741	7422	0.880
July	222.6	71.66	26.34	288.4	281.2	9292	8892	0.858
August	178.7	70.42	23.65	229.6	223.3	7547	7234	0.877
September	146.6	49.99	22.83	196.6	191.4	6482	6218	0.880
October	78.1	39.50	13.70	102.3	98.9	3531	3389	0.921
November	43.9	23.68	10.50	57.1	54.9	2000	1911	0.932
December	38.4	21.80	3.59	51.4	49.2	1844	1764	0.954
Year	1454.0	589.27	14.60	1879.2	1825.2	62875	60230	0.892

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

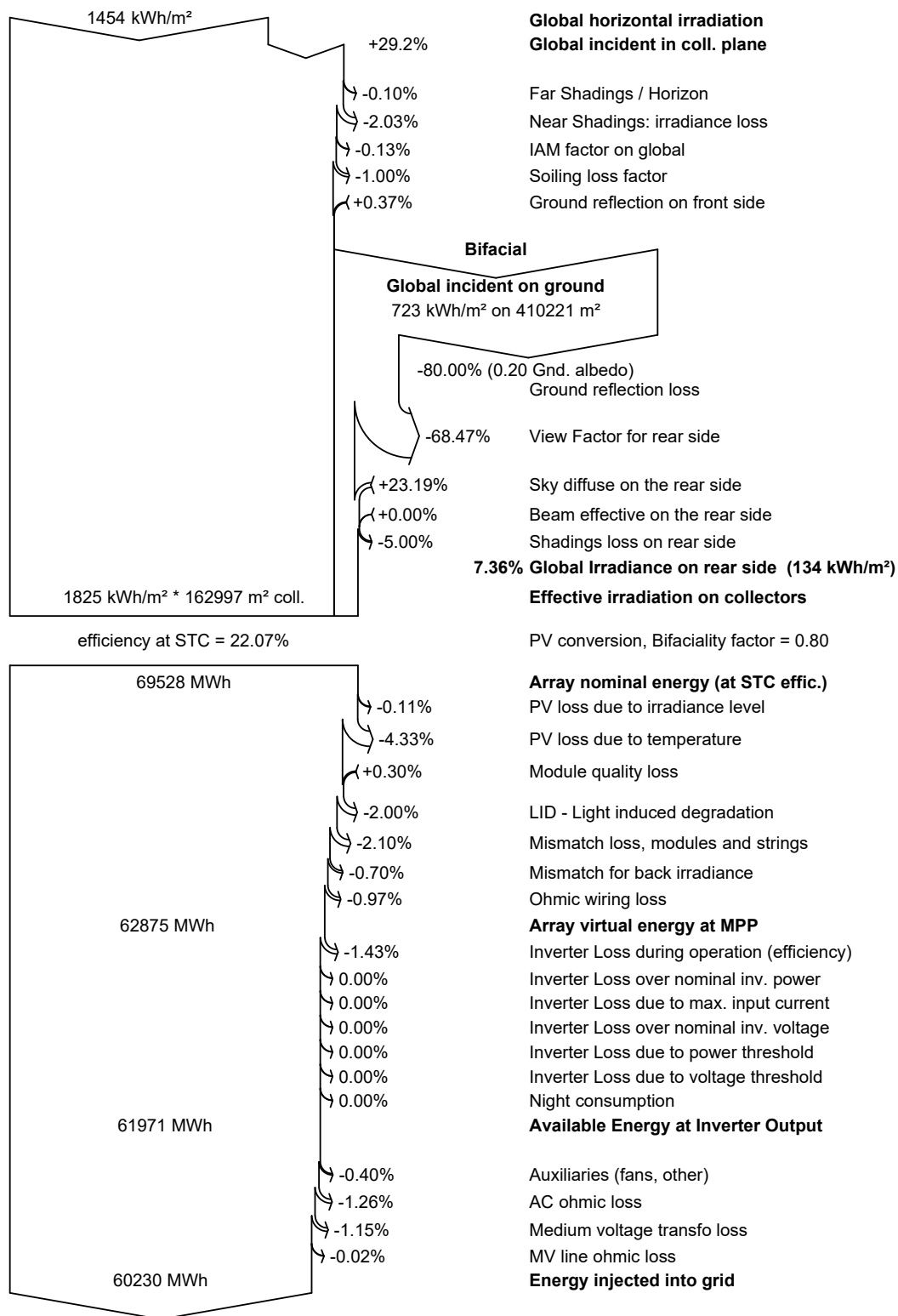
EArray Effective energy at the output of the array
E_Grid Energy injected into grid
PR Performance Ratio



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Loss diagram





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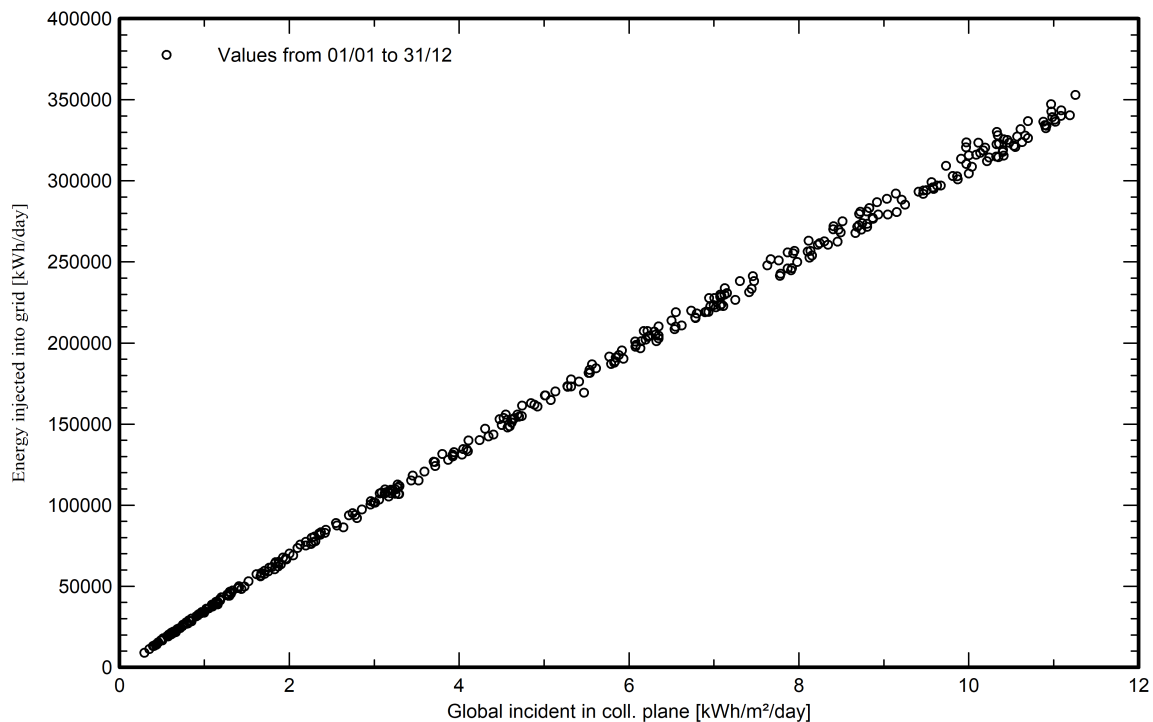
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Special graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

