

REGIONE EMILIA ROMAGNA
PROVINCIA DI FERRARA
COMUNE DI JOLANDA DI SAVOIA

Progetto: **PROVVEDIMENTO AUTORIZZATORIO UNICO
REGIONALE (P.A.U.R.)**
(ai sensi dell'articolo 27 bis del D.Lgs. 152/2006)

**REALIZZAZIONE IMPIANTO AGRIVOLTAICO
DI PRODUZIONE DI ENERGIA DA FONTE SOLARE
DENOMINATO "JOLANDA ZARDI"
DI POTENZA IN IMMISSIONE PARI A 22.274,20 kWp**
Impianto sito nel Comune di Jolanda di Savoia,
Via Rossetta n. snc
44035 - Jolanda di Savoia (FE)

Committente: **SOLAR PV 18 S.R.L.**
Piazza Castello 19
20121 Milano (MI)



Progettisti: **STERN DEVELOPMENT S.r.l.**
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Elaborato:

Elaborato n.:
PD_REL03

DATI TECNICI IMPIANTO E PRODUCIBILITA'

Scala:

Data:
13/10/2025

SOCIETA'	
Società di Progetto	Solar PV18 Srl
Sede legale	Milano (MI) Piazza Castello 19 cap 20121
P.IVA	12987310963
PEC	solarpv18@legalmail.it
INQUADRAMENTO IMPIANTO	
Denominazione	Jolanda Zardi
Indirizzo	Via Rossetta snc.
Latitudine (°)	44.839804°
Longitudine (°)	11.901068°
Caratteristiche	Agrivoltaico standard, aree idonee in virtù della vicinanza a impianto industriale/stabilimento secondo d.lgs 199/2021 art. 20 comma 8 lettera c-ter punto 2
UBICAZIONE	
Regione	Emilia-Romagna
Provincia	Ferrara
Comune	Jolanda di Savoia
Località	Via Rossetta snc.
Sezione	-
Foglio	61
Particelle	28, 29
Foglio	62
Particelle	8, 12, 20, 22, 24, 27
Zonizzazione RUE	Ambiti ad alta vocazione produttiva agricola, art. 2.3.1 delle Norme di Piano.
AREE E PERIMETRI	
Perimetro recinto impianto (m)	2175,98
Area recintata impianto (mq.)	261711,36
Area captante moduli (mq.)	92564,31
Riduzione annua CO2	
Produzione annua (kWh)	35201000
CO2 evitata (ton)	16361,4248
Conneessione	
Comune	Tresignana
Tensione	30000 V
Ente gestore pratica	E-distribuzione
Codice Pratica	392211454
Data accettazione STMG	13/11/2024
Opere Necessarie	posa 1 cabina di smistamento, posa di cavidotto di vettoriameto MT, realizzazione SEU, posa cavidotto AT e ampliamento CP "tresigallo"
Lunghezza Cavidotto MT	1470,33 m
Lunghezza Cavidotto AT	113,7 m
CORRENTE CONTINUA	
Moduli fotovoltaici (marca e modello)	JINKO - Tiger Neo N-type -JKM625-650N-66HL4M-BDV
Potenza Unitaria moduli	650
Num. Moduli	34268
Base modulo	1,134
Altezza modulo	2,382
Area Unitaria modulo	2,701188
Moduli/Stringa da 26	52
Num. Stringhe da 26	653
Moduli/Stringa da 13	26
Num. Stringhe da 13	12
Potenza installata moduli (DC)	22274,2
CORRENTE ALTERNATA	
Inverter (marca e modello)	Solis-(215-255)K-EHV-5G
Potenza Unitaria inverter	255
Num. Inverter	90
Potenza immissione in rete	22950
Potenza immissione da STMG (AC)	21000
CABINE E TRASFORMATORI	
Potenza Unitaria Trasformatori	4000 kVA
Num. Trasformatori	5
Num. Cabine di Campo	5
Num. Trafo/cabina	1

N. Cdc adibite a locale utente	1
Tot. Cabine	6
STRUTTURE	
Tipologia	Tracker
Configurazione strutture (1P/4L/...)	2 P (2 moduli verticali)
Tilt	± 45°
Altezza minma strutture p.c.	1,3
Altezza massima strutture p.c.	4,704
Interfila (pitch)	10,8
Distanza tra moduli	6,016

PVsyst - Simulation report

Grid-Connected System

Project: JOLANDA DI SAVOIA

Variant: jinko 650Wp_solaranywhere

Tracking system with backtracking

System power: 22.27 MWp

(44.8516 11.8883) - Italy

Author

Stern Energy SPA (Italy)



Project summary

Geographical Site

(44.8516 11.8883)

Italy

Situation

Latitude 44.85 °(N)

Longitude 11.85 °(E)

Altitude 10 m

Time zone UTC+1

Project settings

Albedo 0.25

Weather data

(44.8516 11.8883) Jolanda di Savoia

Solar Anywhere, satellite data, SUNY model - 1990

System summary

Grid-Connected System

Simulation for year no 1

Orientation #1

Tracking plane, horizontal N-S axis

Axis azimuth 1.5 °

Phi min / max. -/+ 45 °

Diffuse shading all trackers

Tracking algorithm

Astronomic calculation

Backtracking activated

System information

PV Array

Nb. of modules 34268 units

Pnom total 22.27 MWp

Inverters

Nb. of units 90 units

Total power 22950 kWac

Pnom ratio 0.97

Tracking system with backtracking

Orientation #2

Tracking plane, horizontal N-S axis

Axis azimuth 4.6 °

Phi min / max. -/+ 45 °

Diffuse shading all trackers

Tracking algorithm

Astronomic calculation

Backtracking activated

Near Shadings

Detailed electrical calculation
acc. to module layout : Slow (simul.)

User's needs

Unlimited load (grid)

Results summary

Produced Energy 35201 MWh/year Specific production 1580 kWh/kWp/year Perf. Ratio PR 85.36 %

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PVsyst V8.0.13

VC2, Simulation date:
10/07/25 14:13
with V8.0.13

Stern Energy SPA (Italy)

General parameters

Grid-Connected System

Orientation #1

Tracking plane, horizontal N-S axis

Axis azimuth 1.5 °
Phi min / max. +/- 45 °
Diffuse shading all trackers

Tracking algorithm

Astronomic calculation
Backtracking activated

Tracking system with backtracking

Field properties

Nb. of trackers 409 units
Tracking plane, horizontal N-S axis

Sizes

Tracker Spacing 10.9 m
Sensitive width 4.78 m
Average GCR 44.0 %

Backtracking limit angle

Phi limits +/- 63.9 °

Backtracking parameters

Backtracking pitch 10.8 m
Backtracking width 4.78 m
Left inactive band 0.00 m
Right inactive band 0.00 m
GCR Backtracking 44.4 %
Parameters choice:Automatic

Models used

Transposition	Perez
Diffuse	Imported
Circumsolar	separate

Orientation #2

Tracking plane, horizontal N-S axis

Axis azimuth 4.6 °
Phi min / max. +/- 45 °
Diffuse shading all trackers

Tracking algorithm

Astronomic calculation
Backtracking activated

Field properties

Nb. of trackers 256 units
Tracking plane, horizontal N-S axis

Sizes

Tracker Spacing 10.8 m
Sensitive width 4.78 m
Average GCR 44.4 %

Backtracking limit angle

Phi limits +/- 63.7 °

Backtracking parameters

Backtracking pitch 10.8 m
Backtracking width 4.78 m
Left inactive band 0.00 m
Right inactive band 0.00 m
GCR Backtracking 44.4 %
Parameters choice:Automatic

Horizon

Free Horizon

Near Shadings

Detailed electrical calculation
acc. to module layout : Slow (simul.)

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer Jinko Solar Co., Ltd.
Model JKM650N-66HL4M-BDV
(Custom parameters definition)
JKM650N-66HL4M-BDV.PAN
Unit Nom. Power 650 Wp
Number of PV modules 34268 units
Nominal (STC) 22.27 MWp

Inverter

Manufacturer Solis
Model Solis_255K_EHV_5G_PLUS
(Original PVsyst database)
Unit Nom. Power 255 kWac
Number of inverters 90 units
Total power 22950 kWac



PV Array Characteristics

Array #1 - GRID 1 - CTR 1

Orientation	#1		
Tilt/Azimuth	0/92 °		
Number of PV modules	6708 units	Number of inverters	18 units
Nominal (STC)	4360 kWp	Total power	4590 kWac
Modules	258 string x 26 In series		
At operating cond. (50°C)		Operating voltage	480-1500 V
Pmpp	4065 kWp	Pnom ratio (DC:AC)	0.95
U mpp	1002 V	Power sharing within this inverter	
I mpp	4059 A		

Array #2 - GRID 1 - CTR 2

Orientation	#1		
Tilt/Azimuth	0/92 °		
Number of PV modules	6604 units	Number of inverters	18 units
Nominal (STC)	4293 kWp	Total power	4590 kWac
Modules	254 string x 26 In series		
At operating cond. (50°C)		Operating voltage	480-1500 V
Pmpp	4002 kWp	Pnom ratio (DC:AC)	0.94
U mpp	1002 V	Power sharing within this inverter	
I mpp	3996 A		

Array #3 - GRID 1 - CTR 3

Orientation	#2		
Tilt/Azimuth	0/95 °		
Number of PV modules	6812 units	Number of inverters	18 units
Nominal (STC)	4428 kWp	Total power	4590 kWac
Modules	262 string x 26 In series		
At operating cond. (50°C)		Operating voltage	480-1500 V
Pmpp	4128 kWp	Pnom ratio (DC:AC)	0.96
U mpp	1002 V	Power sharing within this inverter	
I mpp	4122 A		

Array #4 - GRID 2 - CTR 4

Mixed orient.			
#1/#2: 32/246 strings			
Tilt/Azimuth	0/92 ° 0/95 °		
Number of PV modules	7228 units	Number of inverters	18 units
Nominal (STC)	4698 kWp	Total power	4590 kWac
Modules	278 string x 26 In series		
At operating cond. (50°C)		Operating voltage	480-1500 V
Pmpp	4381 kWp	Pnom ratio (DC:AC)	1.02
U mpp	1002 V	Power sharing within this inverter	
I mpp	4374 A		

Array #5 - GRID 2 - CTR 5

Orientation	#1		
Tilt/Azimuth	0/92 °		
Number of PV modules	6916 units	Number of inverters	18 units
Nominal (STC)	4495 kWp	Total power	4590 kWac
Modules	266 string x 26 In series		
At operating cond. (50°C)		Operating voltage	480-1500 V
Pmpp	4191 kWp	Pnom ratio (DC:AC)	0.98
U mpp	1002 V	Power sharing within this inverter	
I mpp	4185 A		

**PVsyst V8.0.13**

VC2, Simulation date:

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with V8.0.13

PV Array Characteristics**Total PV power**

Nominal (STC)	22274 kWp
Total	34268 modules
Module area	92564 m ²

Total inverter power

Total power	22950 kWac
Number of inverters	90 units
Pnom ratio	0.97

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

LID - Light Induced Degradation

Loss Fraction 1.5 %

Module Quality Loss

Loss Fraction -0.20 %

Module mismatch losses

Loss Fraction 0.90 % at MPP

Module average degradation

Year no 1
 Loss factor 0.4 %/year
 Imp / Vmp contributions 80% / 20%
Mismatch due to degradation
 Imp RMS dispersion 0.4 %/year
 Vmp RMS dispersion 0.4 %/year

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.999	0.994	0.979	0.925	0.727	0.000

DC wiring losses

Global wiring resistance 1.3 mΩ
 Loss Fraction 2.5 % at STC

Array #1 - GRID 1 - CTR 1

Global array res. 6.6 mΩ
 Loss Fraction 2.5 % at STC

Array #3 - GRID 1 - CTR 3

Global array res. 6.5 mΩ
 Loss Fraction 2.5 % at STC

Array #5 - GRID 2 - CTR 5

Global array res. 6.4 mΩ
 Loss Fraction 2.5 % at STC

Array #2 - GRID 1 - CTR 2

Global array res. 6.7 mΩ
 Loss Fraction 2.5 % at STC

Array #4 - GRID 2 - CTR 4

Global array res. 6.2 mΩ
 Loss Fraction 2.5 % at STC

System losses**Auxiliaries loss**

Proportional to Power 0.4 W/kW
 20.0 kW from Power thresh.
 Night aux. cons. 100 W



AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 2.20 % at STC

Inverter: Solis_255K_EHV_5G_PLUS

Wire section (90 Inv.) Copper 90 x 3 x 300 mm²
Average wires length 924 m

MV line up to Injection

MV Voltage 20 kV
Average loss Fraction 0.45 % at STC

Array #1 - GRID 1 - CTR 1

Wires Alu 3 x 300 mm²
Length 17775 m

Array #3 - GRID 1 - CTR 3

Wires Alu 3 x 300 mm²
Length 200 m

Array #5 - GRID 2 - CTR 5

Wires Alu 3 x 300 mm²
Length 300 m

Array #2 - GRID 1 - CTR 2

Wires Alu 3 x 300 mm²
Length 150 m

Array #4 - GRID 2 - CTR 4

Wires Alu 3 x 300 mm²
Length 1000 m

**AC losses in transformers****MV transfo**

Grid voltage 20 kV

One transfo in each sub-array

Array #1 - GRID 1 - CTR 1**Transformer parameters**

Nominal power at STC 4.29 MVA

Iron Loss (24/24 Connexion) 4.59 kVA

Iron loss fraction 0.11 % at STC

Copper loss 40.03 kVA

Copper loss fraction 0.93 % at STC

Coils equivalent resistance 3 x 1.39 mΩ

Array #2 - GRID 1 - CTR 2**Transformer parameters**

Nominal power at STC 4.22 MVA

Iron Loss (24/24 Connexion) 4.59 kVA

Iron loss fraction 0.11 % at STC

Copper loss 38.80 kVA

Copper loss fraction 0.92 % at STC

Coils equivalent resistance 3 x 1.39 mΩ

Array #3 - GRID 1 - CTR 3**Transformer parameters**

Nominal power at STC 4.35 MVA

Iron Loss (24/24 Connexion) 4.59 kVA

Iron loss fraction 0.11 % at STC

Copper loss 41.27 kVA

Copper loss fraction 0.95 % at STC

Coils equivalent resistance 3 x 1.39 mΩ

Array #4 - GRID 2 - CTR 4**Transformer parameters**

Nominal power at STC 4.62 MVA

Iron Loss (24/24 Connexion) 4.59 kVA

Iron loss fraction 0.10 % at STC

Copper loss 46.45 kVA

Copper loss fraction 1.01 % at STC

Coils equivalent resistance 3 x 1.39 mΩ

Array #5 - GRID 2 - CTR 5**Transformer parameters**

Nominal power at STC 4.42 MVA

Iron Loss (24/24 Connexion) 4.59 kVA

Iron loss fraction 0.10 % at STC

Copper loss 42.54 kVA

Copper loss fraction 0.96 % at STC

Coils equivalent resistance 3 x 1.39 mΩ



Main results

System Production

Produced Energy

35201 MWh/year

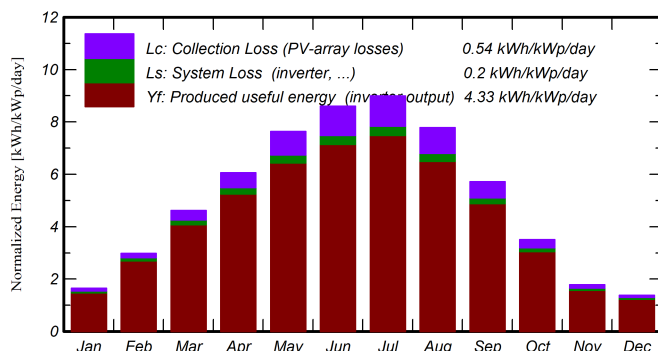
Specific production

1580 kWh/kWp/year

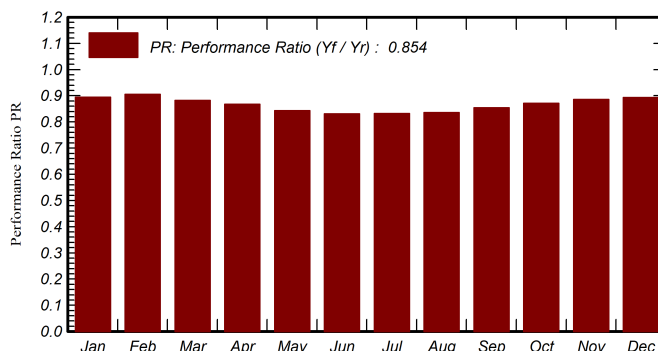
Perf. Ratio PR

85.36 %

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	40.4	21.53	6.98	51.2	49.1	1076	1021	0.895
February	64.3	29.33	5.09	83.4	80.3	1759	1682	0.905
March	110.9	46.65	10.34	143.3	138.4	2948	2817	0.882
April	143.5	60.72	13.19	181.7	175.4	3673	3508	0.867
May	187.9	74.24	21.80	236.9	229.2	4657	4448	0.843
June	203.7	73.15	26.96	258.1	250.0	5001	4777	0.831
July	215.7	68.30	27.14	278.9	270.5	5414	5171	0.832
August	185.9	59.99	26.44	241.2	233.9	4702	4493	0.836
September	131.2	52.13	22.29	171.5	165.8	3410	3264	0.854
October	86.7	43.42	17.33	108.9	104.8	2208	2114	0.872
November	43.0	22.97	10.41	53.4	51.2	1111	1054	0.886
December	33.7	18.52	4.28	42.9	41.0	902	853	0.893
Year	1446.8	570.97	16.09	1851.4	1789.6	36863	35201	0.854

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

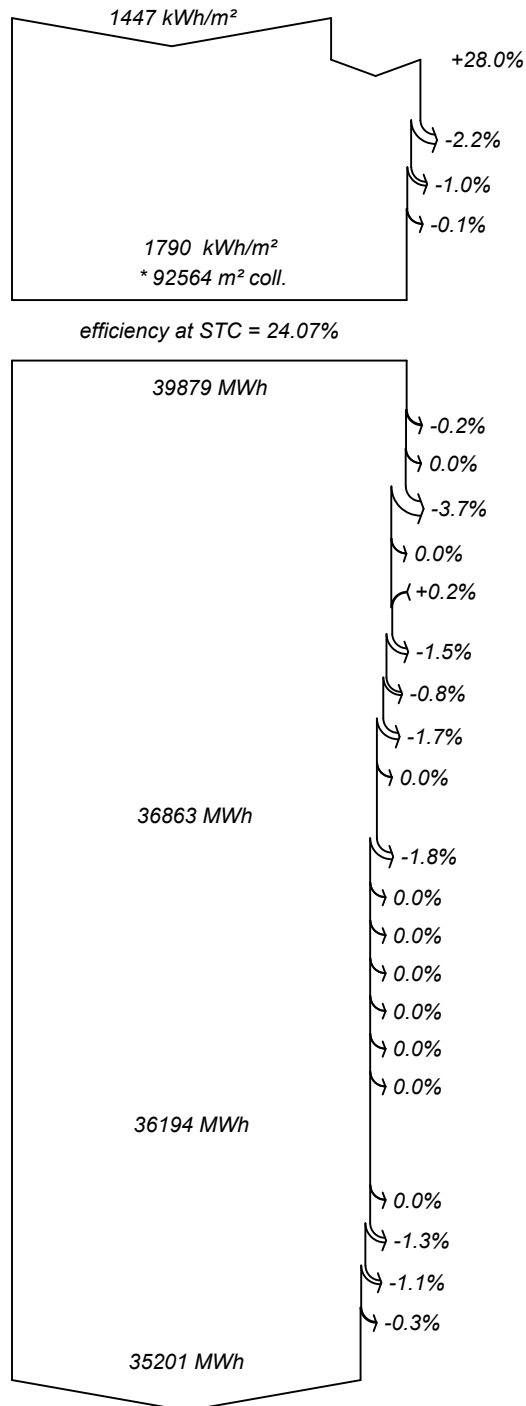
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

Soiling loss factor

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

Module Degradation Loss (for year #1)

PV loss due to irradiance level

PV loss due to temperature

Shadings: Electrical Loss detailed module calc.

Module quality loss

LID - Light induced degradation

Module array mismatch loss

Ohmic wiring loss

Mixed orientation mismatch loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Auxiliaries (fans, other)

AC ohmic loss

Medium voltage transfo loss

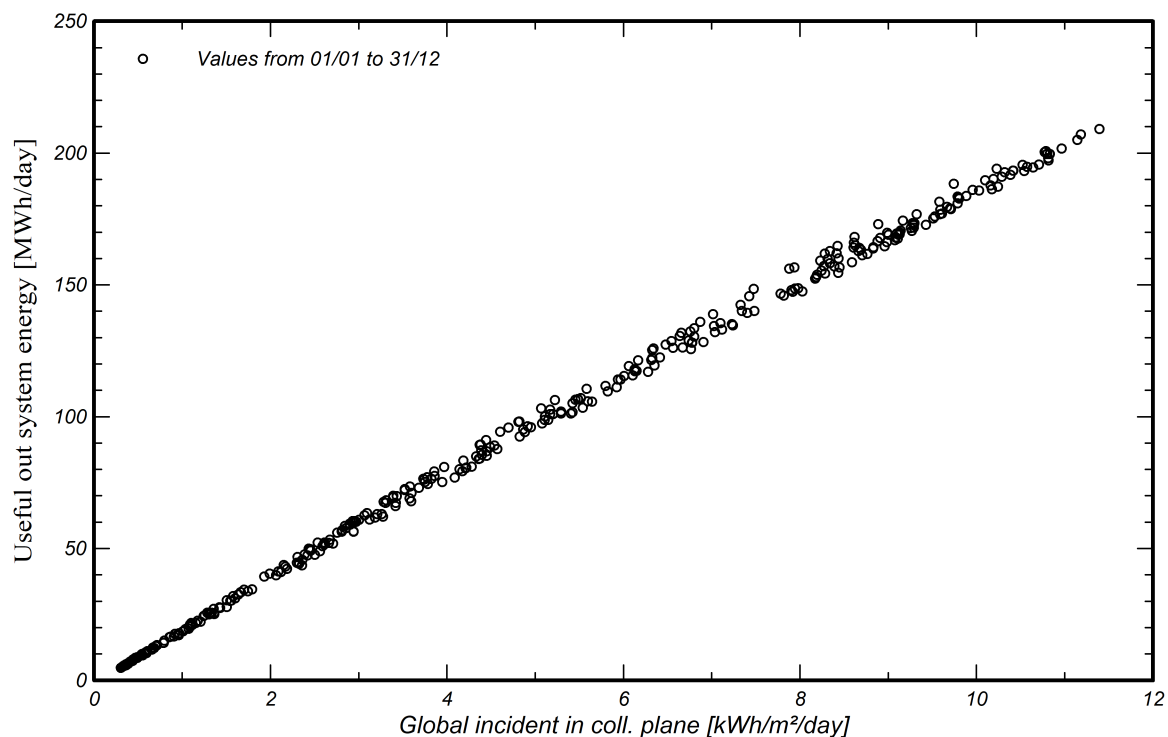
MV line ohmic loss

Energy injected into grid



Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

