



**REGIONE  
PUGLIA**



Provincia di Lecce



Comune di Copertino



Comune di Leverano



Comune di Nardò

Committente:

**GRUPOTEC SOLAR ITALIA 2 SRL**

Via Statuto, 10 - 20121 Milano - Italy  
pec: grupotecsolaritalia2srl@legalmail.it



**Progetto Definitivo  
PROCEDIMENTO VIA NAZIONALE  
ai sensi degli artt. 23-24-25 del D.Lgs. 152/06 e s.m.i.**

Denominazione progetto:

**REALIZZAZIONE IMPIANTO AGRIVOLTAICO  
"MASSERIA ARCHI"**  
Potenza nominale complessiva = 28.334,28 kWp

Sito in:

**COMUNI DI COPERTINO, LEVERANO e NARDO' (LE)**

Titolo elaborato:

**Stima di producibilità dell'impianto**

Elaborato n.

EL08

Scala



Responsabile Coordinamento progetto : dott.ssa agr. Eliana Santoro

TIMBRI E FIRME:

Revisione progettuale: Ing. Nicodemo Agostino

Collaboratori : Ing. Marco Pignolo, Geom. Sara Tessitore



REV.:	REDAZIONE:	CONTROLLO:	APPROVAZIONE :	DATA:
00	Maria Dolores Torregrosa	Ing. Nicodemo Agostino	Dott.ssa Eliana Santoro	15/05/2023
01				
02				

FIRMA/TIMBRO  
COMMITTENTE:



**FLYREN**  
THE CULTURE OF CLEAN ENERGY

Flyren Development S.r.l.  
Lungo Po Antonelli, 21 - 10153 Torino (TO)  
tel: 011/ 8123575 - fax: 011/ 8127528  
email: info@flyren.eu  
web: www.flyren.eu  
C.F. / P. IVA n. 12062400010

# PVsyst - Simulation report

## Grid-Connected System

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Project: Archi\_Puglia\_Flyren

Variant: VC7\_Archi\_REV T-B-78M-55°-S-10.5-MN (AU)

Trackers single array, with backtracking

System power: 28.33 MWp

Archi - Puglia - Italy

**Author**

Grupotec UK (United Kingdom)



**PVsyst V7.3.2**

VC7, Simulation date:  
14/04/23 13:29  
with v7.3.2

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**Project summary**

<b>Geographical Site</b> Archi - Puglia Italy	<b>Situation</b> Latitude 40.27 °N Longitude 18.01 °E Altitude 43 m Time zone UTC+1	<b>Project settings</b> Albedo 0.20
<b>Meteo data</b> Archi - Puglia Meteonorm 7.2, Sat=100% - Synthetic		

**System summary**

<b>Grid-Connected System</b> Simulation for year no 1	<b>Trackers single array, with backtracking</b>		
<b>PV Field Orientation</b> <b>Orientation</b> Tracking plane, horizontal N-S axis Axis azimuth 0 °	<b>Tracking algorithm</b> Astronomic calculation Backtracking activated	<b>Near Shadings</b> According to strings Electrical effect 100 % Diffuse shading Automatic	
<b>System information</b>			
<b>PV Array</b> Nb. of modules 46072 units Pnom total 28.33 MWp		<b>Inverters</b> Nb. of units 88 units Pnom total 26.40 MWac Grid power limit 24.00 MWac Grid lim. Pnom ratio 1.181	
<b>User's needs</b> Unlimited load (grid)			

**Results summary**

Produced Energy	57544076 kWh/year	Specific production	2031 kWh/kWp/year	Perf. Ratio PR	86.55 %
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**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
Predef. graphs	9

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**General parameters****Grid-Connected System****PV Field Orientation****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 10.50 m  
Tracker width 4.99 m  
GCR 47.5 %  
Axis height above ground 2.00 m

**Grid power limitation**

Active Power 24.00 MWac  
Pnom ratio 1.181

**Trackers single array, with backtracking****Tracking algorithm**

Astronomic calculation  
Backtracking activated

**Near Shadings**

According to strings  
Electrical effect 100 %  
Diffuse shading Automatic

**Backtracking array**

Nb. of trackers 110 units  
Single array

**Sizes**

Tracker Spacing 10.5 m  
Collector width 4.95 m  
Ground Cov. Ratio (GCR) 47.1 %  
Left inactive band 0.02 m  
Right inactive band 0.02 m  
Phi min / max. +/- 55.0 °

**Backtracking strategy**

Phi limits for BT +/- 61.6 °  
Backtracking pitch 10.5 m  
Backtracking width 4.99 m

**User's needs**

Unlimited load (grid)

**Bifacial model definitions**

Ground albedo 0.15  
Bifaciality factor 80 %  
Rear shading factor 5.0 %  
Rear mismatch loss 5.0 %  
Shed transparent fraction 0.0 %

**PV Array Characteristics****PV module**

Manufacturer Jinkosolar  
Model JKM615N-78HL4-BDV  
(Custom parameters definition)

Unit Nom. Power 615 Wp  
Number of PV modules 46072 units  
Nominal (STC) 28.33 MWp  
Modules 1772 Strings x 26 In series

**At operating cond. (50°C)**

Pmpp 26.21 MWp  
U mpp 1096 V  
I mpp 23913 A

**Inverter**

Manufacturer Huawei Technologies  
Model SUN2000-330KTL-H1-Preliminary V0.1  
(Custom parameters definition)

Unit Nom. Power 300 kWac  
Number of inverters 88 units  
Total power 26400 kWac  
Operating voltage 500-1500 V  
Max. power (=>30°C) 330 kWac  
Pnom ratio (DC:AC) 1.07  
Power sharing within this inverter

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**PV Array Characteristics****Total PV power**

Nominal (STC) 28334 kWp  
Total 46072 modules  
Module area 128786 m<sup>2</sup>  
Cell area 118661 m<sup>2</sup>

**Total inverter power**

Total power 26400 kWac  
Max. power 29040 kWac  
Number of inverters 88 units  
Pnom ratio 1.07

**Array losses****Array Soiling Losses**

Loss Fraction 1.5 %

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 29.0 W/m<sup>2</sup>K  
Uv (wind) 0.0 W/m<sup>2</sup>K/m/s

**DC wiring losses**

Global array res. 0.25 mΩ  
Loss Fraction 0.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 1.5 %

**Module Quality Loss**

Loss Fraction -0.8 %

**Module mismatch losses**

Loss Fraction 0.9 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.1 %

**Module average degradation**

Year no 1  
Loss factor 0.5 %/year

**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	1.000	0.987	0.969	0.929	0.741	0.000

**System losses****Unavailability of the system**

Time fraction 1.0 %  
3.7 days,  
3 periods

**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 800 Vac tri  
Loss Fraction 2.00 % at STC

**Inverter: SUN2000-330KTL-H1-Preliminary V0.1**

Wire section (88 Inv.) Copper 88 x 3 x 95 mm<sup>2</sup>  
Average wires length 204 m

**MV line up to Injection**

MV Voltage 30 kV  
Average each inverter  
Wires Alu 3 x 500 mm<sup>2</sup>  
Length 25710 m  
Loss Fraction 1.00 % at STC



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**AC losses in transformers**

**MV transfo**

Medium voltage 30 kV

**One transfo parameters**

Nominal power at STC 5.57 MVA  
Iron Loss (night disconnect) 13.92 kVA  
Iron loss fraction 0.25 % at STC  
Copper loss 69.60 kVA  
Copper loss fraction 1.25 % at STC  
Coils equivalent resistance 3 x 1.44 mΩ

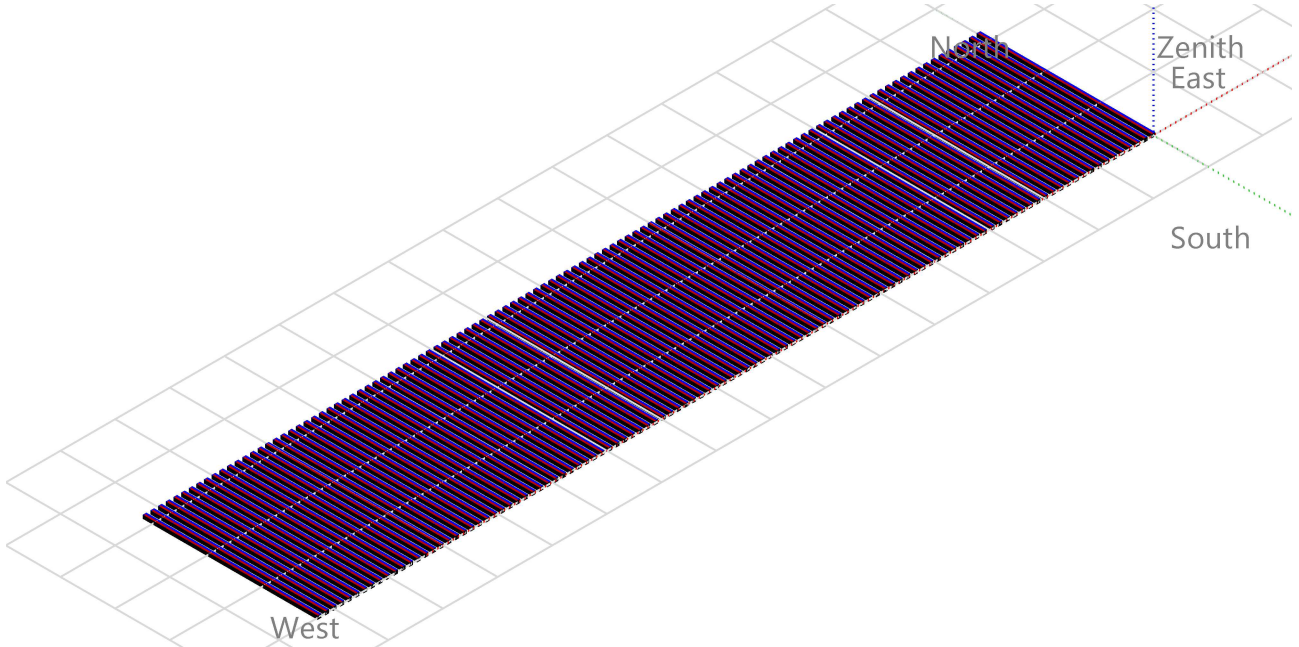
**Operating losses at STC (full system)**

Nb. identical MV transfos 5  
Nominal power at STC 27.84 MVA  
Iron loss (night disconnect) 69.60 kVA  
Copper loss 347.99 kVA



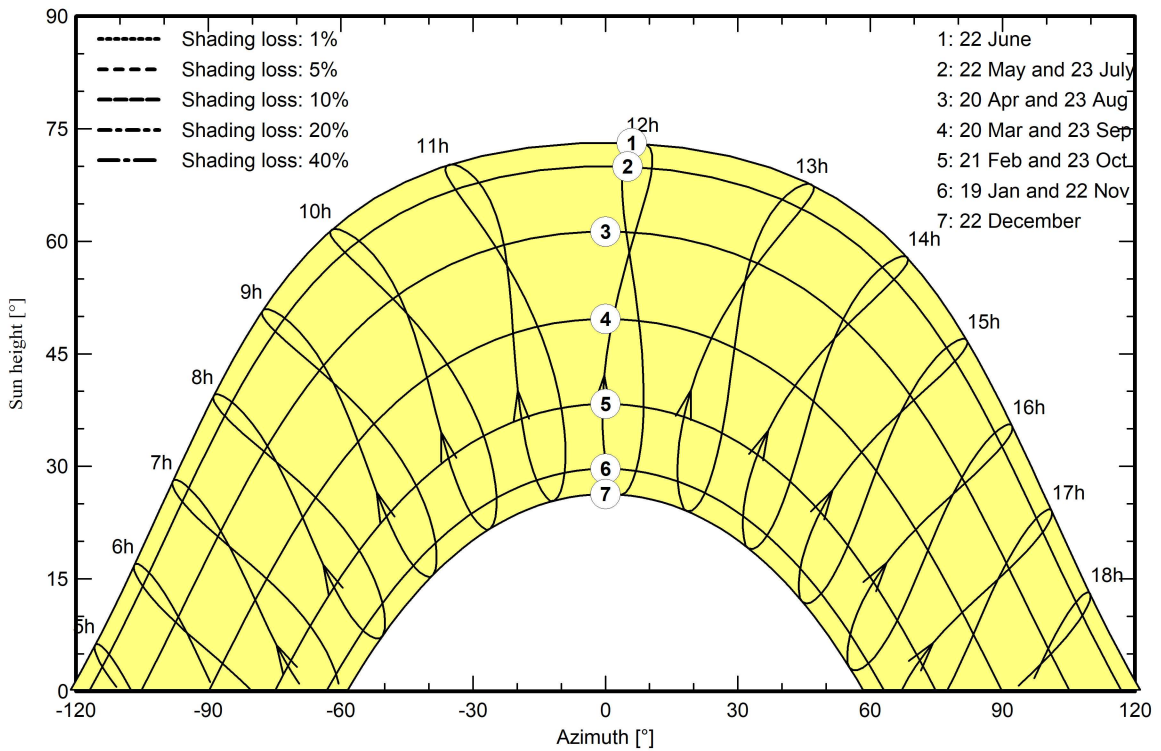
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





# Project: Archi\_Puglia\_Flyren

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### Main results

#### System Production

Produced Energy 57544076 kWh/year

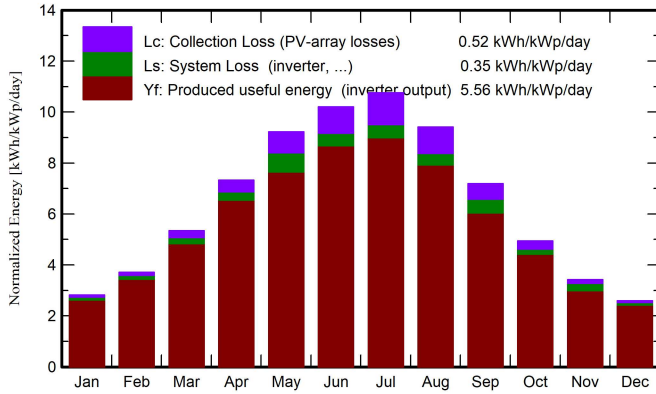
Specific production

2031 kWh/kWp/year

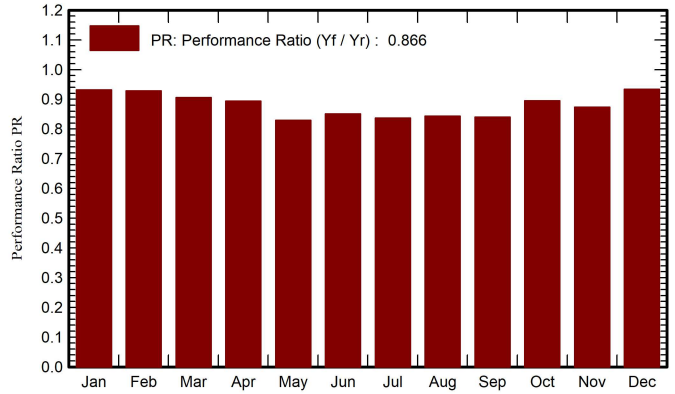
Performance Ratio PR

86.55 %

#### Normalized productions (per installed kWp)



#### Performance Ratio PR



#### Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray kWh	E_Grid kWh	PR ratio
January	66.0	26.00	9.64	87.4	84.2	2407649	2309483	0.932
February	80.0	33.89	9.96	103.8	100.0	2850839	2732124	0.929
March	129.4	51.06	12.99	165.6	159.6	4457266	4250210	0.906
April	172.2	70.47	15.60	219.8	212.3	5846825	5564581	0.894
May	220.3	68.99	21.51	286.1	277.4	7380696	6725275	0.830
June	234.9	64.57	25.72	306.3	297.3	7794711	7384068	0.851
July	251.3	50.09	28.73	333.4	324.1	8352920	7902346	0.837
August	219.1	50.26	28.34	291.7	283.5	7358349	6971832	0.844
September	160.9	45.83	22.56	215.7	209.1	5599172	5136928	0.841
October	115.4	40.32	18.95	153.3	148.1	4069234	3889586	0.895
November	77.5	27.99	14.48	102.8	99.2	2792302	2545867	0.874
December	60.2	23.00	10.92	80.5	77.6	2218531	2131775	0.934
Year	1787.3	552.47	18.34	2346.4	2272.3	61128494	57544076	0.866

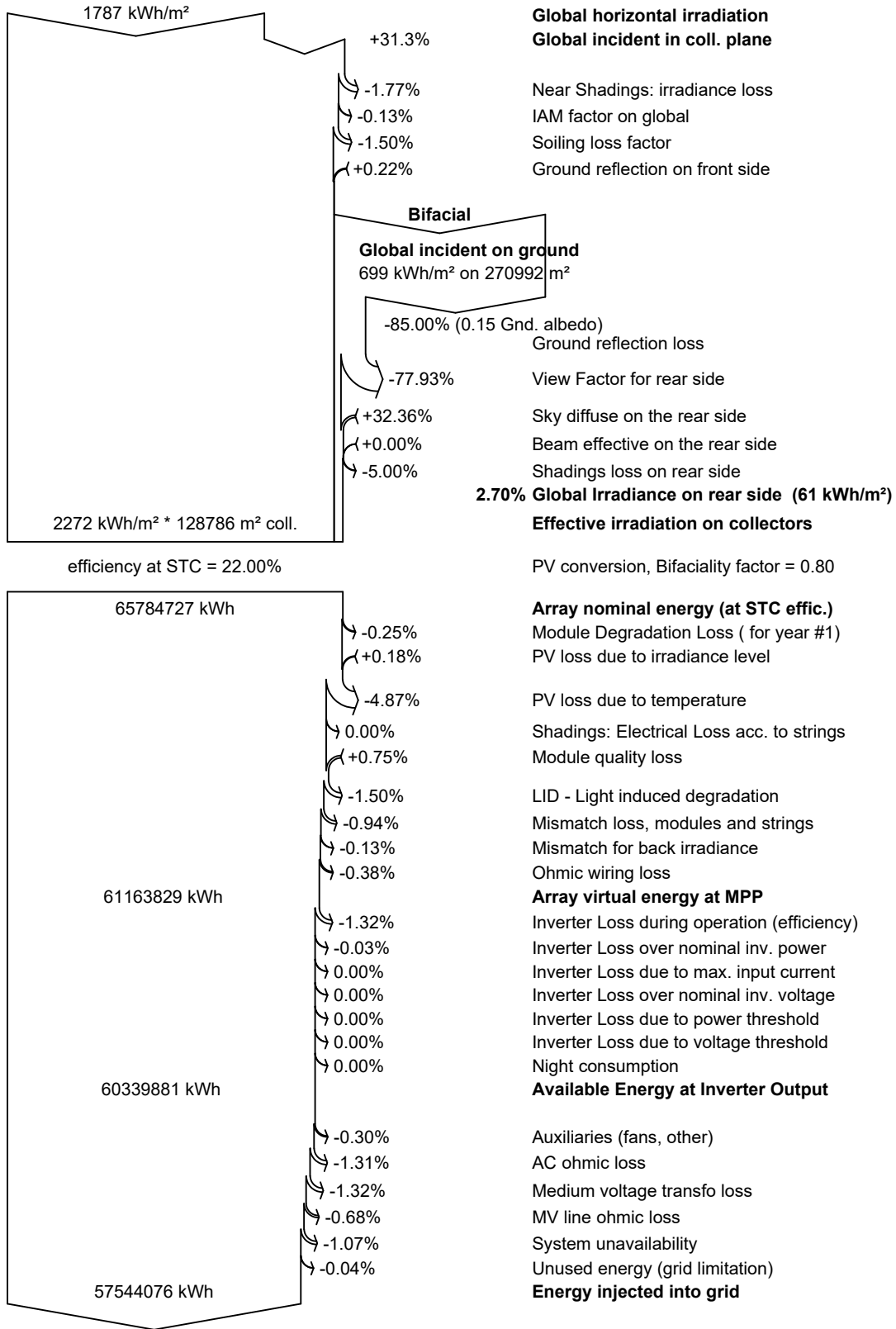
#### Legends

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		





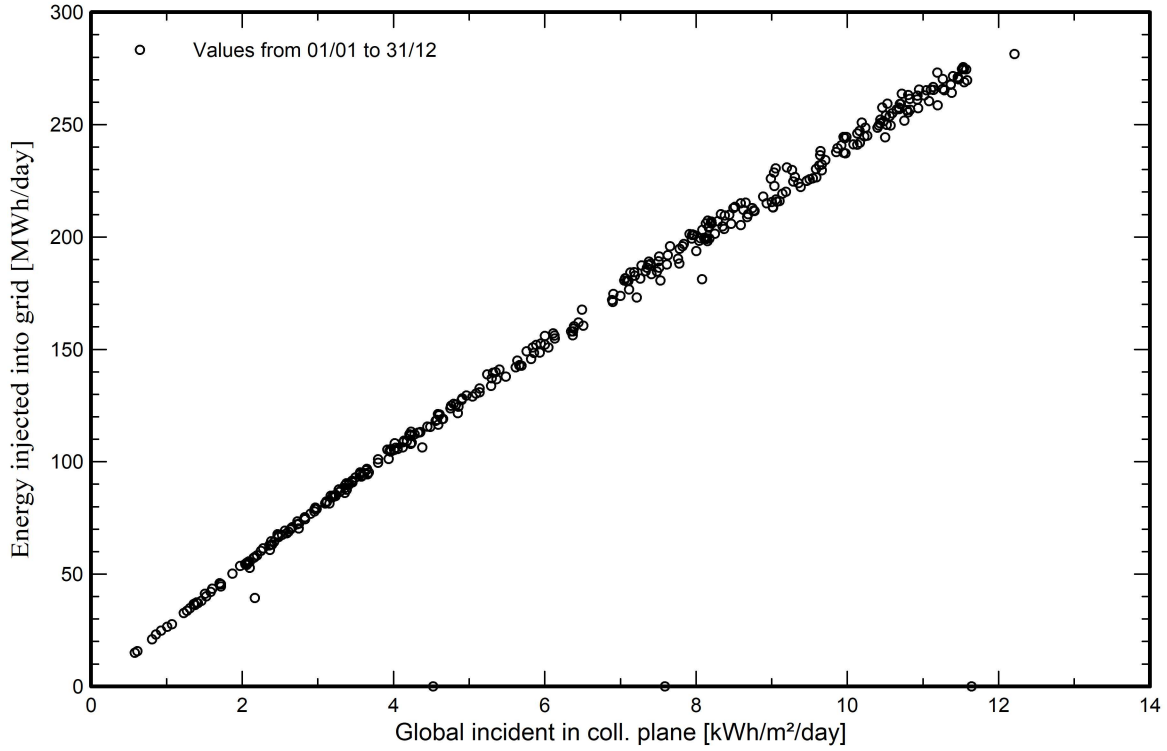
Loss diagram





Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

