



REGIONE
PUGLIA



PROVINCIA DI
BRINDISI



COMUNE DI
BRINDISI

OGGETTO:

“Progetto di un impianto agrivoltaico denominato "CSPV BRINDISI", di potenza pari a 17,8 MWp e delle relative opere di connessione alla RTN, da realizzarsi nel comune di Brindisi (BR)”

ELABORATO:

Calcolo producibilità dell'impianto



PROPONENTE:



AEI SOLAR PROJECT VI S.R.L.
VIA VINCENZO BELLINI, 22
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PROGETTAZIONE:



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REA PZ-206983

Livello prog.	Cat. opera	N°. prog.elaborato	Tipo elaborato	N° foglio	Tot. fogli	Nome file	Scala
PD	I.IF	A.06	R			A.06Calcolo_producibilità_impianto	
REV.	DATA	DESCRIZIONE			ESEGUITO	VERIFICATO	APPROVATO
00	SETTEMBRE 2023	Emissione				Geol. Raffaele Nardone EGM Project	EGM Project

PVsyst - Simulation report

Grid-Connected System

Project: CSPV Brindisi

Variant: Brindisi

Trackers single array, with backtracking

System power: 17.80 MWp

Torre Rossa - Italy

Author

GoBeCloud S.L (Spain)



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VC1, Simulation date:
02/08/23 12:01
with v7.2.21

Project summary

Geographical Site	Situation	Project settings
Torre Rossa	<i>Latitude</i> 40.57 °N	<i>Albedo</i> 0.20
<i>Italy</i>	<i>Longitude</i> 17.97 °E	
	<i>Altitude</i> 30 m	
	<i>Time zone</i> UTC+1	
Meteo data		
<i>Torre Rossa</i>		
<i>Meteonorm 8.0, Sat=100% - Sintético</i>		

System summary

Grid-Connected System	Trackers single array, with backtracking		
<i>Simulation for year no 1</i>			
PV Field Orientation	Tracking algorithm	Near Shadings	
Orientation	<i>Astronomic calculation</i>	<i>Linear shadings</i>	
<i>Tracking plane, horizontal N-S axis</i>	<i>Backtracking activated</i>		
<i>Axis azimuth 0 °</i>			
System information			
PV Array	Inverters		
<i>Nb. of modules</i> 27600 units	<i>Nb. of units</i> 53 units		
<i>Pnom total</i> 17.80 MWp	<i>Pnom total</i> 15.50 MWac		
	<i>Pnom ratio</i> 1.149		
User's needs			
<i>Unlimited load (grid)</i>			

Results summary

<i>Produced Energy</i> 31.03 GWh/year	<i>Specific production</i> 1743 kWh/kWp/year	<i>Perf. Ratio PR</i> 87.80 %
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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 5.50 m
Tracker width 2.38 m
GCR 43.3 %
Axis height above ground 3.13 m

Trackers single array, with backtracking

Tracking algorithm

Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings

Backtracking array

Nb. of trackers 101 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 strategy

Phi limits +/- 64.1 °
Backtracking pitch 5.50 m
Backtracking width 2.38 m

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 - Generador FV 220 kVA

PV module

Manufacturer CSI Solar
Model CS7N-645MB-AG 1500V
(Original PVsyst database)

Unit Nom. Power 645 Wp
Number of PV modules 26250 units
Nominal (STC) 16.93 MWp
Modules 875 Strings x 30 In series

At operating cond. (50°C)

Pmpp 15.54 MWp
U mpp 1012 V
I mpp 15361 A

Inverter

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

Unit Nom. Power 300 kWac
Number of inverters 49 units
Total power 14700 kWac
Operating voltage 500-1500 V
Max. power (=>30°C) 330 kWac
Pnom ratio (DC:AC) 1.15



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PV Array Characteristics

Array #2 - Subconjunto #2		Inverter	
PV module		Manufacturer	
Manufacturer	CSI Solar	Manufacturer	Huawei Technologies
Model	CS7N-645MB-AG 1500V	Model	SUN2000-330KTL-H1-Preliminary V0.1
(Original PVsyst database)		(Custom parameters definition)	
Unit Nom. Power	645 Wp	Unit Nom. Power	200 kWac
Number of PV modules	1350 units	Number of inverters	4 units
Nominal (STC)	871 kWp	Total power	800 kWac
Modules	45 Strings x 30 In series	Operating voltage	500-1500 V
At operating cond. (50°C)		Pnom ratio (DC:AC)	1.09
Pmpp	799 kWp		
U mpp	1012 V		
I mpp	790 A		
Total PV power		Total inverter power	
Nominal (STC)	17802 kWp	Total power	15500 kWac
Total	27600 modules	Number of inverters	53 units
Module area	85735 m ²	Pnom ratio	1.15

Array losses

Array Soiling Losses		Thermal Loss factor		Serie Diode Loss				
Loss Fraction	0.3 %	Module temperature according to irradiance		Voltage drop	0.7 V			
		Uc (const)	29.0 W/m ² K	Loss Fraction	0.1 % at STC			
		Uv (wind)	0.0 W/m ² K/m/s					
LID - Light Induced Degradation		Module Quality Loss		Module mismatch losses				
Loss Fraction	1.5 %	Loss Fraction	-0.7 %	Loss Fraction	1.0 % at MPP			
Strings Mismatch loss		Module average degradation						
Loss Fraction	0.1 %	Year no	1					
		Loss factor	0.45 %/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								
10°	20°	30°	40°	50°	60°	70°	80°	90°
0.998	0.998	0.995	0.992	0.986	0.970	0.917	0.763	0.000

DC wiring losses

Global wiring resistance	1.1 mΩ		
Loss Fraction	1.6 % at STC		
Array #1 - Generador FV 220 kVA		Array #2 - Subconjunto #2	
Global array res.	1.2 mΩ	Global array res.	21 mΩ
Loss Fraction	1.6 % at STC	Loss Fraction	1.5 % at STC

System losses

Unavailability of the system		Auxiliaries loss	
Time fraction	1.0 %	Proportionnal to Power	4.0 W/kW
	3.7 days,	0.0 kW from Power thresh.	
	3 periods		



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AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 1.52 % at STC

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

Wire section (49 Inv.) Copper 49 x 3 x 120 mm²
Average wires length 193 m

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

Wire section (4 Inv.) Copper 4 x 3 x 50 mm²
Average wires length 0 m

MV line up to Injection

MV Voltage 36 kV
Wires Alu 3 x 700 mm²
Length 16450 m
Loss Fraction 1.00 % at STC

AC losses in transformers

MV transfo

Grid voltage 36 kV

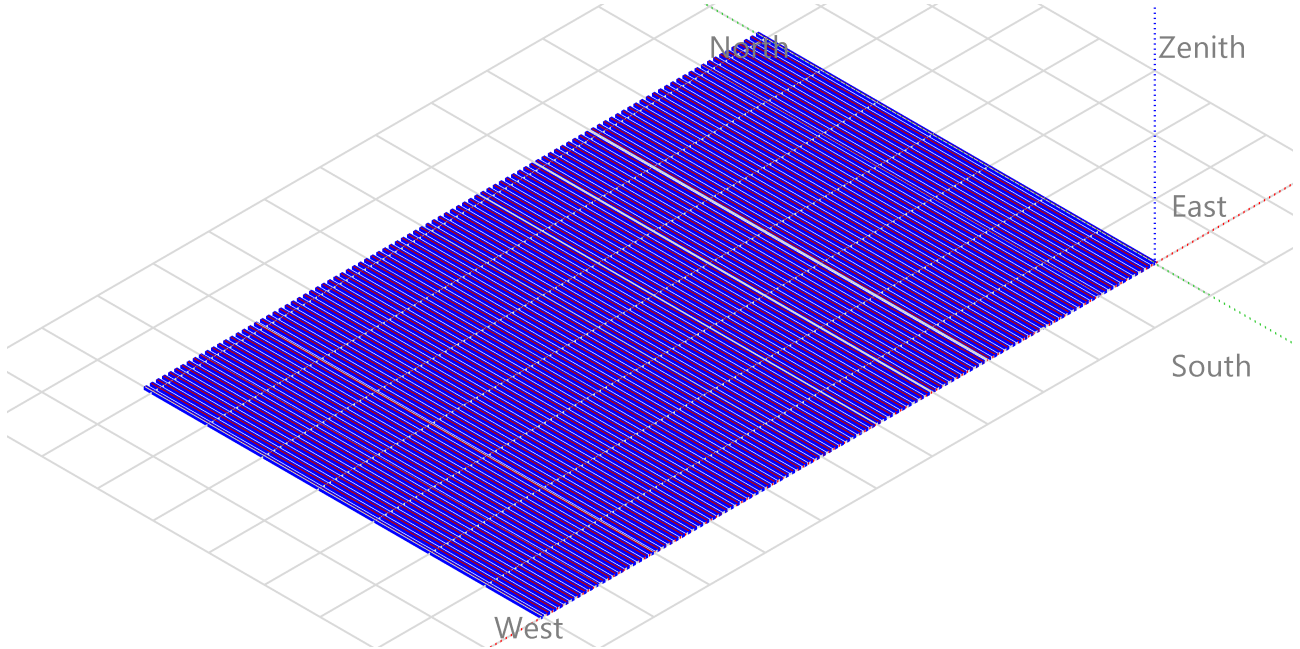
Operating losses at STC

Nominal power at STC 17487 kVA
Iron loss (24/24 Connexion) 34.97 kW
Loss Fraction 0.20 % at STC
Coils equivalent resistance 3 x 0.48 mΩ
Loss Fraction 1.30 % at STC



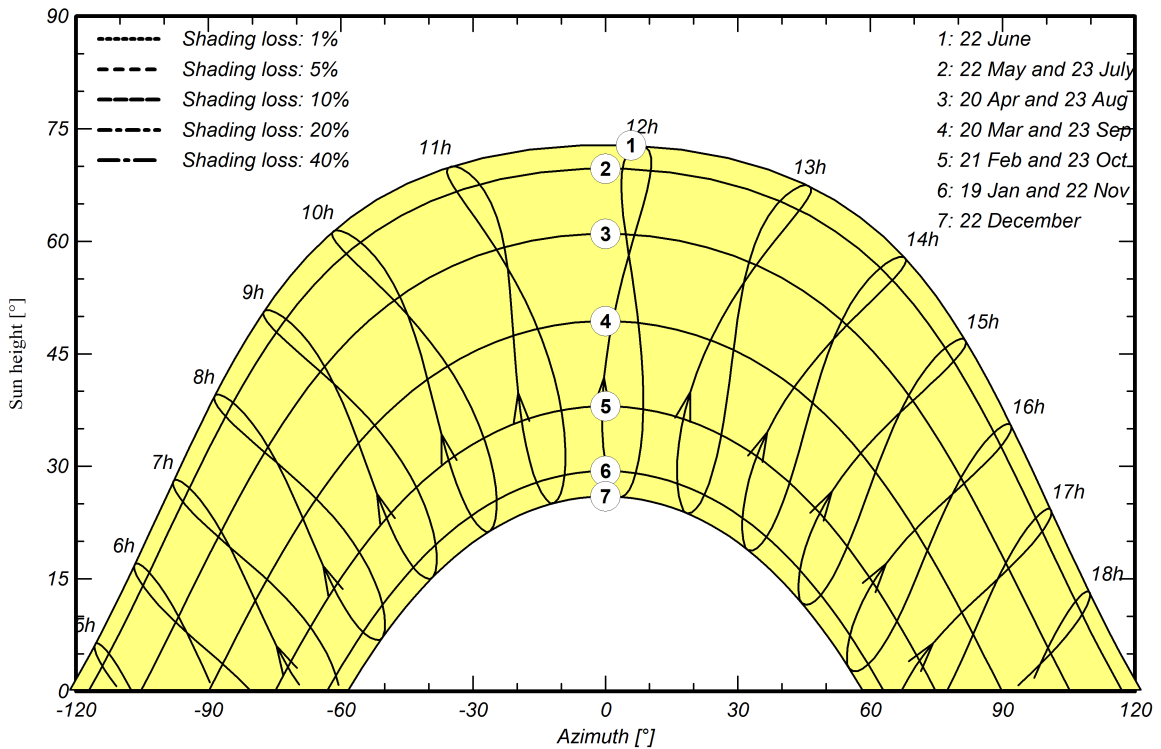
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy

31.03 GWh/year

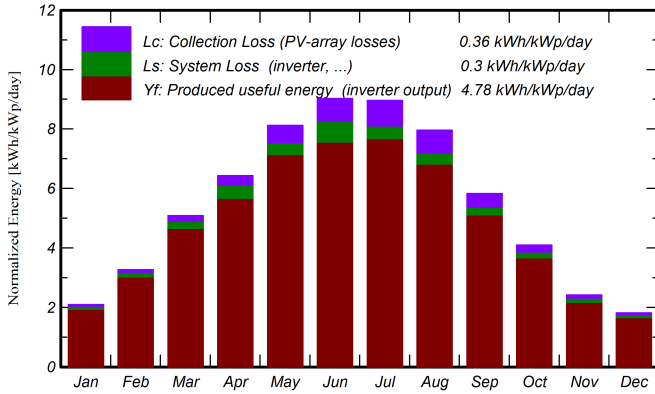
Specific production

1743 kWh/kWp/year

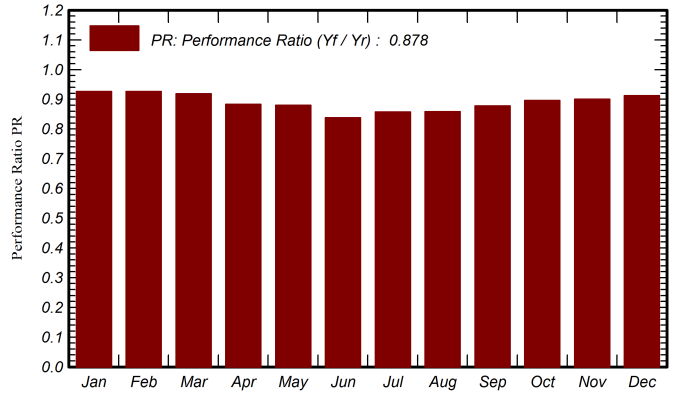
Performance Ratio PR

87.80 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

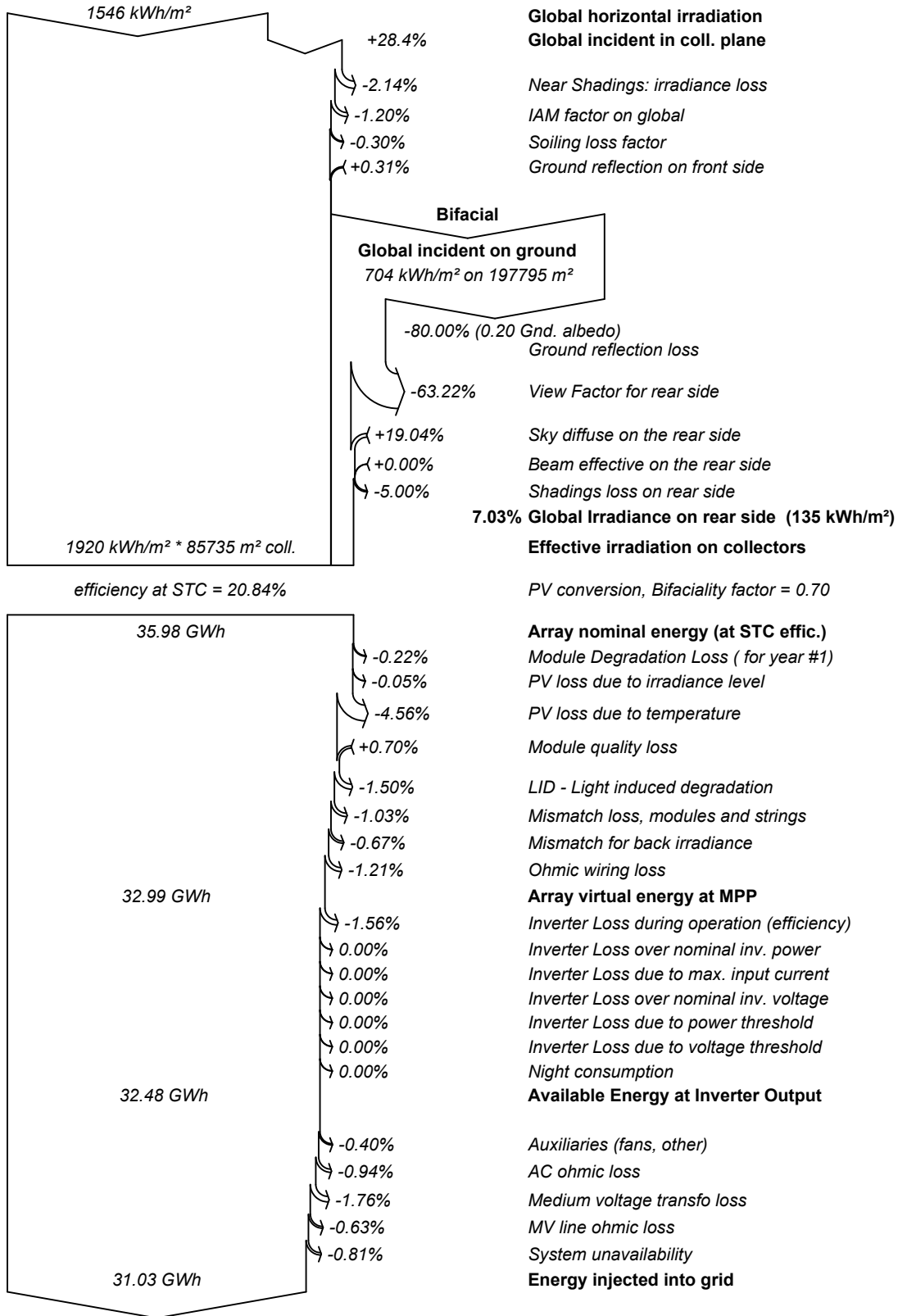
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	GWh	GWh	ratio
January	52.9	32.17	9.46	65.0	61.5	1.133	1.073	0.927
February	70.9	33.82	9.86	91.6	87.6	1.590	1.511	0.927
March	123.5	54.56	12.20	157.6	152.0	2.712	2.576	0.918
April	151.9	70.06	14.80	192.8	186.6	3.276	3.032	0.883
May	196.3	74.89	19.17	251.9	244.8	4.168	3.946	0.880
June	211.3	82.63	23.40	270.8	263.5	4.432	4.042	0.838
July	215.0	81.98	26.75	278.0	270.5	4.478	4.242	0.857
August	189.0	72.56	26.96	246.8	239.9	3.980	3.771	0.858
September	135.9	58.75	22.55	174.9	169.2	2.880	2.732	0.877
October	98.1	43.83	18.65	126.9	122.0	2.134	2.027	0.897
November	56.1	29.79	14.46	72.6	68.8	1.236	1.163	0.900
December	44.6	24.96	11.05	56.4	53.2	0.971	0.916	0.912
Year	1545.6	660.02	17.49	1985.2	1919.7	32.990	31.030	0.878

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		



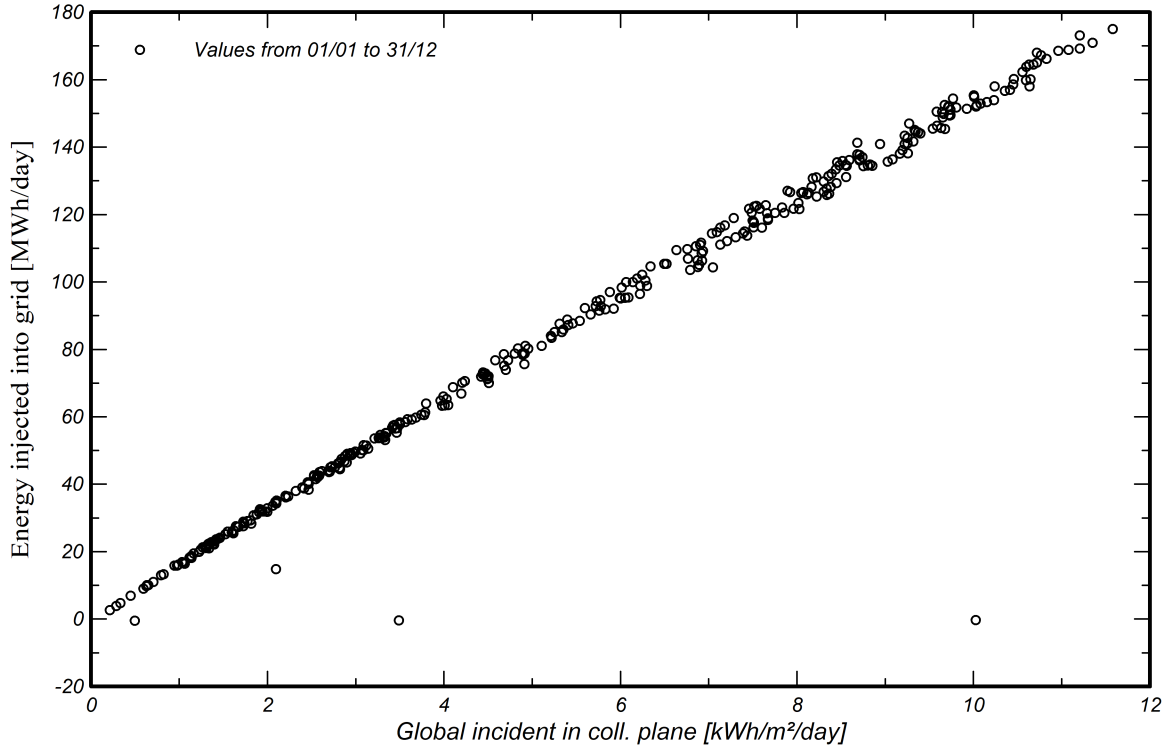
Loss diagram



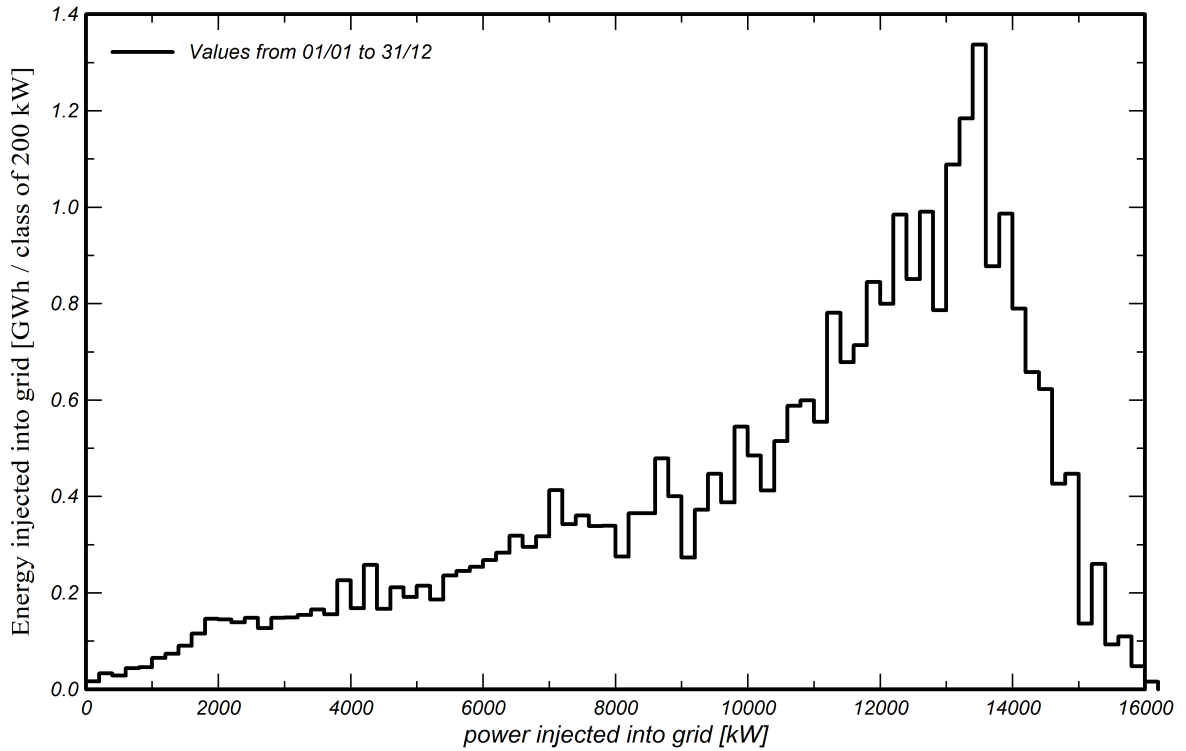


Special graphs

Daily Input/Output diagram



Distribución de potencia de salida del sistema





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Predef. graphs