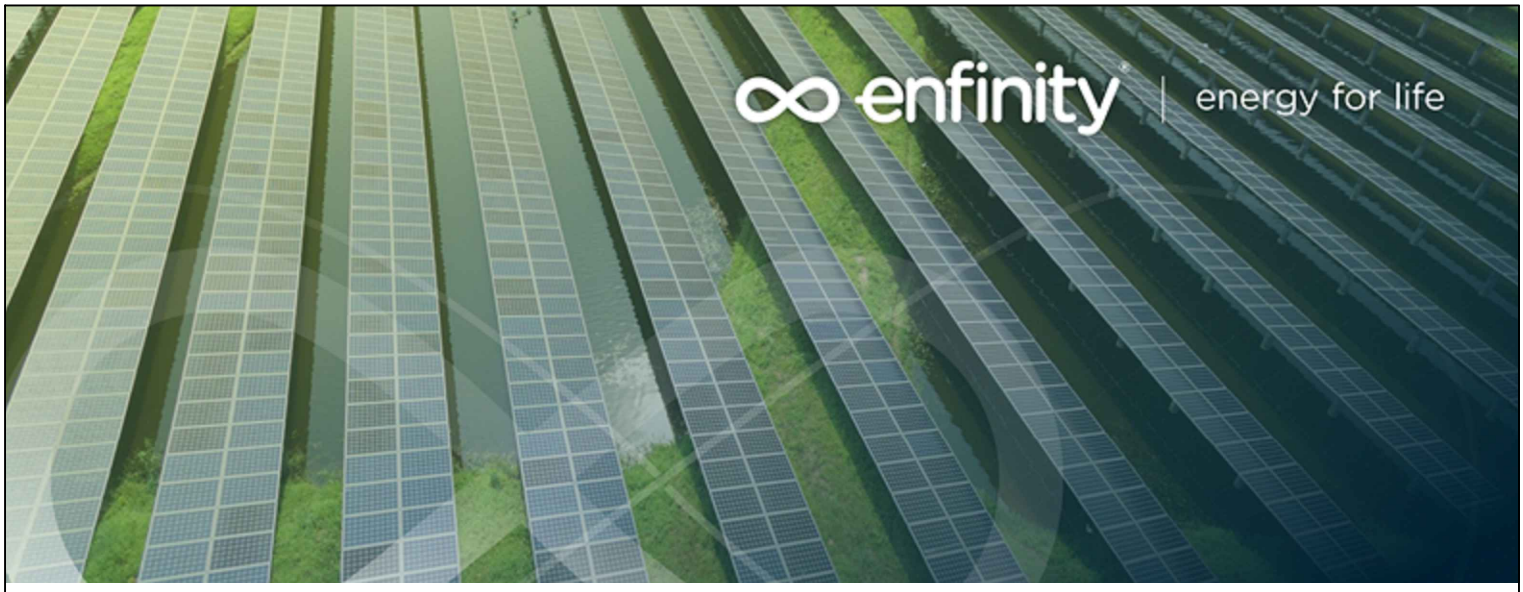

IMPIANTO FOTOVOLTAICO EG Nuovo futuro
E OPERE CONNESSE
POTENZA IMPIANTO 19,8 MWp - COMUNE DI BUSETO PALIZZOLO

Proponente

EG Nuovo futuro S.R.L.
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Progettazione

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Coordinamento progettuale

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Titolo Elaborato

Stima producibilità

LIVELLO PROGETTAZIONE	CODICE ELABORATO	FILENAME	FORMATO	DATA	SCALA
Progetto definitivo	VIA.REL28	-	A0	09/21	-

Revisioni

REV.	DATA	DESCRIZIONE	ESEGUITO	VERIFICATO	APPROVATO
00	27/09/2021	-	AF	PF	ENF

COMUNE DI BUSETO PALIZZOLO
REGIONE SICILIA

STIMA PRODUCIBILITA’

Sommario

DATI PROGETTO

Project summary

Geographical Site
Castellammare
Italy

Situation

Latitude	37.99 °N
Longitude	12.79 °E
Altitude	457 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Castellammare
SolarGIS Monthly aver. , period not spec. - Synthetic

System summary

Grid-Connected System

Trackers single array, with backtracking

PV Field Orientation

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

Near Shadings

According to strings	
Electrical effect	80 %

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	33024 units
Pnom total	19.81 MWp

Inverters

Nb. of units	88 units
Pnom total	17.60 MWac
Grid power limit	16.33 MWac
Grid lim. Pnom ratio	1.213

Results summary

Produced Energy	37842 MWh/year	Specific production	1910 kWh/kWp/year	Perf. Ratio PR	87.00 %
Apparent energy	37842 MVAh				

Table of contents

General parameters

Grid-Connected System — **Trackers single array, with backtracking**

PV Field Orientation

Orientation		Backtracking strategy		Models used	
Tracking plane, horizontal N-S axis		Nb. of trackers	350 units	Transposition	Perez
Axis azimuth	0 °	Single array		Diffuse	Perez, Meteonorm
		Sizes		Circumsolar	separate
		Tracker Spacing	10.00 m		
		Collector width	4.36 m		
		Ground Cov. Ratio (GCR)	43.6 %		
		Phi min / max.	-/+ 60.0 °		
		Backtracking limit angle			
		Phi limits	+/- 64.0 °		

Horizon	Near Shadings	User's needs
Free Horizon	According to strings	Unlimited load (grid)
	Electrical effect 80 %	

Bifacial system

Model: 2D Calculation unlimited trackers

Bifacial model geometry		Bifacial model definitions	
Tracker Spacing	10.00 m	Ground albedo	0.20
Tracker width	4.36 m	Bifaciality factor	70 %
GCR	43.6 %	Rear shading factor	4.0 %
Axis height above ground	2.50 m	Rear mismatch loss	3.5 %
		Module transparency	4.0 %

Grid injection point

Grid power limitation		Power factor	
Active Power	16.33 MWac	Cos(phi) (leading)	1.000
Pnom ratio	1.213		

PV Array Characteristics

PV module		Inverter	
Manufacturer	Trina Solar	Manufacturer	Huawei Technologies
Model	TSM-600DEG20C.20	Model	SUN2000-215KTL-H0
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	600 Wp	Unit Nom. Power	200 kVA
Number of PV modules	33024 units	Number of inverters	88 units
Nominal (STC)	19.81 MWp	Total power	17600 kVA
Modules	1032 Strings x 32 In series	Operating voltage	500-1500 V
At operating cond. (50°C)		Max. power (=>33°C)	215 kVA
Pmpp	18.14 MWp	Pnom ratio (DC:AC)	1.13
U mpp	1000 V		
I mpp	18133 A		

Total PV power		Total inverter power	
Nominal (STC)	19814 kWp	Total power	17600 kVA
Total	33024 modules	Nb. of inverters	88 units
Module area	93462 m²	Pnom ratio	1.13
Cell area	87382 m²		

Array losses

Array Soiling Losses
Loss Fraction 1.5 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 30.0 W/m²K
Uv (wind) 1.2 W/m²K/m/s

DC wiring losses
Global array res. 0.35 mΩ
Loss Fraction 0.6 % at STC

Serie Diode Loss
Voltage drop 0.7 V
Loss Fraction 0.1 % at STC

LID - Light Induced Degradation
Loss Fraction 1.5 %

Module Quality Loss
Loss Fraction -0.7 %

Module mismatch losses
Loss Fraction 0.4 % at MPP

Strings Mismatch loss
Loss Fraction 0.1 %

IAM loss factor
Incidence effect (IAM): User defined profile

0°	40°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.992	0.983	0.961	0.933	0.853	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 2.26 % at STC
Inverter: SUN2000-215KTL-H0
Wire section (88 Inv.) Copper 88 x 3 x 10000 mm²
Average wires length 34740 m

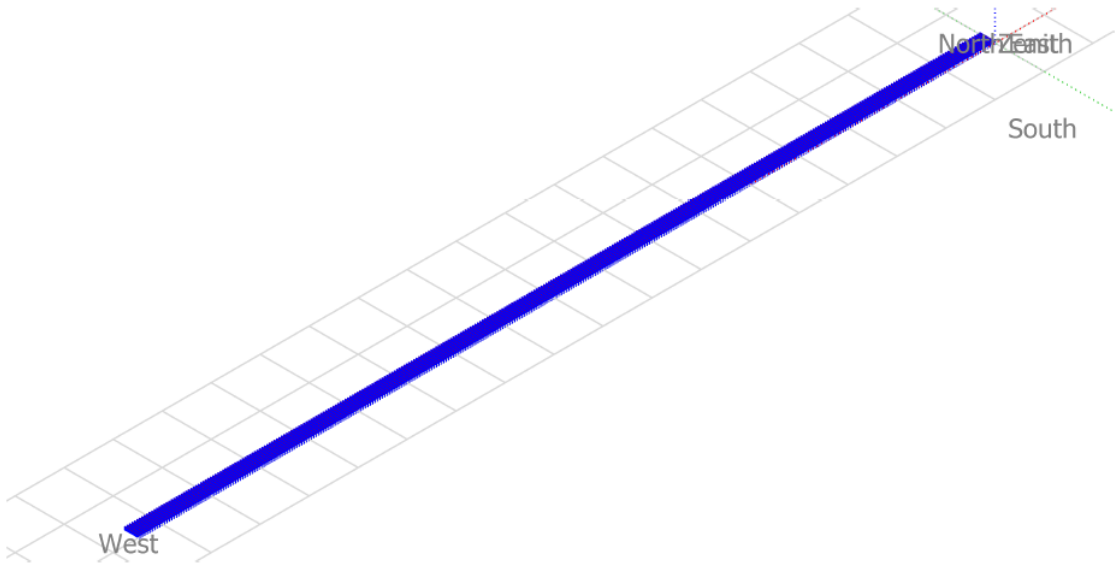
MV line up to Injection
MV Voltage 30 kV
Wires Copper 3 x 240 mm²
Length 10071 m
Loss Fraction 1.70 % at STC

AC losses in transformers

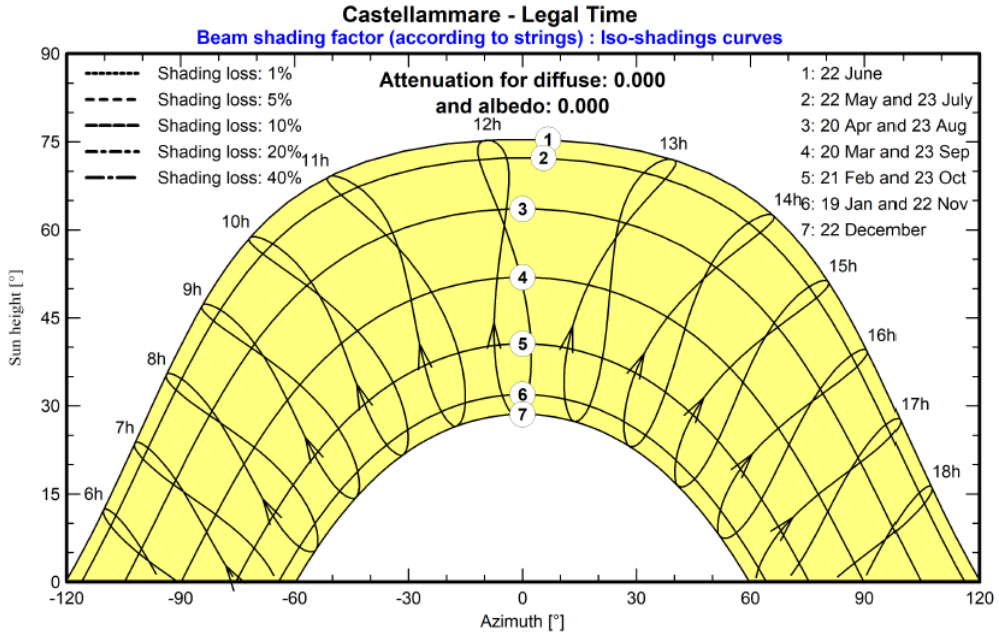
MV transfo
Grid voltage 30 kV
Operating losses at STC
Nominal power at STC 19451 kVA
Iron loss (24/24 Connexion) 29.18 kW
Loss Fraction 0.15 % at STC
Coils equivalent resistance 3 x 0.54 mΩ
Loss Fraction 1.65 % at STC

Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



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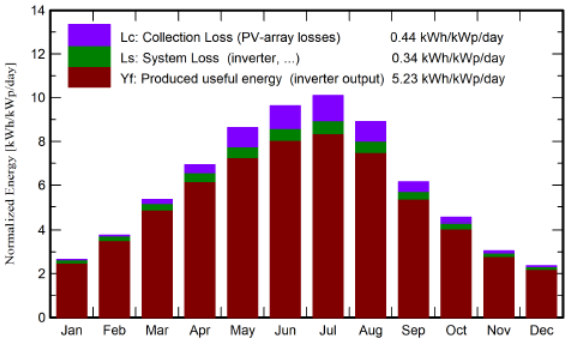
Main results

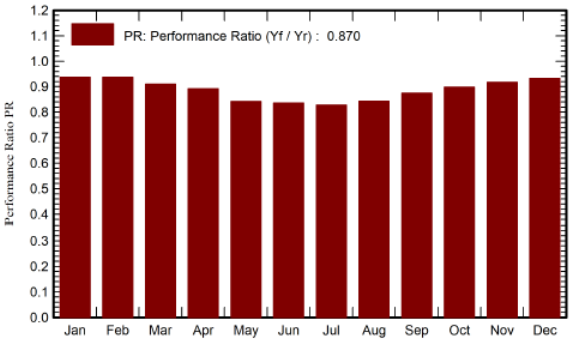
System Production

Produced Energy	37842 MWh/year	Specific production	1910 kWh/kWp/year
Apparent energy	37842 MVAh	Performance Ratio PR	87.00 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	EApGrid MVAh	PR ratio	EReGrid MVAh
January	64.1	31.60	9.40	82.4	79.0	1622	1531	0.937	0.000
February	81.2	37.50	9.30	105.3	101.4	2070	1955	0.937	0.000
March	129.3	54.90	10.90	165.6	159.9	3178	2987	0.910	0.000
April	161.0	66.00	13.10	207.6	200.8	3910	3670	0.892	0.000
May	206.3	74.40	17.30	267.5	259.2	4762	4463	0.842	0.000
June	222.8	71.70	21.30	288.9	280.4	5113	4787	0.836	0.000
July	238.2	68.20	23.90	313.1	304.2	5496	5137	0.828	0.000
August	207.6	65.40	24.60	275.7	267.6	4928	4609	0.844	0.000
September	143.5	59.70	21.60	184.3	178.0	3401	3192	0.874	0.000
October	108.2	48.10	18.40	140.3	135.2	2652	2499	0.899	0.000
November	71.2	35.40	14.30	91.2	87.6	1759	1659	0.918	0.000
December	56.8	29.10	10.99	73.2	70.0	1433	1354	0.933	0.000
Year	1690.2	642.00	16.30	2195.3	2123.3	40325	37842	0.870	0.000

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	EApGrid	Apparent energy to the grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane	EReGrid	Reactive energy to the grid
GlobEff	Effective Global, corr. for IAM and shadings		

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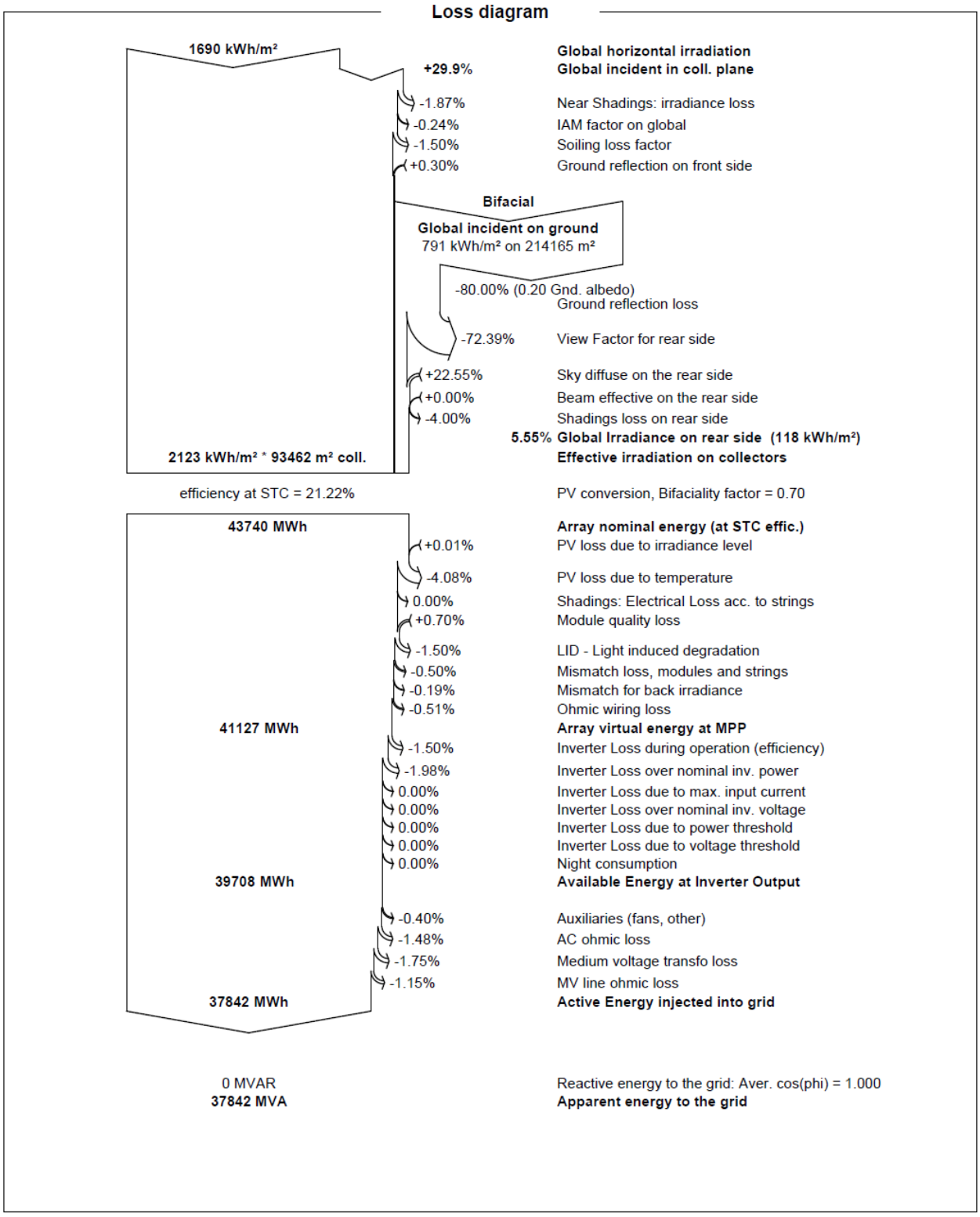
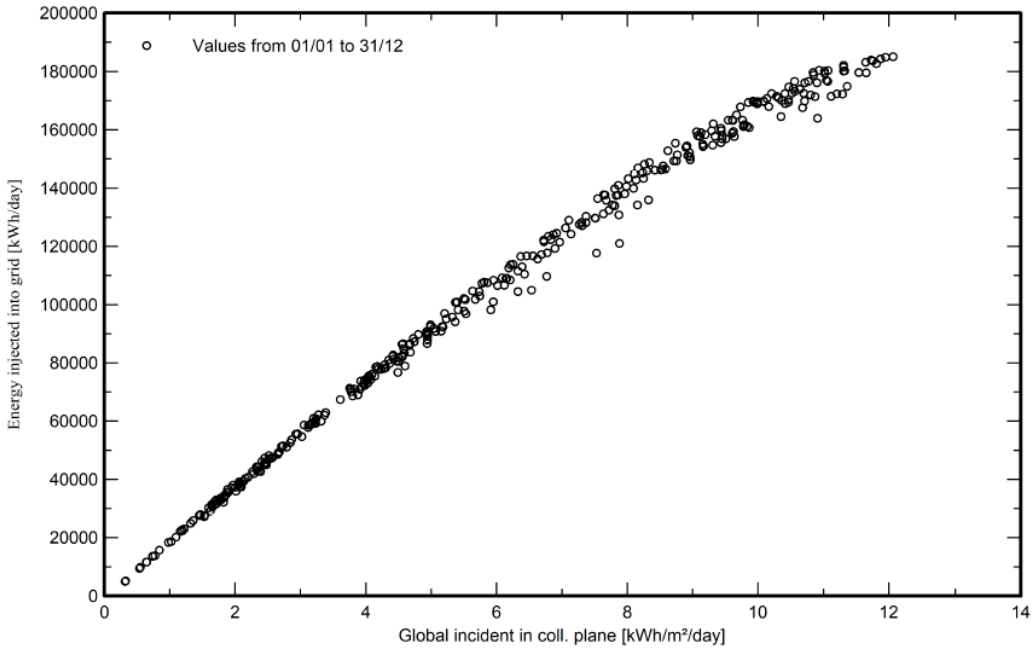
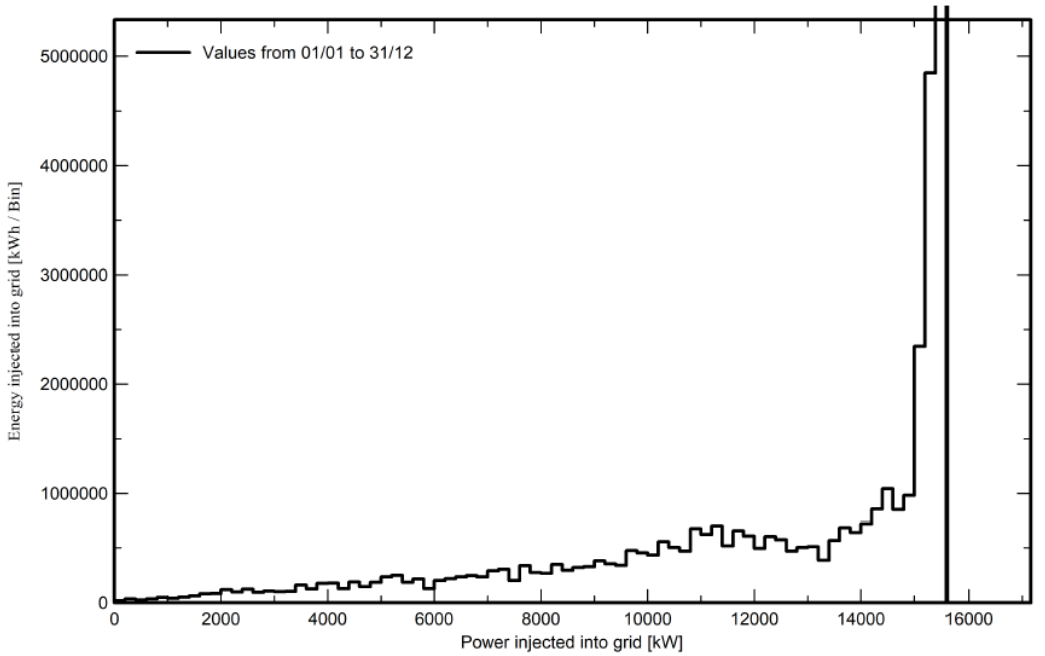


Special graphs

Daily Input/Output diagram



System Output Power Distribution



P50 - P90 evaluation

Meteo data

Source	SolarGIS Monthly aver. , period not spec.
Kind	Not defined
Year-to-year variability(Variance)	0.5 %
Specified Deviation	

Global variability (meteo + system)

Variability (Quadratic sum)	1.9 %

Simulation and parameters uncertainties

PV module modelling/parameters	1.0 %
Inverter efficiency uncertainty	0.5 %
Soiling and mismatch uncertainties	1.0 %
Degradation uncertainty	1.0 %

Annual production probability

Variability	0.71 GWh
P50	37.84 GWh
P90	36.93 GWh
P95	36.68 GWh

Probability distribution