



REGIONE PUGLIA



COMUNE DI POGGIO  
IMPERIALE



COMUNE DI LESINA



COMUNE DI SAN PAOLO  
CIVITATE



COMUNE DI APRICENA


Nome Progetto / Project Name

**IMPIANTO AGRIVOLTAICO,  
DENOMINATO POGGIO 2  
POTENZA INSTALLATA 20,35 MW  
CON PANNELLI SU SUPPORTO TRACKER  
AD ASSE ORIZZONTALE IN AGRO DI  
POGGIO IMPERIALE, SAN PAOLO CIVITATE, APRICENA  
E RELATIVE OPERE DI CONNESSIONE**

committente	Titolo documento / Document title		
	Relazione sulla producibilità		
GC POGGIO II	Tavola / Panel	Codice elaborato / Code processed	
	01	PG2_REL_FV_PRD_005	

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N.	Data Revisione	Descrizione revisione	Preparato	Vagliato	Approvato

Specialista / Specialist	Sviluppatore / Developer
Ing. Pasquale De Bonis	 RENEWABLE CONSULTING

Progettisti / Planner			
	RENEWABLE CONSULTING S.R.L.		
	Nome file	Dimensione cartiglio	Scala
.....	A4	---	

## SOMMARIO

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### ALLEGATI:

- REPORT PVSYST



PROGETTO RELATIVO ALLA COSTRUZIONE ED ESERCIZIO DI UN IMPIANTO AGRIVOLTAICO, DENOMINATO POGGIO 2, POTENZA INSTALLATA 20,35 MW, CON PANNELLI SU SUPPORTO TRACKER AD ASSE ORIZZONTALE IN AGRO DI POGGIO IMPERIALE, SAN PAOLO CIVITATE, APRICENA

COMUNE DI POGGIO IMPERIALE,  
COMUNE DI LESINA, COMUNE DI SAN  
PAOLO CIVITATE E COMUNE DI  
APRICENA

PG2\_REL\_FV\_PRD\_005\_Relazione tecnica producibilità

## 1. PREMESSA

Il presente documento è parte integrante del progetto definitivo redatto per la realizzazione della connessione elettrica alla rete di Terna SpA, in riferimento all'impianto di produzione di energia elettrica da fonte fotovoltaica denominato **GC POGGIO IMP II**, da realizzarsi in agro dei comuni di Apricena e Poggio Imperiale (FG), caratterizzato da una potenza di 20,35 MWp.

## 2. CALCOLO PRODUCIBILITÀ IMPIANTO

La valutazione della producibilità è stata eseguita tramite simulazione software con l'inserimento dei dati geometrici ed elettrici dell'impianto, geolocalizzando il sito per i dati meteorologici annuali calcolando quindi puntualmente i diversi orientamenti ottenuti dal movimento delle strutture ad inseguimento durante la giornata.

Da tale report si evince che la producibilità attesa media annua dell'impianto è pari a **32750 MWh/anno** con una produzione specifica pari a **1609 kWh/kWp/a**.

# PVsyst - Simulation report

## Grid-Connected System

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Project: STMG 2

Variant: interasse 5m

Tracking system

System power: 20.35 MWp

Poggio Imperiale - Italy

**Author**

ING. PASQUALE DE BONIS (Italy)

**PVsyst V7.2.21**

VC2, Simulation date:  
05/11/22 09:46  
with v7.2.21

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**Project summary****Geographical Site**

**Poggio Imperiale**  
Italy

**Situation**

Latitude 41.83 °N  
Longitude 15.37 °E  
Altitude 68 m  
Time zone UTC+1

**Project settings**

Albedo 0.20

**Meteo data**

Poggio Imperiale  
Meteonorm 7.3 (1991-2010), Sat=74% - Sintetico

**System summary****Grid-Connected System****PV Field Orientation**

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

**Tracking system**

**Tracking algorithm**  
Astronomic calculation

**Near Shadings**

Linear shadings

**System information****PV Array**

Nb. of modules 33644 units  
Pnom total 20.35 MWp

**Inverters**

Nb. of units 53 units  
Pnom total 16.96 MWac  
Pnom ratio 1.200

**User's needs**

Unlimited load (grid)

**Results summary**

Produced Energy 32.75 GWh/year Specific production 1609 kWh/kWp/year Perf. Ratio PR 78.94 %

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## PVsyst V7.2.21

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## General parameters

Grid-Connected System		Tracking system	
<b>PV Field Orientation</b>		<b>Tracking algorithm</b>	
<b>Orientation</b>		Astronomic calculation	
Tracking plane, horizontal N-S axis			
Axis azimuth	0 °		
<b>Models used</b>		<b>Trackers configuration</b>	
Transposition	Perez	Nb. of trackers	515 units
Diffuse	Perez, Meteonorm	<b>Sizes</b>	
Circumsolar	separate	Tracker Spacing	5.00 m
		Collector width	2.26 m
		Ground Cov. Ratio (GCR)	45.1 %
		Phi min / max.	-/+ 60.0 °
		<b>Shading limit angles</b>	
		Phi limits	+/- 63.0 °
<b>Horizon</b>		<b>User's needs</b>	
Free Horizon		Unlimited load (grid)	
		<b>Near Shadings</b>	
		Linear shadings	

## PV Array Characteristics

PV module		Inverter	
Manufacturer	Risen Energy Co., Ltd	Manufacturer	Sungrow
Model	RSM120-8-605M	Model	SG350HX-20A-Preliminary
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	605 Wp	Unit Nom. Power	320 kWac
Number of PV modules	33644 units	Number of inverters	53 units
Nominal (STC)	20.35 MWp	Total power	16960 kWac
<b>Array #1 - Sottocampo #1</b>		<b>Array #1 - Sottocampo #1</b>	
Number of PV modules	29120 units	Number of inverters	46 units
Nominal (STC)	17.62 MWp	Total power	14720 kWac
Modules	1120 Strings x 26 In series	Operating voltage	500-1500 V
<b>At operating cond. (50°C)</b>		Max. power (=>30°C)	352 kWac
Pmpp	16.13 MWp	Pnom ratio (DC:AC)	1.20
U mpp	821 V		
I mpp	19657 A		
<b>Array #2 - Sottocampo #2</b>		<b>Array #2 - Sottocampo #2</b>	
Number of PV modules	4524 units	Number of inverters	7 units
Nominal (STC)	2737 kWp	Total power	2240 kWac
Modules	174 Strings x 26 In series	Operating voltage	500-1500 V
<b>At operating cond. (50°C)</b>		Max. power (=>30°C)	352 kWac
Pmpp	2506 kWp	Pnom ratio (DC:AC)	1.22
U mpp	821 V		
I mpp	3054 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	20355 kWp	Total power	16960 kWac
Total	33644 modules	Number of inverters	53 units
Module area	95216 m <sup>2</sup>	Pnom ratio	1.20
Cell area	89224 m <sup>2</sup>		



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**Array losses**

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 20.0 W/m²K  
Uv (wind) 0.0 W/m²K/m/s

**LID - Light Induced Degradation**

Loss Fraction 1.6 %

**Module Quality Loss**

Loss Fraction -0.8 %

**Module mismatch losses**

Loss Fraction 2.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.1 %

**IAM loss factor**

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

**DC wiring losses**

Global wiring resistance 0.59 mΩ  
Loss Fraction 1.5 % at STC

**Array #1 - Sottocampo #1**

Global array res. 0.68 mΩ  
Loss Fraction 1.5 % at STC

**Array #2 - Sottocampo #2**

Global array res. 4.4 mΩ  
Loss Fraction 1.5 % at STC

**System losses**

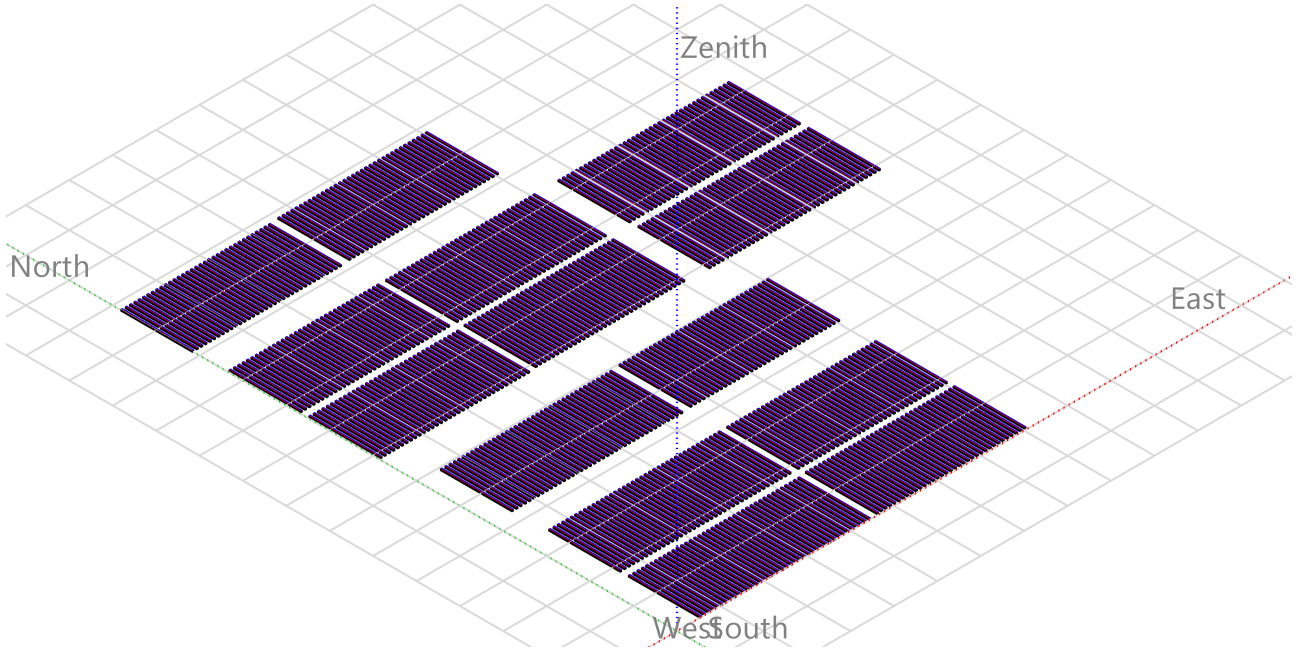
**Auxiliaries loss**

constant (fans) 20.0 kW  
0.0 kW from Power thresh.  
Night aux. cons. 10.0 kW



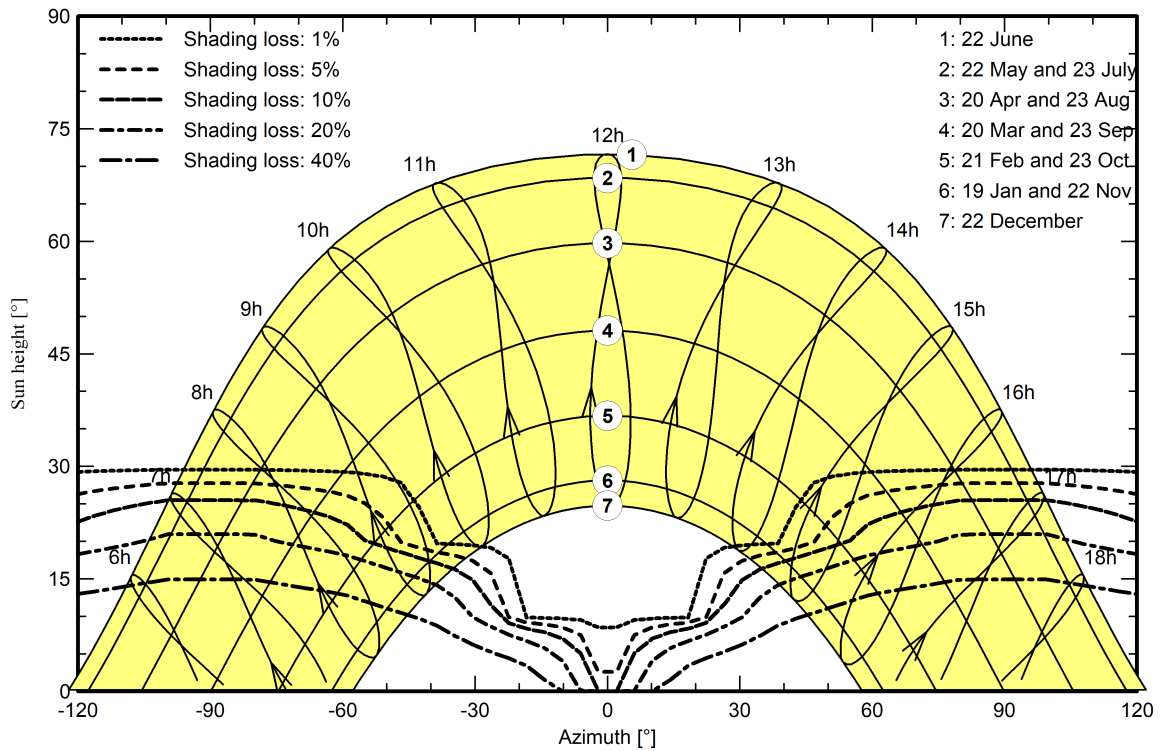
### Near shadings parameter

Perspective of the PV-field and surrounding shading scene



### Iso-shadings diagram

Orientation #1







**Main results**

**System Production**

Produced Energy 32.75 GWh/year

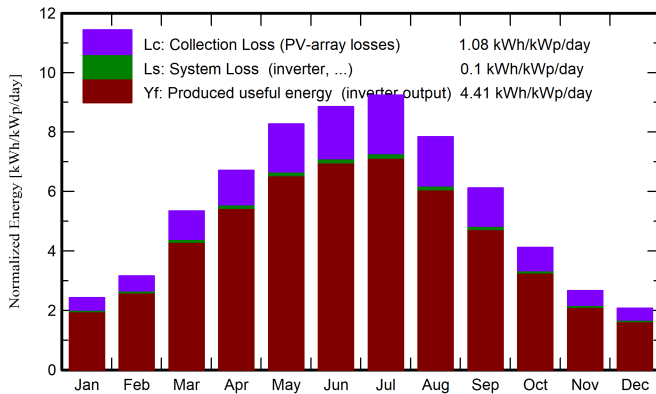
Specific production

1609 kWh/kWp/year

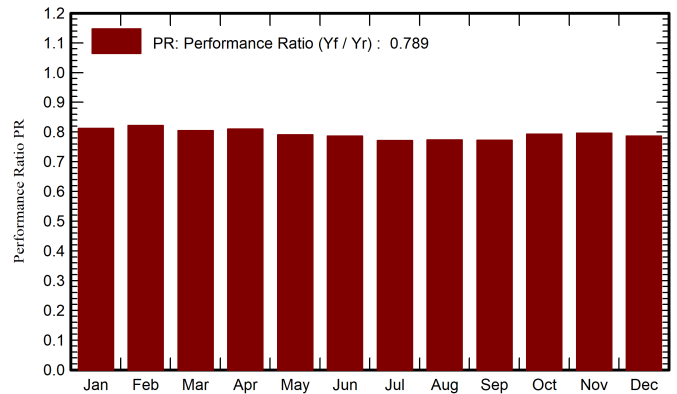
Performance Ratio PR

78.94 %

**Normalized productions (per installed kWp)**



**Performance Ratio PR**



**Balances and main results**

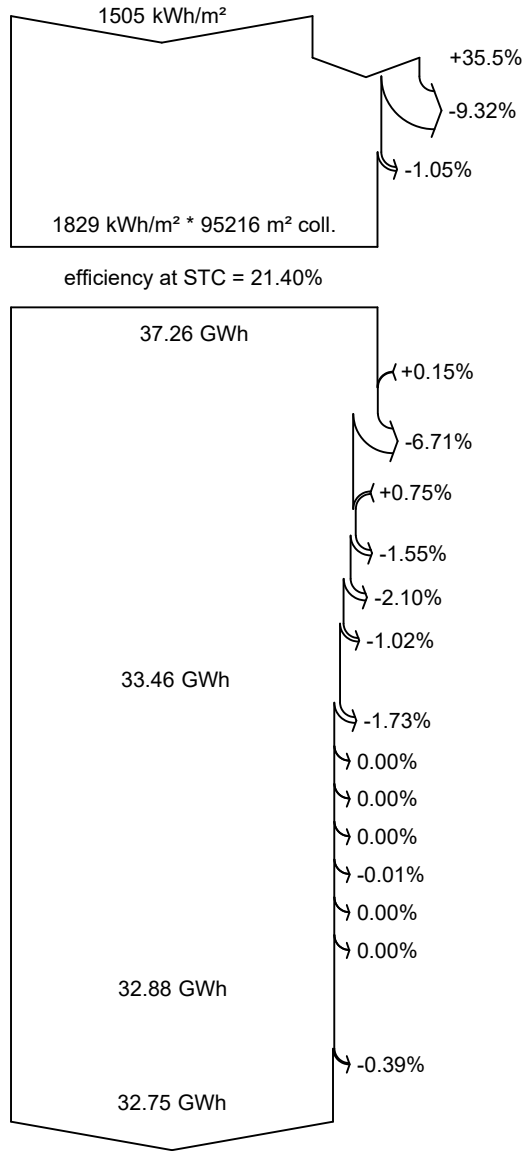
	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray GWh	E_Grid GWh	PR ratio
January	53.3	24.19	7.70	75.2	64.5	1.276	1.243	0.812
February	67.4	39.13	8.01	88.4	77.1	1.516	1.479	0.822
March	118.5	50.86	11.13	165.7	146.2	2.774	2.714	0.805
April	151.2	68.61	13.83	201.4	181.9	3.392	3.323	0.810
May	191.3	81.29	19.83	256.4	233.7	4.209	4.125	0.790
June	202.1	86.08	23.99	265.8	245.3	4.342	4.257	0.787
July	212.8	86.25	27.14	286.7	262.6	4.592	4.503	0.772
August	180.1	77.57	26.64	243.1	221.4	3.908	3.830	0.774
September	132.4	58.39	20.93	183.7	162.0	2.952	2.891	0.773
October	92.8	45.36	17.58	127.8	112.0	2.109	2.061	0.792
November	57.3	29.44	12.34	79.8	68.6	1.329	1.294	0.797
December	45.5	24.19	9.02	64.4	53.7	1.061	1.031	0.787
Year	1504.7	671.36	16.57	2038.4	1828.9	33.461	32.751	0.789

**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

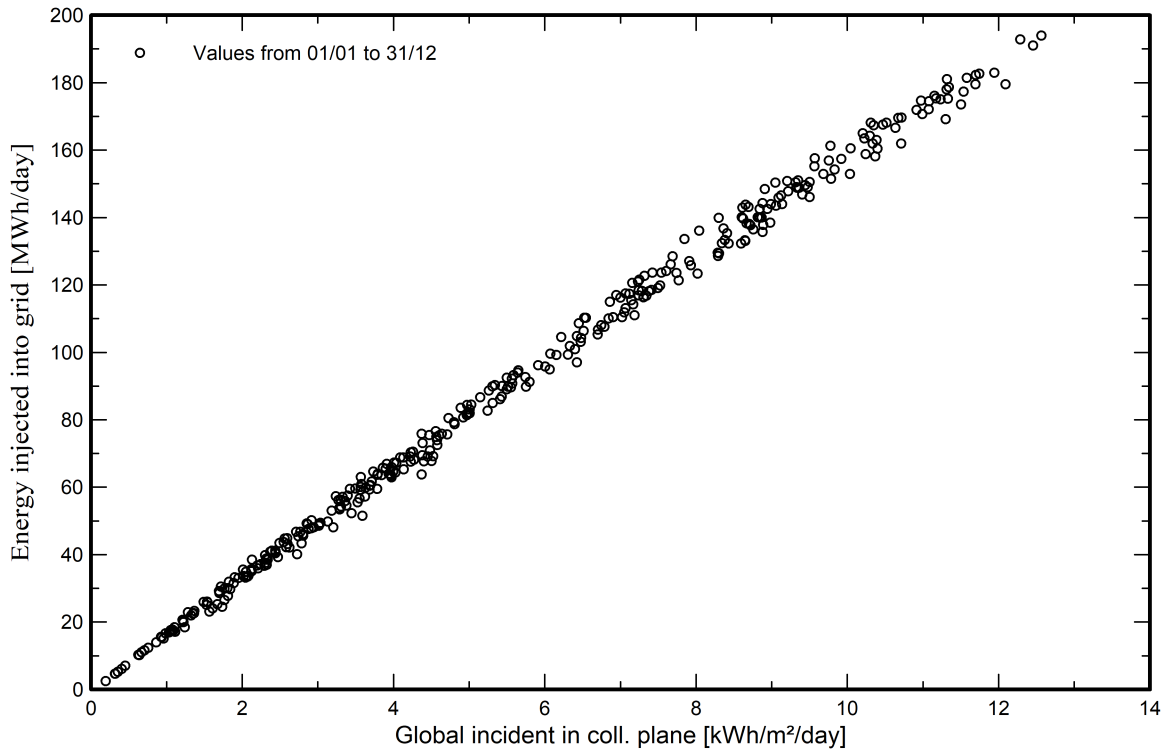


- Global horizontal irradiation**
- Global incident in coll. plane**
- Near Shadings: irradiance loss
- IAM factor on global
- Effective irradiation on collectors**
- PV conversion
- Array nominal energy (at STC effic.)**
- PV loss due to irradiance level
- PV loss due to temperature
- Module quality loss
- LID - Light induced degradation
- Mismatch loss, modules and strings
- Ohmic wiring 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)
- Energy injected into grid**

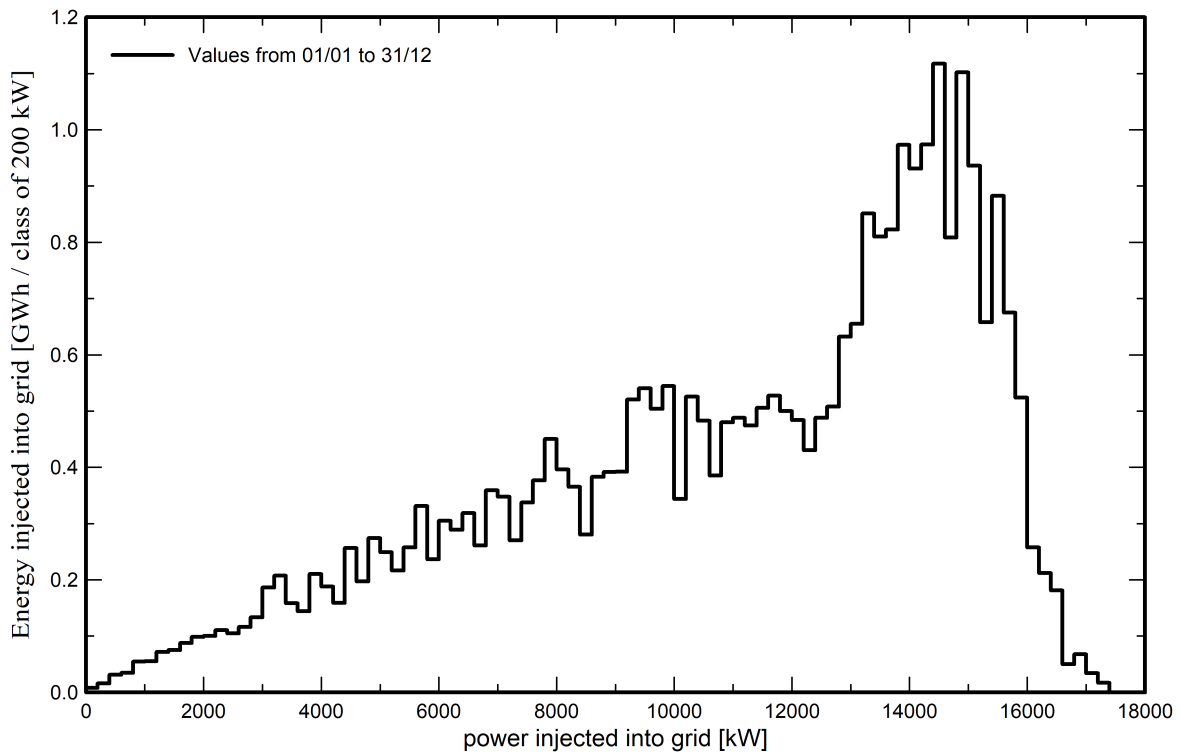


Special graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema





**P50 - P90 evaluation**

**Meteo data**

Source Meteororm 7.3 (1991-2010), Sat=74%  
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 0.61 GWh  
P50 32.75 GWh  
P90 31.97 GWh  
P95 31.74 GWh

**Probability distribution**

