

REGIONE: LAZIO

PROVINCIA: VITERBO

COMUNI: ACQUAPENDENTE

ELABORATO:

119.21.01.R05

OGGETTO:

**IMPIANTO FOTOVOLTAICO
ACQUAPENDENTE 37.15MWp
PROGETTO DEFINITIVO**

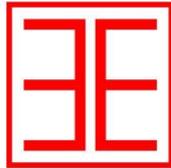
PROPONENTE:

ICA FOR s.r.l.

ICA FOR s.r.l.

via Giorgio Pitacco n.7, 00177 Roma (RM)

**PROGETTO
DEFINITIVO**



**E N E R G Y
E N V I R O N M E N T
E N G I N E E R I N G**

3E Ingegneria S.r.l.

Via G. Volpe n.92 – cap 56121 – Pisa (PI)

3eingegneria@pec.it

www.3eingegneria.it

info@3eingegneria.it

Relazione Autoconsumo Energia Elettrica



Note:

DATA	REV	DESCRIZIONE	ELABORATO da:	APPROVATO da:
DICEMBRE 2021	0	Emissione	3E Ingegneria Srl	ICA FOR

PROPRIETÀ ESCLUSIVA DELLE SOCIETÀ SOPRA INDICATE,
UTILIZZO E DUPLICAZIONE VIETATE SENZA AUTORIZZAZIONE SCRITTA



ENERGY
ENVIRONMENT
ENGINEERING

**Impianto Fotovoltaico “ACQUAPENDENTE ”
da 37.15 MWp
Relazione Autoconsumo Energia Elettrica**

OGGETTO / SUBJECT

ICA FOR s.r.l.

CLIENTE / CUSTOMER

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1 SCOPO DEL DOCUMENTO

Il presente documento ha l'obiettivo di illustrare i valori di producibilità annua e l'autoconsumo di energia elettrica dell'impianto fotovoltaico della ICA FOR srl denominato "Acquapendente". Si precisa che l'impianto fotovoltaico opererà in regime di cessione totale in quanto tutta l'energia elettrica prodotta, al netto dei servizi ausiliari di impianto, verrà immessa in rete e non autoconsumata.

1.1 Producibilità di impianto e autoconsumo energia elettrica

La stima della producibilità dell'impianto è stata effettuata con l'impiego del simulatore PVsyst, inserendo l'irraggiamento e la meteorologia specifici del luogo, la geometria delle strutture di sostegno dei moduli, le caratteristiche di producibilità dei moduli.

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PVsyst - Simulation report

Grid-Connected System

Project: Acquapendente

Variant: Acquapendente 37.15 Mw 55454 TRINA670 Sie1415Idd
Tracking system with backtracking
System power: 37.15 MWp
La Sbarra - Italy

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with v7.2.10

Project: Acquapendente
Variant: Acquapendente 37.15 Mw 55454 TRINA670 Sie1415Idd

Project summary

Geographical Site La Sbarra Italy	Situation Latitude 42.73 °N Longitude 11.84 °E Altitude 457 m Time zone UTC+1	Project settings Albedo 0.20
Meteo data La Sbarra PVGIS api TMY		

System summary

Grid-Connected System PV Field Orientation Tracking plane, horizontal N-S axis Axis azimuth 0 °	Tracking system with backtracking Near Shadings According to strings Electrical effect 100 %	User's needs Unlimited load (grid)
System information PV Array Nb. of modules 55454 units Pnom total 37.15 MWp	Inverters Nb. of units 28 units Pnom total 39.62 MWac Grid power limit 33.77 MWac Grid lim. Pnom ratio 1.100	

Results summary

Produced Energy 64 GWh/year	Specific production 1710 kWh/kWp/year	Perf. Ratio PR 84.83 %
Apparent energy 65585 MVAh		

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Variant: Acquapendente 37.15 Mw 55454 TRINA670 Sie1415ldd

General parameters

Grid-Connected System		Tracking system with backtracking	
PV Field Orientation			
Orientation		Backtracking strategy	
Tracking plane, horizontal N-S axis		Nb. of trackers	879 units
Axis azimuth 0 °		Sizes	
		Tracker Spacing	11.1 m
		Collector width	4.70 m
		Ground Cov. Ratio (GCR)	42.5 %
		Phi min / max.	-/+ 60.0 °
		Backtracking limit angle	
		Phi limits	+/- 64.8 °
Horizon		Near Shadings	
Free Horizon		According to strings	
		Electrical effect	100 %
		User's needs	
		Unlimited load (grid)	
Grid injection point		Power factor	
Grid power limitation		Cos(phi) (leading) 0.970	
Active Power	33.77 MWac		
Pnom ratio	1.100		

PV Array Characteristics

PV module		Inverter	
Manufacturer	Generic	Manufacturer	Generic
Model	TSM-670DEG21C.20	Model	SOLEIL1415 P(Text) REV04
(Original PVsyst database)		(Custom parameters definition)	
Unit Nom. Power	670 Wp	Unit Nom. Power	1415 kVA
Number of PV modules	55454 units	Number of inverters	28 units
Nominal (STC)	37.15 MWp	Total power	39620 kVA
Modules	1631 Strings x 34 In series	Operating voltage	950-1400 V
At operating cond. (50°C)		Max. power (=>20°C)	1443 kVA
Pmpp	34.04 MWp	Pnom ratio (DC:AC)	0.94
U mpp	1078 V		
I mpp	31582 A		
Total PV power		Total inverter power	
Nominal (STC)	37154 kWp	Total power	39620 kVA
Total	55454 modules	Number of inverters	28 units
Module area	174408 m ²	Pnom ratio	0.94
Cell area	161038 m ²		

Array losses

Array Soiling Losses		Thermal Loss factor		DC wiring losses	
Loss Fraction	2.0 %	Module temperature according to irradiance		Global array res.	0.56 mΩ
		Uc (const)	20.0 W/m ² K	Loss Fraction	1.5 % at STC
		Uv (wind)	0.0 W/m ² K/m/s		
LID - Light Induced Degradation		Module Quality Loss		Module mismatch losses	
Loss Fraction		Loss Fraction		2.0 % at MPP	
Strings Mismatch loss					
Loss Fraction	0.1 %				

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Array losses
IAM loss factor

Incidence effect (IAM): User defined profile

Auxiliaries loss

 constant (fans) 15.00 kW
 0.0 kW from Power thresh.
 Proportional to Power 1.0 W/kW
 0.0 kW from Power thresh.
 Night aux. cons. 6.00 kW

AC wiring losses
Inv. output line up to MV transfo

 Inverter voltage 640 Vac tri
 Loss Fraction 0.32 % at STC

Inverter: SOLEIL1415 P(Text) REV04

 Wire section (28 Inv.) Alu 28 x 3 x 1000 mm²
 Average wires length 30 m

MV line up to Injection

 MV Voltage 36 kV
 Average each inverter
 Wires Alu 3 x 500 mm²
 Length 20000 m
 Loss Fraction 0.48 % at STC

AC losses in transformers
MV transfo

Grid voltage 36 kV

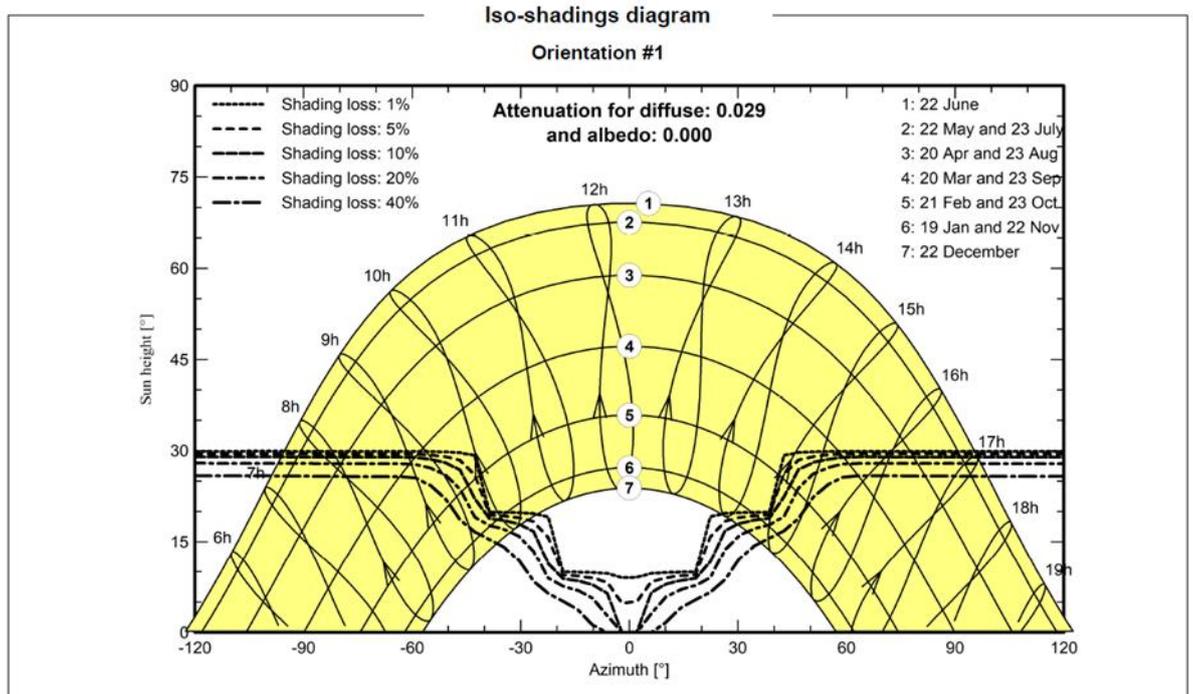
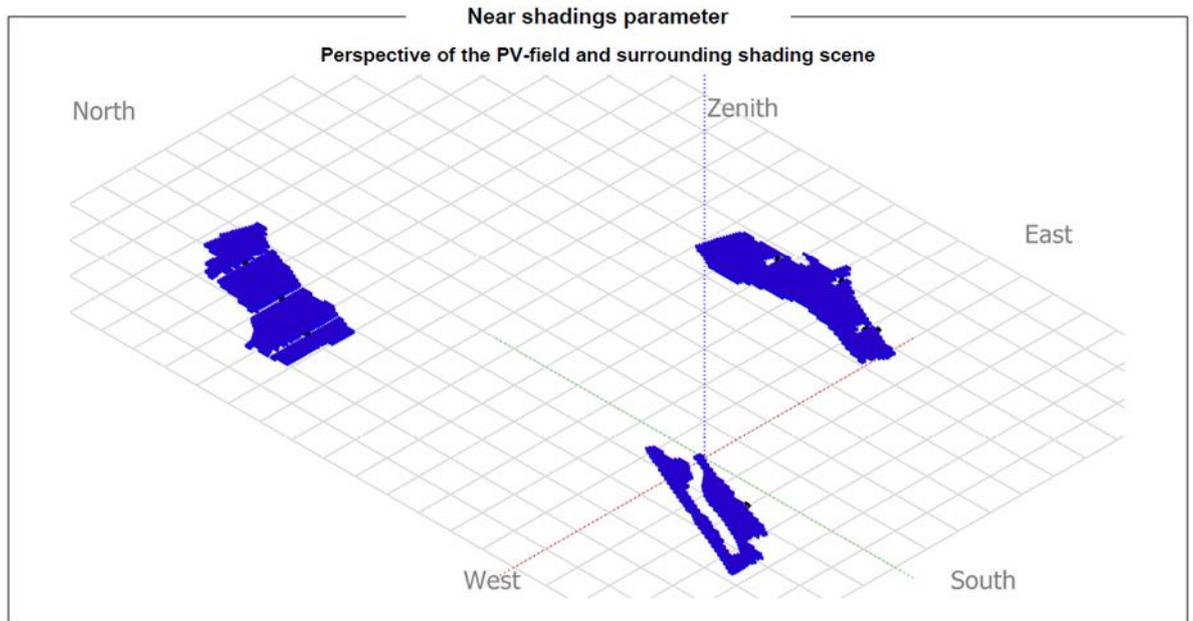
Operating losses at STC

 Nominal power at STC 36861 kVA
 Iron loss (24/24 Connexion) 5.53 kW/Inv.
 Loss Fraction 0.12 % at STC
 Coils equivalent resistance 3 x 0.89 mΩ/inv.
 Loss Fraction 1.00 % at STC



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with v7.2.10

Project: Acquapendente

Variant: Acquapendente 37.15 Mw 55454 TRINA670 Sie1415ldd

Main results

System Production

Produced Energy

64 GWh/year

Specific production

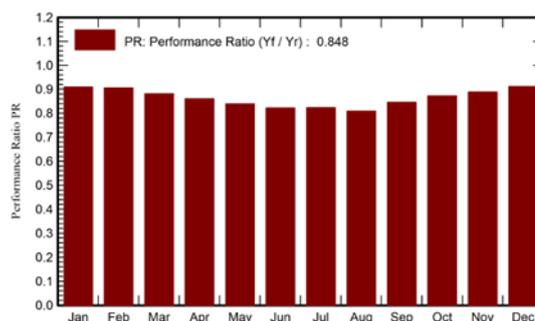
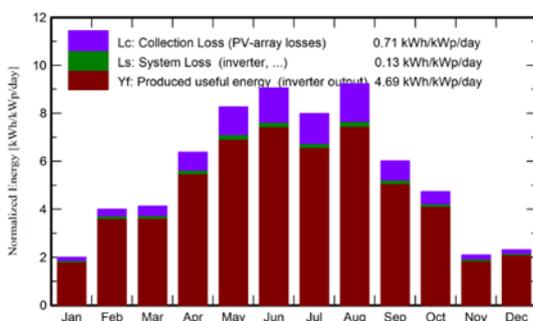
1710 kWh/kWp/year

Apparent energy

65585 MVAh

Performance Ratio PR

84.83 %



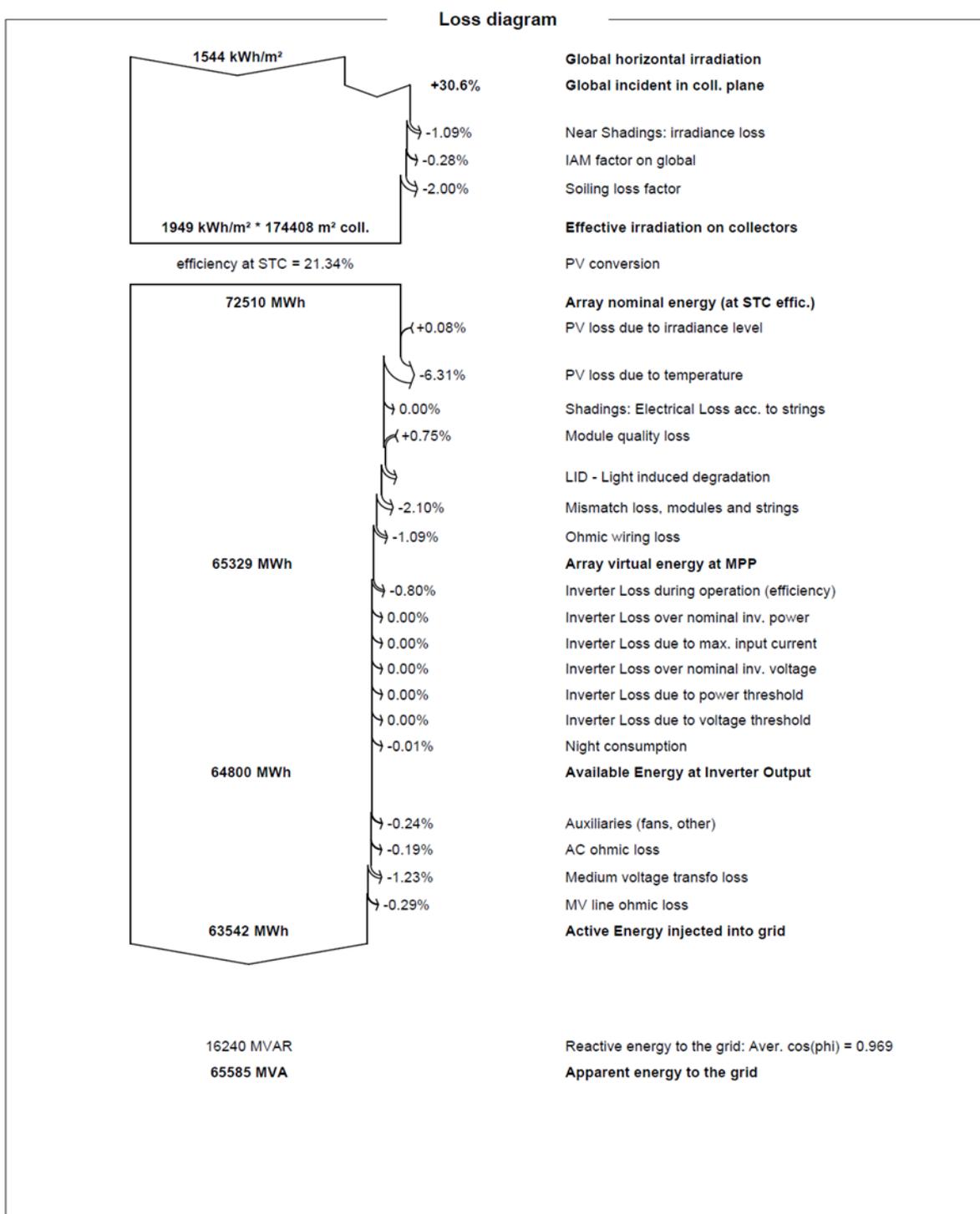
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	GWh	GWh	ratio
January	47.8	25.29	5.35	61.8	59.2	2.165	2.087	0.909
February	81.8	30.65	5.23	112.1	108.1	3.879	3.771	0.906
March	100.6	50.07	8.00	128.0	123.3	4.315	4.189	0.881
April	151.0	67.61	12.00	191.3	184.9	6.287	6.120	0.861
May	199.2	76.34	15.57	256.0	247.8	8.200	7.984	0.839
June	211.0	74.00	20.00	271.8	263.2	8.518	8.295	0.822
July	193.3	81.53	21.24	247.8	239.6	7.782	7.580	0.823
August	211.7	57.71	24.04	286.1	277.6	8.829	8.605	0.809
September	137.7	54.45	18.45	180.4	174.5	5.820	5.667	0.845
October	107.5	40.76	14.04	146.6	141.7	4.882	4.752	0.873
November	50.1	26.91	10.16	62.7	60.1	2.151	2.072	0.889
December	52.1	22.40	5.67	71.4	68.5	2.502	2.420	0.912
Year	1543.9	607.73	13.36	2016.0	1948.6	65.329	63.542	0.848

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		


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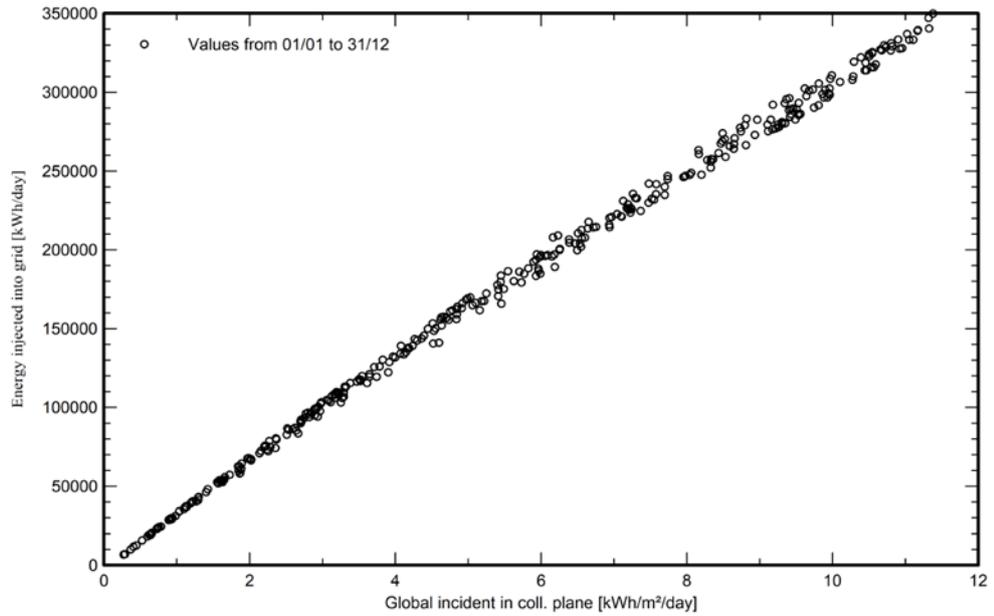


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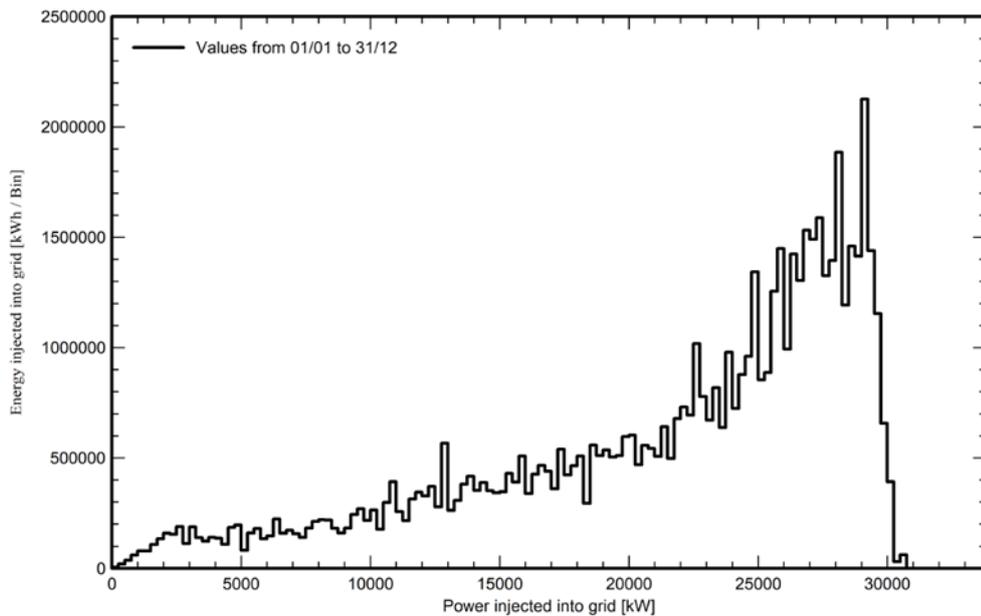
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Special graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema



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P50 - P90 evaluation
Meteo data

 Source PVGIS api TMY
Kind Not defined
Year-to-year variability(Variance) 0.0 %

Specified Deviation
Global variability (meteo + system)

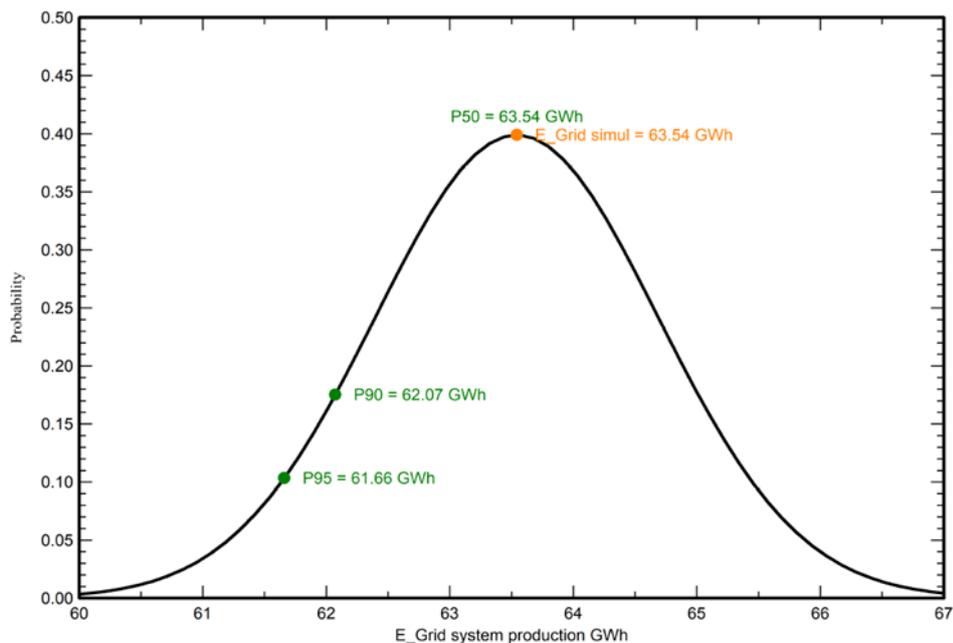
Variability (Quadratic sum) 1.8 %

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 1.15 GWh
P50 63.54 GWh
P90 62.07 GWh
P95 61.66 GWh

Probability distribution




Come riportato nel diagramma di flusso di cui sopra, si evidenzia che:

- l'energia elettrica disponibile all'uscita degli inverter (energia elettrica in corrente alternata) è pari a circa 64.800 MWh/anno;
- le perdite di impianto sulla sezione in corrente alternata (perdite di linea e di trasformazione) sono pari a circa 1.098 MWh/anno;
- l'energia elettrica necessaria per l'alimentazione dei servizi ausiliari di impianto è stimabile con buona approssimazione in 150 MWh/anno;
- il sistema di videosorveglianza e controllo presenta un consumo elettrico annuo molto contenuto, dell'ordine dei 10 MWh/anno.

La produzione elettrica netta immessa nella rete elettrica nazionale è pari a circa:

63.542 MWh/anno.

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