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NOME COMMESSA:

NUOVO IMPIANTO AGROVOLTAICO DI PRODUZIONE DI ENERGIA DA FONTE SOLARE DENOMINATO IMPIANTO "SPOT26" DI POTENZA NOMINALE PARI A 10,55 MW E DI POTENZA INSTALLABILE PARI A 13,581 MWP, DA REALIZZARSI NEL COMUNE DI GUAGNANO (LE).
IMPIANTO SPOT 26

STATO DI AVANZAMENTO COMMESSA:

PROGETTO DEFINITIVO PER AUTORIZZAZIONE UNICA

CODICE COMMESSA:

HE.18.0065

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OGGETTO:

Analisi della risorsa solare e stima di produzione energia

SCALA:

NOME FILE:

2V7IYQ2_AnalisiRisorsaSolare.pdf

DATA:

MAGGIO 2022

TAVOLA:

-

N. REV.	DATA	REVISIONE
0	05.2022	Emissione

ELABORATO	VERIFICATO	VALIDATO
M.Girardi	responsabile commessa A.Albuzzi	direttore tecnico N.Zuech

PVsyst - Simulation report

Grid-Connected System

Project: HE.19.0024 HEPV07 Srl - SPOT26

Variant: SPOT26 PVGYS SARAH 2005-2016

Trackers single array, with backtracking

System power: 13.58 MWp

Guagnano - Italy

Author

Heliopolis spa (Italy)



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Project summary

Geographical Site Guagnano Italy	Situation Latitude 40.42 °N Longitude 17.92 °E Altitude 34 m Time zone UTC+1	Project settings Albedo 0.20
Meteo data Guagnano PVGIS-SARAH averages 01/01/05 to 31/12/16 - Synthetic		

System summary

Grid-Connected System Simulation for year no 1	Trackers single array, with backtracking		
PV Field Orientation Tracking plane, horizontal N-S axis Axis azimuth 0 °	Near Shadings Linear shadings	User's needs Unlimited load (grid)	
System information			
PV Array		Inverters	
Nb. of modules	30520 units	Nb. of units	42 units
Pnom total	13.58 MWp	Pnom total	9450 kWac
		Pnom ratio	1.437

Results summary

Produced Energy	25319 MWh/year	Specific production	1864 kWh/kWp/year	Perf. Ratio PR	83.40 %
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General parameters

Grid-Connected System		Trackers single array, with backtracking	
PV Field Orientation		Backtracking strategy	
Orientation		Nb. of trackers	56 units
Tracking plane, horizontal N-S axis		Single array	
Axis azimuth	0 °	Sizes	
		Tracker Spacing	5.50 m
		Collector width	2.11 m
		Ground Cov. Ratio (GCR)	38.4 %
		Phi min / max.	-/+ 60.0 °
		Backtracking limit angle	
		Phi limits	+/- 67.3 °
Horizon		Near Shadings	
Free Horizon		Linear shadings	
		Models used	
		Transposition	Perez
		Diffuse	Perez, Meteonorm
		Circumsolar	separate
		User's needs	
		Unlimited load (grid)	

PV Array Characteristics

PV module		Inverter	
Manufacturer	JA Solar	Manufacturer	Sungrow
Model	JAM72S20-445/MR_AA	Model	SG250HX
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	445 Wp	Unit Nom. Power	225 kWac
Number of PV modules	30520 units	Number of inverters	504 * MPPT 8% 42 units
Nominal (STC)	13.58 MWp	Total power	9450 kWac
Modules	1090 Strings x 28 In series	Operating voltage	600-1500 V
At operating cond. (50°C)		Max. power (=>30°C)	250 kWac
Pmpp	12.45 MWp	Pnom ratio (DC:AC)	1.44
U mpp	1056 V		
I mpp	11793 A		
Total PV power		Total inverter power	
Nominal (STC)	13581 kWp	Total power	9450 kWac
Total	30520 modules	Number of inverters	42 units
Module area	67810 m ²	Pnom ratio	1.44
Cell area	60913 m ²		

Array losses

Array Soiling Losses		Thermal Loss factor		DC wiring losses	
Loss Fraction	1.0 %	Module temperature according to irradiance		Global array res.	0.39 mΩ
		Uc (const)	29.0 W/m ² K	Loss Fraction	0.4 % at STC
		Uv (wind)	0.0 W/m ² K/m/s		
LID - Light Induced Degradation		Module Quality Loss		Module mismatch losses	
Loss Fraction	1.0 %	Loss Fraction	-0.3 %	Loss Fraction	0.7 % at MPP
Strings Mismatch loss		Module average degradation			
Loss Fraction	0.1 %	Year no	1		
		Loss factor	0.5 %/year		
		Mismatch due to degradation			
		Imp RMS dispersion	0.4 %/year		
		Vmp RMS dispersion	0.4 %/year		

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Array losses**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	1.000	0.985	0.943	0.840	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 1.37 % at STC

Inverter: SG250HX

Wire section (42 Inv.) Alu 42 x 3 x 2500 mm²
Average wires length 2180 m

MV line up to Injection

MV Voltage 20 kV
Wires Copper 3 x 150 mm²
Length 1167 m
Loss Fraction 0.49 % at STC

AC losses in transformers**MV transfo**

Grid voltage 20 kV

Operating losses at STC

Nominal power at STC 13376 kVA
Iron loss (24/24 Connexion) 13.38 kW
Loss Fraction 0.10 % at STC
Coils equivalent resistance 3 x 0.48 mΩ
Loss Fraction 1.00 % at STC



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Main results

System Production

Produced Energy 25319 MWh/year

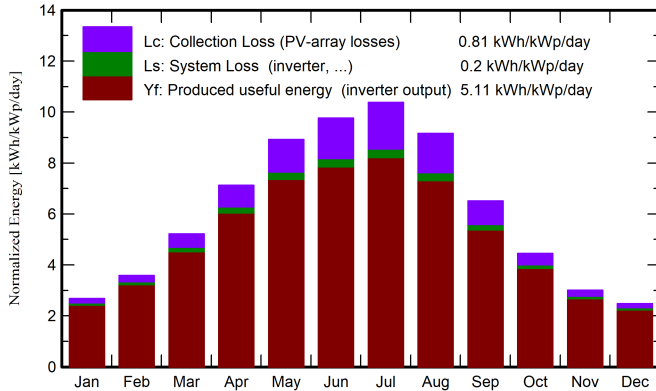
Specific production

1864 kWh/kWp/year

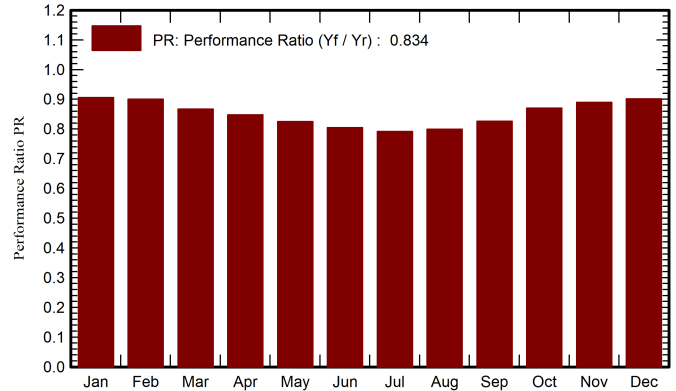
Performance Ratio PR

83.40 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray MWh	E_Grid MWh	PR ratio
January	62.5	29.00	9.72	83.0	79.9	1060	1021	0.905
February	76.0	36.50	9.90	100.5	96.7	1275	1230	0.901
March	125.2	53.10	11.90	161.7	156.1	1979	1905	0.867
April	163.5	64.80	15.04	213.9	206.9	2561	2464	0.848
May	207.7	71.10	18.82	276.7	268.4	3224	3099	0.825
June	222.1	71.40	23.26	293.1	284.5	3332	3202	0.804
July	238.5	63.30	26.50	321.7	312.7	3602	3459	0.792
August	209.5	59.10	26.40	283.9	275.7	3210	3083	0.799
September	147.5	54.50	22.52	195.5	189.1	2280	2193	0.826
October	104.2	44.70	18.20	137.9	132.9	1692	1629	0.870
November	67.9	31.50	14.56	90.3	86.7	1133	1092	0.890
December	57.0	25.90	10.89	77.1	74.0	980	944	0.902
Year	1681.6	604.90	17.35	2235.2	2163.6	26328	25319	0.834

Legends

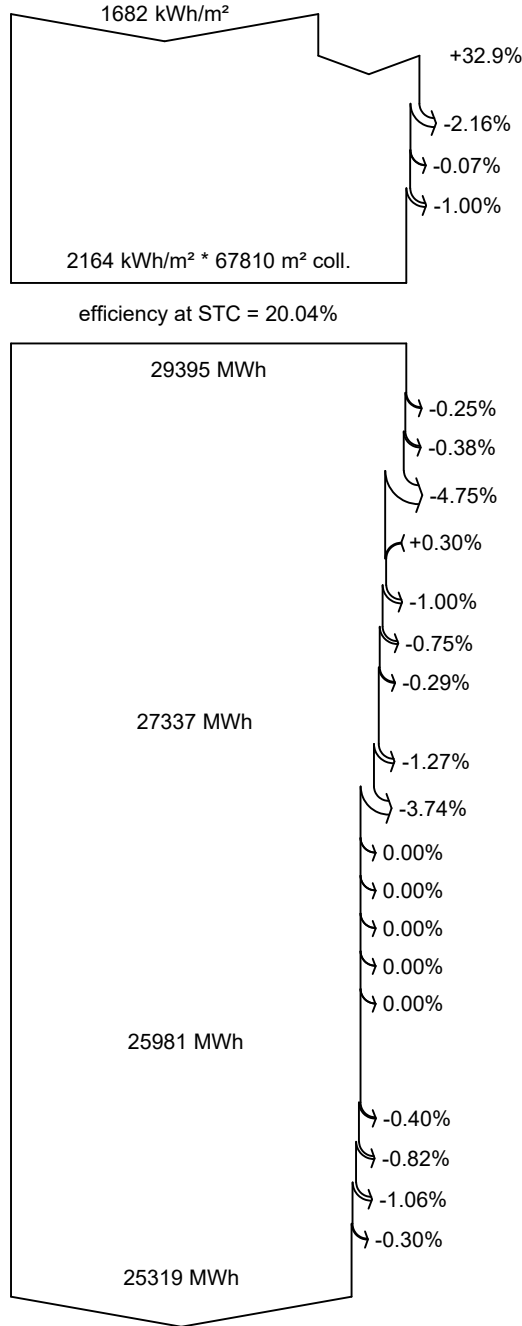
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance Ratio



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

Module Degradation Loss (for year #1)

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)

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid

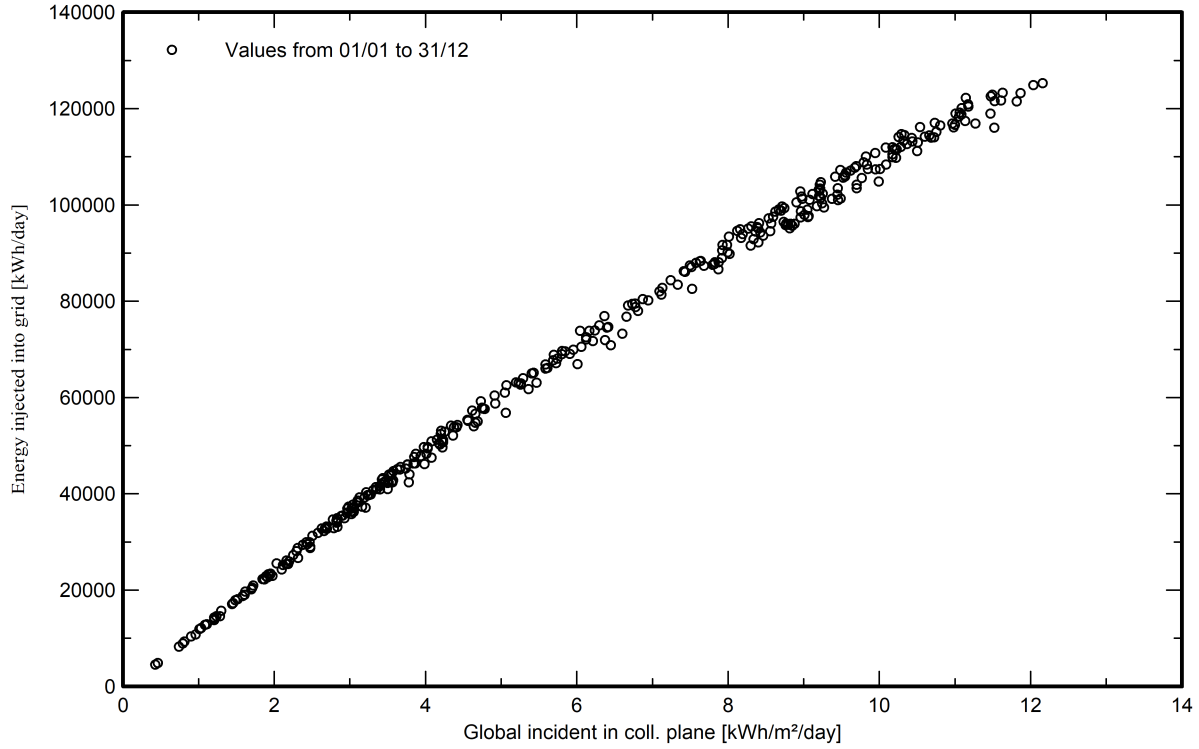


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Special graphs

Daily Input/Output diagram



System Output Power Distribution

