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CERTIFIED
Net
 MANAGEMENT SYSTEM

ORDINE INGEGNERI DELLA PROVINCIA DI FOGGIA
 DOTT. ING. ANTONIO MEZZINA
 N. 11604

PROGETTI e STUDI SPECIALISTICI

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Opera

Progetto definitivo per la realizzazione di un impianto Agri-fotovoltaico, denominato "TANZANITE" da realizzarsi alla località "La Ficora", nei territori comunali di Orta Nova (FG) e Cerignola (FG) per una potenza complessiva pari a **32,53 MWp**, nonché nelle opere connesse ed infrastrutture indispensabili alla costruzione e all'esercizio dell'impianto

Oggetto

Folder:
70EY71_DocumentazioneSpecialistica

Nome Elaborato:
PR_11- Studio del potenziale solare

Descrizione Elaborato:
Studio del potenziale solare

00	Novembre 2022	Progetto definitivo	Ing. O. Tricarico	Ing. A. Mezzina	Pacifico Tanzanite S.r.l.
Rev.	Data	Oggetto della revisione	Elaborazione	Verifica	Approvazione

Scala: -

Formato: A4

Codice Pratica **I70EY71**

PVsyst - Simulation report

Grid-Connected System

Project: Pacifico Tanzanite S.r.l.

Variant: Nuova variante di simulazione

Unlimited Trackers with backtracking

System power: 32.53 MWp

Cerignola - Italia



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13/02/23 17:00
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Project summary

Geographical Site	Situation	Project settings
Cerignola	Latitude 41.27 °N	Albedo 0.20
Italia	Longitude 15.90 °E	
	Altitude 129 m	
	Time zone UTC+1	
Meteo data		
Cerignola		
PVGIS api TMY		

System summary

Grid-Connected System	Unlimited Trackers with backtracking		Near Shadings
PV Field Orientation	Tracking algorithm	No Shadings	
Orientation	Astronomic calculation		
Tracking horizontal axis	Backtracking activated		
System information		Inverters	
PV Array		Nb. of units	12 units
Nb. of modules	55614 units	Pnom total	31.92 MWac
Pnom total	32.53 MWp	Pnom ratio	1.019
User's needs			
Unlimited load (grid)			

Results summary

Produced Energy	57322 MWh/year	Specific production	1762 kWh/kWp/year	Perf. Ratio PR	83.62 %
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General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Tracking horizontal axis

Unlimited Trackers with backtracking**Tracking algorithm**

Astronomic calculation

Backtracking activated

Backtracking strategy

Nb. of trackers 10 units

Unlimited trackers

Sizes

Tracker Spacing 6.60 m

Collector width 3.00 m

Ground Cov. Ratio (GCR) 45.5 %

Left inactive band 0.02 m

Right inactive band 0.02 m

Phi min / max. +/- 60.0 °

Backtracking limit angle

Phi limits +/- 62.4 °

Models used

Transposition Perez

Diffuse Imported

Circumsolar separate

Horizon

Free Horizon

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 6.60 m

Tracker width 3.04 m

GCR 46.1 %

Axis height above ground 2.10 m

Bifacial model definitions

Ground albedo 0.30

Bifaciality factor 80 %

Rear shading factor 5.0 %

Rear mismatch loss 10.0 %

Module transparency 0.0 %

PV Array Characteristics**PV module**

Manufacturer Jinkosolar

Model JKM585M-7RL4-V

(Custom parameters definition)

Unit Nom. Power 585 Wp

Number of PV modules 55614 units

Nominal (STC) 32.53 MWp

Array #1 - Inverter 237 stringhe

Number of PV modules 6162 units

Nominal (STC) 3605 kWp

Modules 237 Strings x 26 In series

At operating cond. (50°C)

Pmpp 3289 kWp

U mpp 1047 V

I mpp 3140 A

Inverter

Manufacturer SMA

Model Sunny Central 2660 UP (Preliminary)

(Custom parameters definition)

Unit Nom. Power 2660 kWac

Number of inverters 12 units

Total power 31920 kWac

Number of inverters 1 unit

Total power 2660 kWac

Operating voltage 880-1325 V

Pnom ratio (DC:AC) 1.36

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PV Array Characteristics**Array #2 - Inverter 136 stringhe**

Number of PV modules	3536 units	Number of inverters	1 unit
Nominal (STC)	2069 kWp	Total power	2660 kWac
Modules	136 Strings x 26 In series		
At operating cond. (50°C)			
Pmpp	1887 kWp	Operating voltage	880-1325 V
U mpp	1047 V	Pnom ratio (DC:AC)	0.78
I mpp	1802 A		

Array #3 - Inverter 220 stringhe

Number of PV modules	11440 units	Number of inverters	2 units
Nominal (STC)	6692 kWp	Total power	5320 kWac
Modules	440 Strings x 26 In series		
At operating cond. (50°C)			
Pmpp	6106 kWp	Operating voltage	880-1325 V
U mpp	1047 V	Pnom ratio (DC:AC)	1.26
I mpp	5830 A		

Array #4 - Inverter 161 stringhe

Number of PV modules	25116 units	Number of inverters	6 units
Nominal (STC)	14.69 MWp	Total power	15960 kWac
Modules	966 Strings x 26 In series		
At operating cond. (50°C)			
Pmpp	13.40 MWp	Operating voltage	880-1325 V
U mpp	1047 V	Pnom ratio (DC:AC)	0.92
I mpp	12800 A		

Array #5 - Inverter 135 stringhe

Number of PV modules	3510 units	Number of inverters	1 unit
Nominal (STC)	2053 kWp	Total power	2660 kWac
Modules	135 Strings x 26 In series		
At operating cond. (50°C)			
Pmpp	1873 kWp	Operating voltage	880-1325 V
U mpp	1047 V	Pnom ratio (DC:AC)	0.77
I mpp	1789 A		

Array #6 - Inverter 225 stringhe

Number of PV modules	5850 units	Number of inverters	1 unit
Nominal (STC)	3422 kWp	Total power	2660 kWac
Modules	225 Strings x 26 In series		
At operating cond. (50°C)			
Pmpp	3122 kWp	Operating voltage	880-1325 V
U mpp	1047 V	Pnom ratio (DC:AC)	1.29
I mpp	2981 A		

Total PV power

Nominal (STC)	32534 kWp	Total inverter power	
Total	55614 modules	Total power	31920 kWac
Module area	152053 m ²	Nb. of inverters	12 units
		Pnom ratio	1.02



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Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

Serie Diode Loss

Voltage drop 0.7 V
Loss Fraction 0.1 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

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 0.57 mΩ
Loss Fraction 1.4 % at STC

Array #1 - Inverter 237 stringhe

Global array res. 3.5 mΩ
Loss Fraction 0.9 % at STC

Array #2 - Inverter 136 stringhe

Global array res. 9.6 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Inverter 220 stringhe

Global array res. 3.0 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Inverter 161 stringhe

Global array res. 1.4 mΩ
Loss Fraction 1.5 % at STC

Array #5 - Inverter 135 stringhe

Global array res. 9.7 mΩ
Loss Fraction 1.5 % at STC

Array #6 - Inverter 225 stringhe

Global array res. 5.8 mΩ
Loss Fraction 1.5 % at STC

System losses

Unavailability of the system

Time fraction 2.0 %
7.3 days,
3 periods

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 600 Vac tri
Loss Fraction 0.41 % at STC

Inverter: Sunny Central 2660 UP (Preliminary)

Wire section (2 Inv.) Copper 2 x 3 x 2500 mm²
Average wires length 250 m

Inverter: Sunny Central 2660 UP (Preliminary)

Wire section (8 Inv.) Copper 8 x 3 x 1500 mm²
Average wires length 0 m

Inverter: Sunny Central 2660 UP (Preliminary)

Wire section (2 Inv.) Copper 2 x 3 x 2000 mm²
Average wires length 0 m



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AC wiring losses

MV line up to Injection

MV Voltage	30 kV
Average each inverter	
Wires	Copper 3 x 10 mm ²
Length	500 m
Loss Fraction	0.28 % at STC



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AC losses in transformers

MV transfo

Grid voltage 30 kV

Operating losses at STC

Nominal power at STC 31844 kVA

Iron loss (24/24 Connexion) 2.65 kW/Inv.

Loss Fraction 0.10 % at STC

Coils equivalent resistance 3 x 3.12 mΩ/inv.

Loss Fraction 2.30 % at STC



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Main results

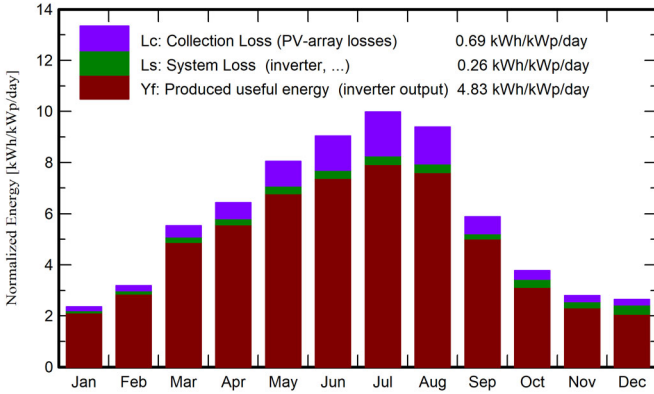
System Production

Produced Energy 57322 MWh/year

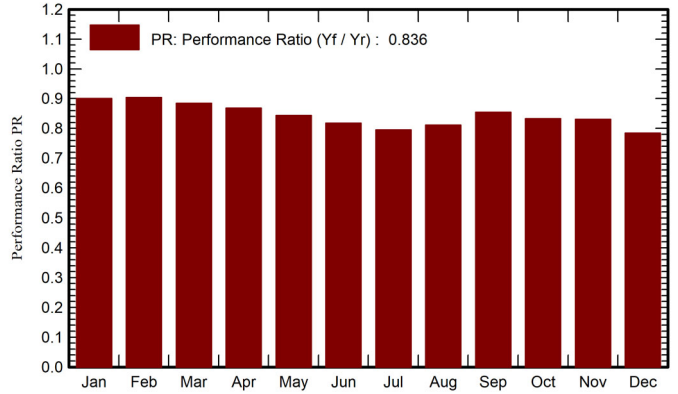
Specific production
Performance Ratio PR

1762 kWh/kWp/year
83.62 %

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	59.2	30.32	7.79	73.2	66.7	2234	2145	0.901
February	69.7	34.16	7.69	89.0	82.4	2728	2618	0.904
March	132.1	51.03	11.83	171.6	161.2	5147	4937	0.884
April	153.7	66.07	14.73	192.8	181.4	5682	5446	0.868
May	196.5	72.95	19.30	249.6	235.9	7146	6847	0.843
June	213.7	74.14	25.46	271.1	256.8	7518	7209	0.817
July	236.0	61.78	29.27	309.3	293.9	8344	8000	0.795
August	220.3	54.78	27.88	291.2	276.7	8020	7688	0.811
September	136.0	53.66	21.88	176.4	165.8	5110	4904	0.854
October	91.6	43.15	16.57	116.8	108.8	3477	3163	0.832
November	64.5	28.99	14.15	84.0	77.2	2503	2270	0.831
December	60.6	23.45	9.18	82.1	74.9	2465	2096	0.785
Year	1633.8	594.50	17.20	2107.1	1981.7	60375	57322	0.836

Legends

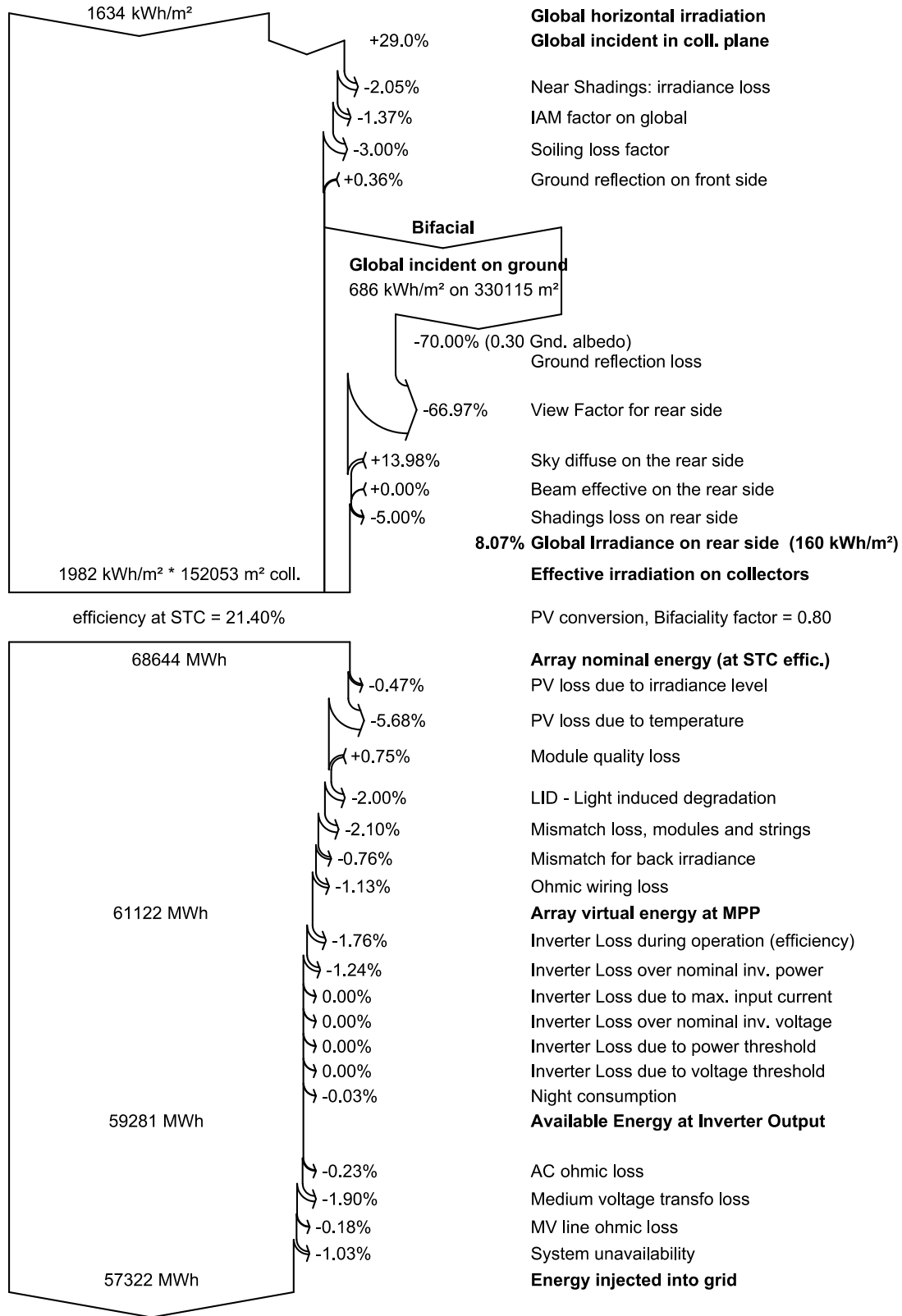
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



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Loss diagram



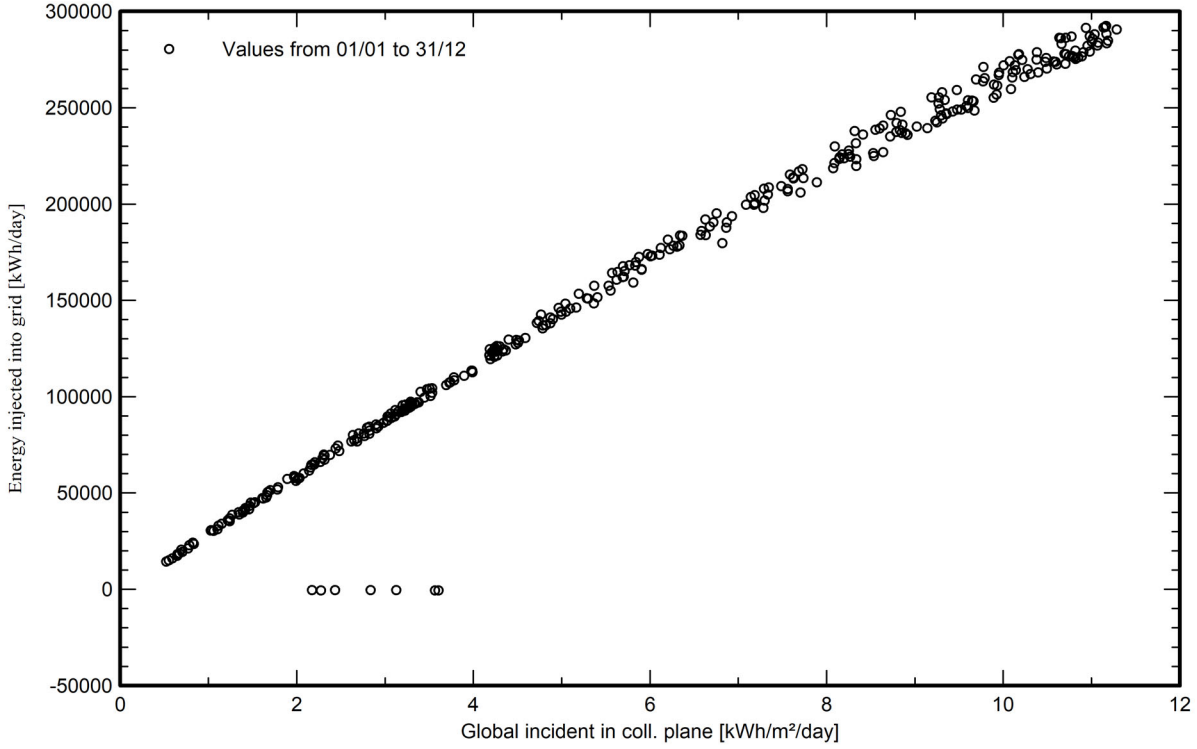


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Special graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

