

**Regione Puglia**  
**Provincia di Brindisi**  
**Comuni di Brindisi e San Pietro Vernotico**

**PROGETTO DEFINITIVO: IMPIANTO FV-QUERCIA**



OGGETTO:  
PROGETTAZIONE E REALIZZAZIONE DI UN IMPIANTO AGRO-FOTOVOLTAICO  
DELLA POTENZA DI 39,000 MW IN AC E 46,627 MW IN DC E DI TUTTE LE OPERE  
CONNESSE ED INFRASTRUTTURE

**IL COMMITTENTE**

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LARGO DONEGANI GUIDO N. 2 - MILANO (MI)  
P.IVA 10707670963

timbro e firma  
  
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timbro e firma

COD. ELAB:

A30

ELABORATO

CALCOLO DELLA PRODUCIBILITA'  
PVsyst

SCALA

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REVISIONE

rev. 01

CODICE DI RINTRACCIABILITÀ

201800623

DATA

11/01/2023

TIMBRO ENTE AUTORIZZANTE



# PVsyst - Simulation report

## Grid-Connected System

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Project: FV Quercia

Variant: FV Quercia

Unlimited Trackers with backtracking

System power: 46.63 MWp

Torre San Sabina - Italy

**Author**

Energie rinnovabili srl (Italy)



# Project: FV Quercia

Variant: FV Quercia

## PVsyst V7.2.21

VCO, Simulation date:  
10/01/23 10:57  
with v7.2.21

Energie rinnovabili srl (Italy)

### Project summary

<b>Geographical Site</b> Torre San Sabina Italy	<b>Situation</b> Latitude 40.99 °N Longitude 17.95 °E Altitude 0 m Time zone UTC+1	<b>Project settings</b> Albedo 0.30
<b>Meteo data</b> Torre San Sabina TA rina dataset - Sintetico		

### System summary

<b>Grid-Connected System</b>	<b>Unlimited Trackers with backtracking</b>		
<b>PV Field Orientation</b> Orientation Tracking horizontal axis	<b>Tracking algorithm</b> Astronomic calculation Backtracking activated	<b>Near Shadings</b> No Shadings	
<b>System information</b>			
<b>PV Array</b>		<b>Inverters</b>	
Nb. of modules	78364 units	Nb. of units	195 units
Pnom total	46.63 MWp	Pnom total	39.00 MWac
		Pnom ratio	1.196
<b>User's needs</b> Unlimited load (grid)			

### Results summary

Produced Energy	84.97 GWh/year	Specific production	1822 kWh/kWp/year	Perf. Ratio PR	88.17 %
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**PVsyst V7.2.21**

VC0, Simulation date:  
10/01/23 10:57  
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Energie rinnovabili srl (Italy)

**General parameters****Grid-Connected System****PV Field Orientation****Orientation**

Tracking horizontal axis

**Unlimited Trackers with backtracking****Tracking algorithm**

Astronomic calculation  
Backtracking activated

**Backtracking array**

Nb. of trackers 10 units

Unlimited trackers

**Sizes**

Tracker Spacing 9.00 m

Collector width 4.76 m

Ground Cov. Ratio (GCR) 52.9 %

Left inactive band 0.02 m

Right inactive band 0.02 m

Phi min / max. +/- 55.0 °

**Backtracking strategy**

Phi limits +/- 57.7 °

Backtracking pitch 9.00 m

Backtracking width 4.76 m

**Models used**

Transposition Perez  
Diffuse Perez, Meteonorm  
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 9.00 m

Tracker width 4.80 m

GCR 53.3 %

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 %

Shed transparent fraction 0.0 %

**PV Array Characteristics****PV module**

Manufacturer Trina Solar

Model TSM-595DEG20C.20

(Custom parameters definition)

Unit Nom. Power 595 Wp

Number of PV modules 78364 units

Nominal (STC) 46.63 MWp

Modules 3014 Strings x 26 In series

**At operating cond. (50°C)**

Pmpp 42.69 MWp

U mpp 809 V

I mpp 52785 A

**Total PV power**

Nominal (STC) 46627 kWp

Total 78364 modules

Module area 221779 m<sup>2</sup>Cell area 207351 m<sup>2</sup>**Inverter**

Manufacturer Huawei Technologies

Model SUN2000-215KTL-H3

(Custom parameters definition)

Unit Nom. Power 200 kWac

Number of inverters 195 units

Total power 39000 kWac

Operating voltage 500-1500 V

Max. power (=&gt;33°C) 215 kWac

Pnom ratio (DC:AC) 1.20

**Total inverter power**

Total power 39000 kWac

Number of inverters 195 units

Pnom ratio 1.20



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## Array losses

## Array Soiling Losses

Loss Fraction 2.0 %

## Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m<sup>2</sup>KUv (wind) 0.0 W/m<sup>2</sup>K/m/s

## DC wiring losses

Global array res. 0.13 mΩ

Loss Fraction 0.8 % at STC

## LID - Light Induced Degradation

Loss Fraction 1.3 %

## Module Quality Loss

Loss Fraction -0.5 %

## Module mismatch losses

Loss Fraction 0.8 % 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

constant (fans) 200 kW

100.0 kW from Power thresh.

## AC wiring losses

## Inv. output line up to MV transfo

Inverter voltage 800 Vac tri

Loss Fraction 0.00 % at STC

## Inverter: SUN2000-215KTL-H3

Wire section (195 Inv.) Alu 195 x 3 x 95 mm<sup>2</sup>

Average wires length 0 m

## MV line up to Injection

MV Voltage 20 kV

Wires Copper 3 x 1000 mm<sup>2</sup>

Length 3719 m

Loss Fraction 0.80 % at STC

## AC losses in transformers

## MV transfo

Grid voltage 20 kV

## Operating losses at STC

Nominal power at STC 45769 kVA

Iron loss (night disconnect) 45.77 kW

Loss Fraction 0.10 % at STC

Coils equivalent resistance 3 x 0.14 mΩ

Loss Fraction 1.00 % at STC



**Main results**

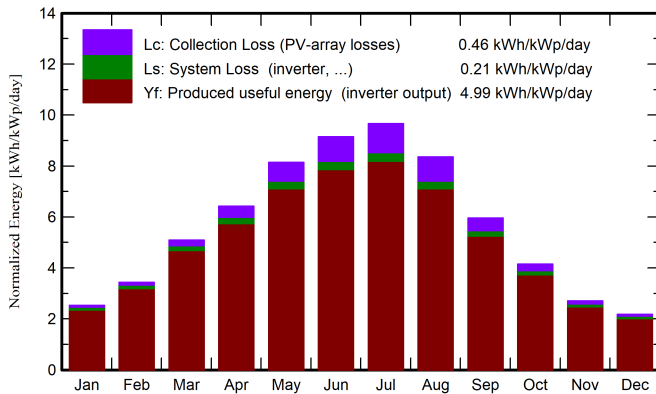
**System Production**

Produced Energy 84.97 GWh/year

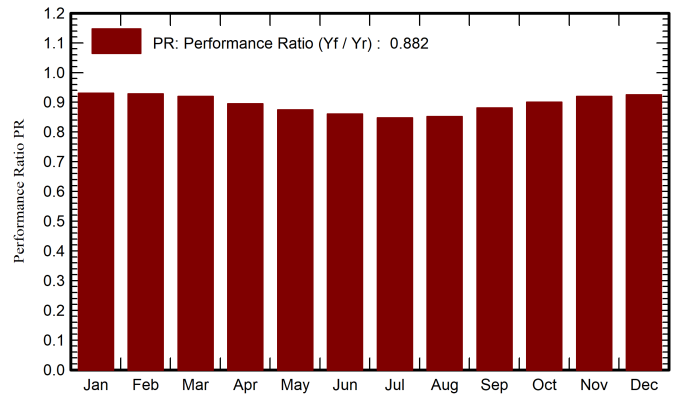
Specific production  
Performance Ratio PR

1822 kWh/kWp/year  
88.17 %

**Normalized productions (per installed kWp)**



**Performance Ratio PR**



**Balances and main results**

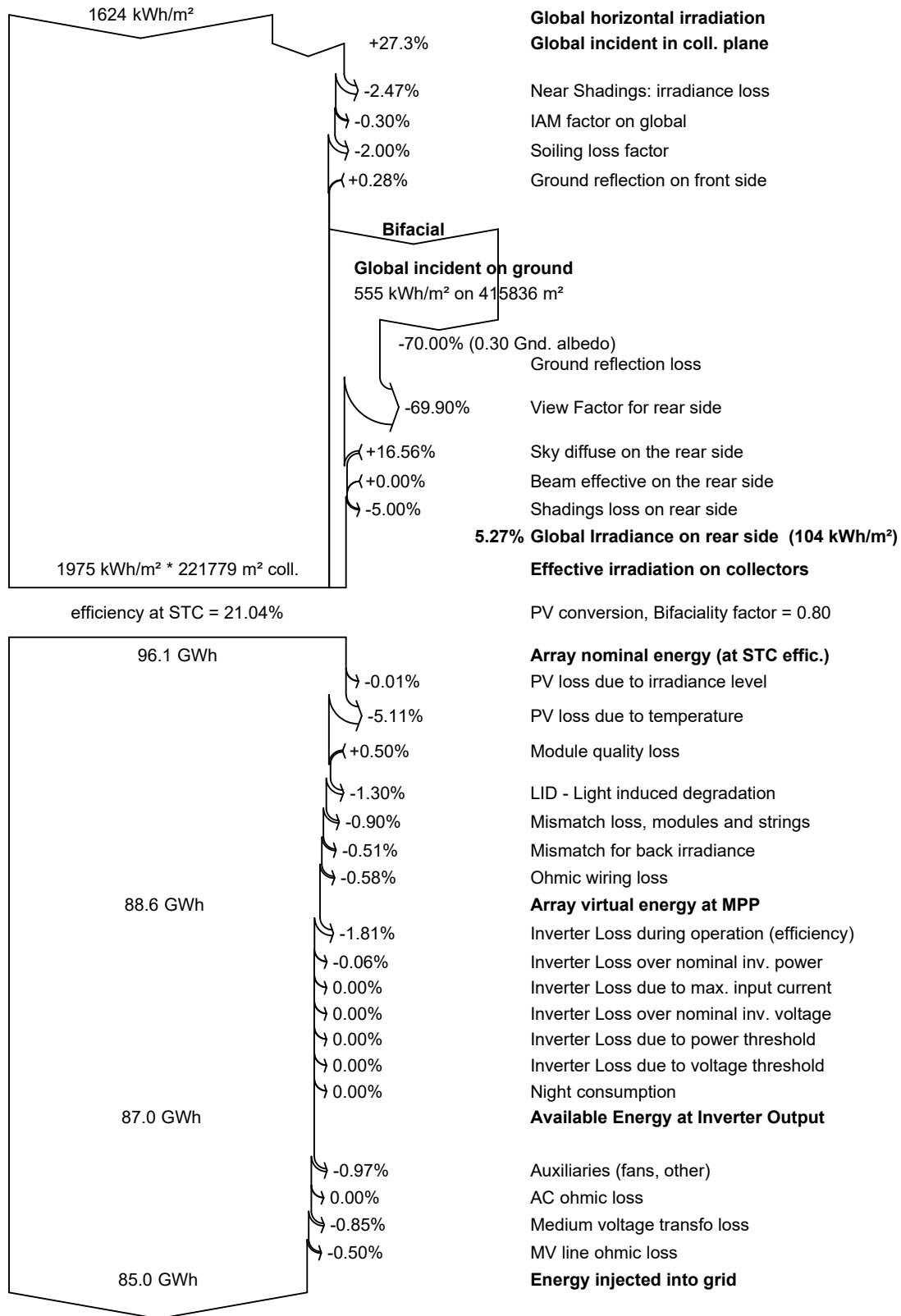
	<b>GlobHor</b> kWh/m <sup>2</sup>	<b>DiffHor</b> kWh/m <sup>2</sup>	<b>T_Amb</b> °C	<b>GlobInc</b> kWh/m <sup>2</sup>	<b>GlobEff</b> kWh/m <sup>2</sup>	<b>EArray</b> GWh	<b>E_Grid</b> GWh	<b>PR</b> ratio
<b>January</b>	61.0	28.00	9.80	78.5	74.4	3.56	3.41	0.931
<b>February</b>	76.0	34.00	10.20	96.3	91.4	4.35	4.17	0.929
<b>March</b>	125.0	52.00	13.00	157.9	150.7	7.06	6.78	0.920
<b>April</b>	154.0	64.00	16.10	192.7	183.9	8.39	8.04	0.895
<b>May</b>	200.0	74.00	21.70	252.3	241.5	10.73	10.29	0.875
<b>June</b>	215.0	70.00	26.30	274.5	263.2	11.47	11.01	0.860
<b>July</b>	231.0	65.00	29.10	299.4	287.6	12.33	11.84	0.848
<b>August</b>	201.0	62.00	28.60	259.0	248.4	10.72	10.29	0.852
<b>September</b>	141.0	55.00	23.20	178.8	170.8	7.65	7.34	0.881
<b>October</b>	102.0	44.00	19.30	128.6	122.4	5.63	5.40	0.900
<b>November</b>	65.0	31.00	14.60	81.1	76.9	3.63	3.48	0.919
<b>December</b>	53.0	25.00	10.90	67.6	63.8	3.05	2.92	0.925
<b>Year</b>	1624.0	604.00	18.62	2066.8	1975.0	88.58	84.97	0.882

**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**

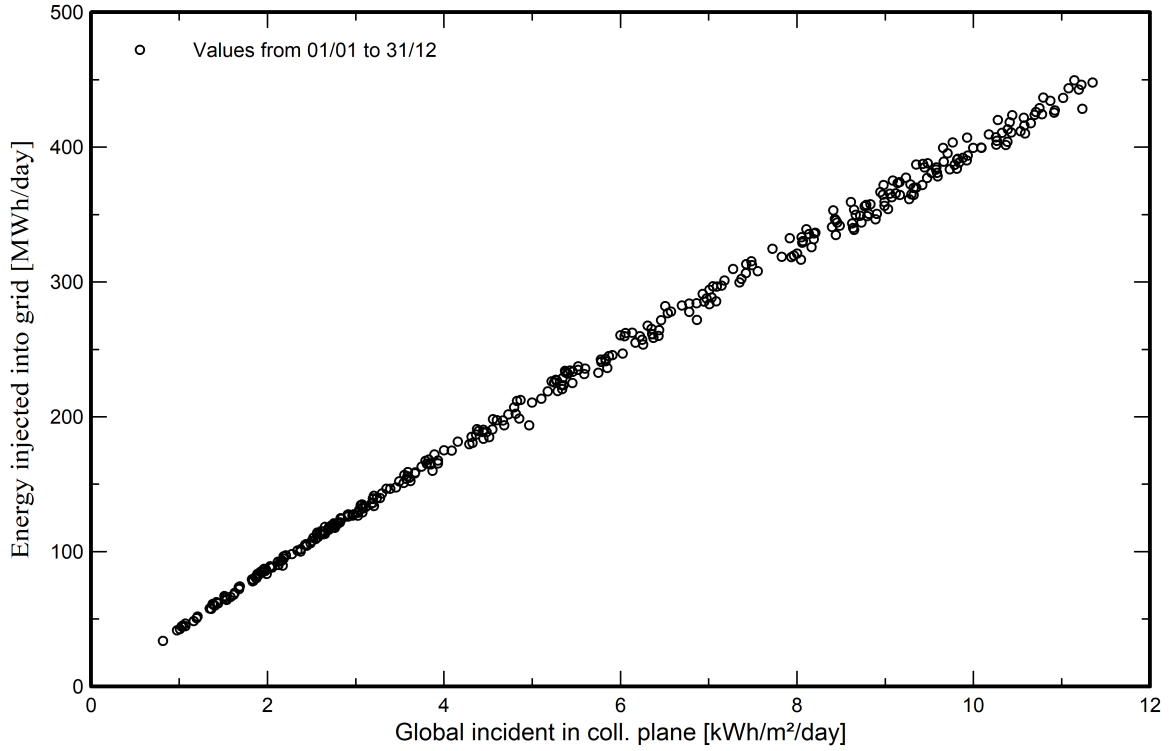






Special graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

