



TRANSIZIONE ECOLOGICA



REGIONE SICILIA



COMUNE DI RAMACCA



COMUNE DI CASTEL DI IUDICA

NOME PROGETTO:

Costruzione ed esercizio di un impianto agrovoltaico avente potenza in immissione pari a ~~240,500~~ 205,490MW, con relativo collegamento alla rete elettrica, sito nei comuni di Castel di Iudica e Ramacca (CT) - Impianto "FICURINIA".

ID. PROGETTO DEL MITE: ID_VIP 8434

PROCEDURA:

Valutazione di impatto ambientale ai sensi dell'art. 23 c. 1 del D.Lgs. 152/06 e ss.mm.ii..

PROPONENTE:



INE FICURINIA S.R.L.
Piazza Walther Von Vogelweide 8,
Bolzano (BZ) 39100
pec: ineficuriniasrl@legalmail.it
RESPONSABILE PROGETTO:
Ing. Jury Mancinelli

INE FICURINIA S.R.L.
a company of ILOS New Energy Italy
P.IVA e C.F. n° IT 1631151002
Sede legale: Piazza Walther Von Vogelweide 8,
39100 Bolzano (BZ)
ineficuriniasrl@legalmail.it

Legale rappresentante: Ing. Sergio Chiericoni

ELABORATO REDATTO DA:

Dott. Ing. Giada Stella BOLIGNANO
Iscrizione all'Albo n° A 2508
alla Sezione degli Ingegneri (Sez. A)
- Settore civile e ambientale
- Settore industriale
- Settore dell'informazione



ORDINE DEGLI INGEGNERI
DELLA PROVINCIA DI REGGIO CALABRIA



IDENTIFICATORE ELABORATO:
RS06REL066A0_rev.01

CARTELLA:
VIA_16

TITOLO ELABORATO:
Analisi della risorsa solare e stima di produzione energia lotto 3664

SCALA:
-

PROGETTAZIONE E COORDINAMENTO



Arato SRL
Dott. Ing. Giada Stella Maria Bolignano
Ordine degli Ingegneri, Prov. di Reggio Calabria, n. A 2508
Via Diaz, 74 - 74023 Grottaglie (TA)
info@aratosrl.com

GEOLOGIA E IDROLOGIA



Dott. Geol. Domenico Boso
Ordine dei Geologi della Sicilia, n. 1005
Gecexpert di Maria Rita Arcidiacono
via Panebianco, 10
95024 Acireale (CT)

OPERE ELETTRICHE



Studio Tecnico BFP SRL
Dott. Ing. Danilo Pomponio
Ordine degli Ingegneri, Prov. di Bari, n. A6222
Via Degli Arredatori, 8 - 70026 Modugno (BA)
info@bfpgroup.net

IDRAULICA



I3 Ingegneria S.r.l.
Dott. Ing. Alfredo Foti
Ordine degli Ingegneri, Prov. di Catania, n. A2333
via Galermo, 308 - 95123 Catania (CT)
i3ingegneria@gmail.com

ACUSTICA



Dott. Ing. Marcello Lalanza
Ordine degli Ingegneri, Prov. di Taranto, n. A2166
via Costa 25/b - 74127 S. Giorgio Jonico (TA)
marcellolalanza@gmail.com

STUDIO PEDO-AGRONOMICO



Dott. Agr. Arturo Urso
Ordine dei Dottori Agronomi e Forestali,
Prov. di Catania, n. 1280
Via Fulvirenti, 10
95131 Catania (CT)
arturo.urso@gmail.com

ARCHEOLOGIA



GeA Archeologia Preventiva
Dott. Archeologa Ghiselda Pennisi, Abilitazione MIBACT 2192
Via De Gasperi, 4 - 95030 Sant'Agata Li Battiati (CT)
info@aratosrl.com

STRUTTURE ED OPERE CIVILI



Dott. Ing. Giuseppe Furnari
Ordine degli Ingegneri, Prov. di Catania, n. A6223
Viale del Rololo, 44
95126 Catania (CT)
scp.furnari@gmail.com

N. REV.	DATA	REVISIONE
0	apr-22	Emissione
1	sett-23	Integrazioni con modifica sostanziale del progetto in riscontro a richiesta MASF prot. nr _amie.CTVA. REGISTRO UFFICIALE.U.0006731.018-06-2023

ELABORATO	VERIFICATO	VALIDATO
Ing. Baldacconi/Ing. D'Elia/Ing. Vizzarro Ing. Baldacconi/Ing. D'Elia	Ing. Bolignano Ing. Bolignano	INE FICURINIA S.R.L. INE FICURINIA S.R.L.

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PVsyst - Simulation report

Grid-Connected System

Project: Ficurinia lotto #3664

Variant: New simulation variant

Ground system (tables) on a hill

System power: 32.21 MWp

Cavalera - Italy



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 13:11
with v7.4.2

ARATO SRL (Italy)

Project summary

Geographical Site	Situation	Project settings
Cavalera	Latitude 37.49 °N	Albedo 0.20
Italy	Longitude 14.61 °E	
	Altitude 395 m	
	Time zone UTC+1	
Meteo data		
Cavalera		
PVGIS api TMY		

System summary

Grid-Connected System	Ground system (tables) on a hill		
Simulation for year no 1			
PV Field Orientation	Near Shadings	User's needs	
Fixed plane	Linear shadings : Fast (table)	Unlimited load (grid)	
Tilt/Azimuth 31.3 / 3.1 °			
System information			
PV Array	Inverters		
Nb. of modules 52800 units	Nb. of units 16 units		
Pnom total 32.21 MWp	Pnom total 31.18 MWac		
	Pnom ratio 1.033		

Results summary

Produced Energy 51.76 GWh/year	Specific production 1607 kWh/kWp/year	Perf. Ratio PR 78.04 %
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ARATO SRL (Italy)

General parameters

Grid-Connected System		Ground system (tables) on a hill	
PV Field Orientation		Sheds configuration	
Orientation		Models used	
Fixed plane		Nb. of sheds	2233 units
Tilt/Azimuth	31.3 / 3.1 °	Sizes	
		Sheds spacing	11.1 m
		Collector width	4.60 m
		Ground Cov. Ratio (GCR)	41.4 %
		Shading limit angle	
		Limit profile angle	18.4 °
Horizon		Near Shadings	
Average Height	5.7 °	Linear shadings : Fast (table)	
		User's needs	
		Unlimited load (grid)	

PV Array Characteristics

PV module		Inverter	
Manufacturer	JA Solar	Manufacturer	Santerno
Model	JAM78S30-610/MR	Model	Sunway TG 1800 1500V TE - 690
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	610 Wp	Unit Nom. Power	1912 kWac
Number of PV modules	19200 units	Number of inverters	6 units
Nominal (STC)	11.71 MWp	Total power	11472 kWac
Array #1 - Sub-array #1		Array #1 - Sub-array #1	
Number of PV modules	3168 units	Number of inverters	1 unit
Nominal (STC)	1932 kWp	Total power	1912 kWac
Modules	132 Strings x 24 In series		
At operating cond. (50°C)		At operating cond. (50°C)	
Pmpp	1750 kWp	Operating voltage	690-1200 V
U mpp	982 V	Max. power (=>25°C)	2151 kWac
I mpp	1781 A	Pnom ratio (DC:AC)	1.01
		Power sharing within this inverter	
Array #2 - Sub-array #2		Array #2 - Sub-array #2	
Number of PV modules	3144 units	Number of inverters	1 unit
Nominal (STC)	1918 kWp	Total power	1912 kWac
Modules	131 Strings x 24 In series		
At operating cond. (50°C)		At operating cond. (50°C)	
Pmpp	1737 kWp	Operating voltage	690-1200 V
U mpp	982 V	Max. power (=>25°C)	2151 kWac
I mpp	1768 A	Pnom ratio (DC:AC)	1.00
		Power sharing within this inverter	
Array #3 - Sub-array #3		Array #3 - Sub-array #3	
Number of PV modules	3144 units	Number of inverters	1 unit
Nominal (STC)	1918 kWp	Total power	1912 kWac
Modules	131 Strings x 24 In series		
At operating cond. (50°C)		At operating cond. (50°C)	
Pmpp	1737 kWp	Operating voltage	690-1200 V
U mpp	982 V	Max. power (=>25°C)	2151 kWac
I mpp	1768 A	Pnom ratio (DC:AC)	1.00
		Power sharing within this inverter	



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ARATO SRL (Italy)

PV Array Characteristics

Array #4 - Sub-array #4

Number of PV modules 3264 units
Nominal (STC) 1991 kWp
Modules 136 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1803 kWp
U mpp 982 V
I mpp 1835 A

Number of inverters 1 unit
Total power 1912 kWac

Operating voltage 690-1200 V
Max. power (=>25°C) 2151 kWac
Pnom ratio (DC:AC) 1.04
Power sharing within this inverter

Array #5 - Sub-array #5

Number of PV modules 3240 units
Nominal (STC) 1976 kWp
Modules 135 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1790 kWp
U mpp 982 V
I mpp 1822 A

Number of inverters 1 unit
Total power 1912 kWac

Operating voltage 690-1200 V
Max. power (=>25°C) 2151 kWac
Pnom ratio (DC:AC) 1.03
Power sharing within this inverter

Array #6 - Sub-array #6

Number of PV modules 3240 units
Nominal (STC) 1976 kWp
Modules 135 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1790 kWp
U mpp 982 V
I mpp 1822 A

Number of inverters 1 unit
Total power 1912 kWac

Operating voltage 690-1200 V
Max. power (=>25°C) 2151 kWac
Pnom ratio (DC:AC) 1.03
Power sharing within this inverter

PV module

Manufacturer JA Solar
Model JAM78S30-610/MR
(Custom parameters definition)

Unit Nom. Power 610 Wp
Number of PV modules 17640 units
Nominal (STC) 10.76 MWp

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600
(Custom parameters definition)

Unit Nom. Power 1662 kWac
Number of inverters 6 units
Total power 9972 kWac

Array #7 - Sub-array #7

Number of PV modules 2928 units
Nominal (STC) 1786 kWp
Modules 122 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1617 kWp
U mpp 982 V
I mpp 1646 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.07
Power sharing within this inverter

Array #8 - Sub-array #8

Number of PV modules 2928 units
Nominal (STC) 1786 kWp
Modules 122 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1617 kWp
U mpp 982 V
I mpp 1646 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.07
Power sharing within this inverter



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ARATO SRL (Italy)

PV Array Characteristics

Array #9 - Sub-array #9

Number of PV modules 2784 units
Nominal (STC) 1698 kWp
Modules 116 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1538 kWp
U mpp 982 V
I mpp 1565 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.02
Power sharing within this inverter

Array #10 - Sub-array #10

Number of PV modules 3000 units
Nominal (STC) 1830 kWp
Modules 125 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1657 kWp
U mpp 982 V
I mpp 1687 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.10
Power sharing within this inverter

Array #11 - Sub-array #11

Number of PV modules 3000 units
Nominal (STC) 1830 kWp
Modules 125 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1657 kWp
U mpp 982 V
I mpp 1687 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.10
Power sharing within this inverter

Array #12 - Sub-array #12

Number of PV modules 3000 units
Nominal (STC) 1830 kWp
Modules 125 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1657 kWp
U mpp 982 V
I mpp 1687 A

Number of inverters 1 unit
Total power 1662 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.10
Power sharing within this inverter

Array #13 - Sub-array #13

PV module

Manufacturer JA Solar
Model JAM78S30-610/MR
(Custom parameters definition)

Unit Nom. Power 610 Wp
Number of PV modules 4008 units
Nominal (STC) 2445 kWp
Modules 167 Strings x 24 In series

At operating cond. (50°C)

Pmpp 2214 kWp
U mpp 982 V
I mpp 2254 A

Inverter

Manufacturer Santerno
Model SUNWAY STATION TG1800&900-1500V-TE 600 (2445kW)
(Custom parameters definition)

Unit Nom. Power 2445 kWac
Number of inverters 1 unit
Total power 2445 kWac
Operating voltage 860-1200 V
Max. power (=>25°C) 2445 kWac
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

PV module

Manufacturer JA Solar
Model JAM78S30-610/MR
(Custom parameters definition)

Unit Nom. Power 610 Wp
Number of PV modules 11952 units
Nominal (STC) 7291 kWp

Inverter

Manufacturer Santerno
Model SUNWAY STATION TG1800&900-1500V-TE 600 (2430kW)
(Custom parameters definition)

Unit Nom. Power 2430 kWac
Number of inverters 3 units
Total power 7291 kWac



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PV Array Characteristics

Array #14 - Sub-array #14

Number of PV modules	3984 units	Number of inverters	1 unit
Nominal (STC)	2430 kWp	Total power	2430 kWac
Modules	166 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	2201 kWp	Max. power (=>25°C)	2430 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	2240 A	Power sharing within this inverter	

Array #15 - Sub-array #15

Number of PV modules	3984 units	Number of inverters	1 unit
Nominal (STC)	2430 kWp	Total power	2430 kWac
Modules	166 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	2201 kWp	Max. power (=>25°C)	2430 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	2240 A	Power sharing within this inverter	

Array #16 - Sub-array #16

Number of PV modules	3984 units	Number of inverters	1 unit
Nominal (STC)	2430 kWp	Total power	2430 kWac
Modules	166 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	2201 kWp	Max. power (=>25°C)	2430 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	2240 A	Power sharing within this inverter	

Total PV power

Nominal (STC)	32208 kWp
Total	52800 modules
Module area	147592 m ²
Cell area	136072 m ²

Total inverter power

Total power	31179 kWac
Max. power	32614 kWac
Number of inverters	16 units
Pnom ratio	1.03

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 -0.3 %

Module mismatch losses

Loss Fraction 0.8 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 1
Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year
Vmp RMS dispersion 0.4 %/year

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



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DC wiring losses

Global wiring resistance 0.55 mΩ
Loss Fraction 1.5 % at STC

Array #1 - Sub-array #1

Global array res. 9.1 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 9.2 mΩ
Loss Fraction 1.5 % at STC

Array #5 - Sub-array #5

Global array res. 8.9 mΩ
Loss Fraction 1.5 % at STC

Array #7 - Sub-array #7

Global array res. 9.9 mΩ
Loss Fraction 1.5 % at STC

Array #9 - Sub-array #9

Global array res. 10 mΩ
Loss Fraction 1.5 % at STC

Array #11 - Sub-array #11

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

Array #13 - Sub-array #13

Global array res. 7.2 mΩ
Loss Fraction 1.5 % at STC

Array #15 - Sub-array #15

Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2

Global array res. 9.2 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 8.9 mΩ
Loss Fraction 1.5 % at STC

Array #6 - Sub-array #6

Global array res. 8.9 mΩ
Loss Fraction 1.5 % at STC

Array #8 - Sub-array #8

Global array res. 9.9 mΩ
Loss Fraction 1.5 % at STC

Array #10 - Sub-array #10

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

Array #12 - Sub-array #12

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

Array #14 - Sub-array #14

Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #16 - Sub-array #16

Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

System losses

Auxiliaries loss

constant (fans) 10.00 kW
2.2 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 690 Vac tri
Loss Fraction 2.00 % at STC

Inverters: Sunway TG 1800 1500V TE - 690, Sunway TG 1800 1500V TE - 600, SUNWAY STATION TG1800&900-1500V-TE 600 (2445kW), SUNWAY S

Wire section (16 Inv.) Copper 16 x 3 x 1500 mm²
Average wires length 330 m

MV line up to Injection

MV Voltage 20 kV
Average each inverter
Wires Copper 3 x 50 mm²
Length 10731 m
Loss Fraction 2.00 % at STC



AC losses in transformers

MV transfo

Medium voltage 20 kV

One transfo parameters

Nominal power at STC 1.98 MVA
Iron Loss (24/24 Connexion) 2.02 kVA
Iron loss fraction 0.10 % at STC
Copper loss 39.66 kVA
Copper loss fraction 2.00 % at STC
Coils equivalent resistance 3 x 4.80 mΩ

Operating losses at STC (full system)

Nb. identical MV transfos 16
Nominal power at STC 31.72 MVA
Iron loss (24/24 Connexion) 32.36 kVA
Copper loss 634.49 kVA



Horizon definition

Horizon from PVGIS website API, Lat=37°29'31", Long=14°36'48", Alt=395m

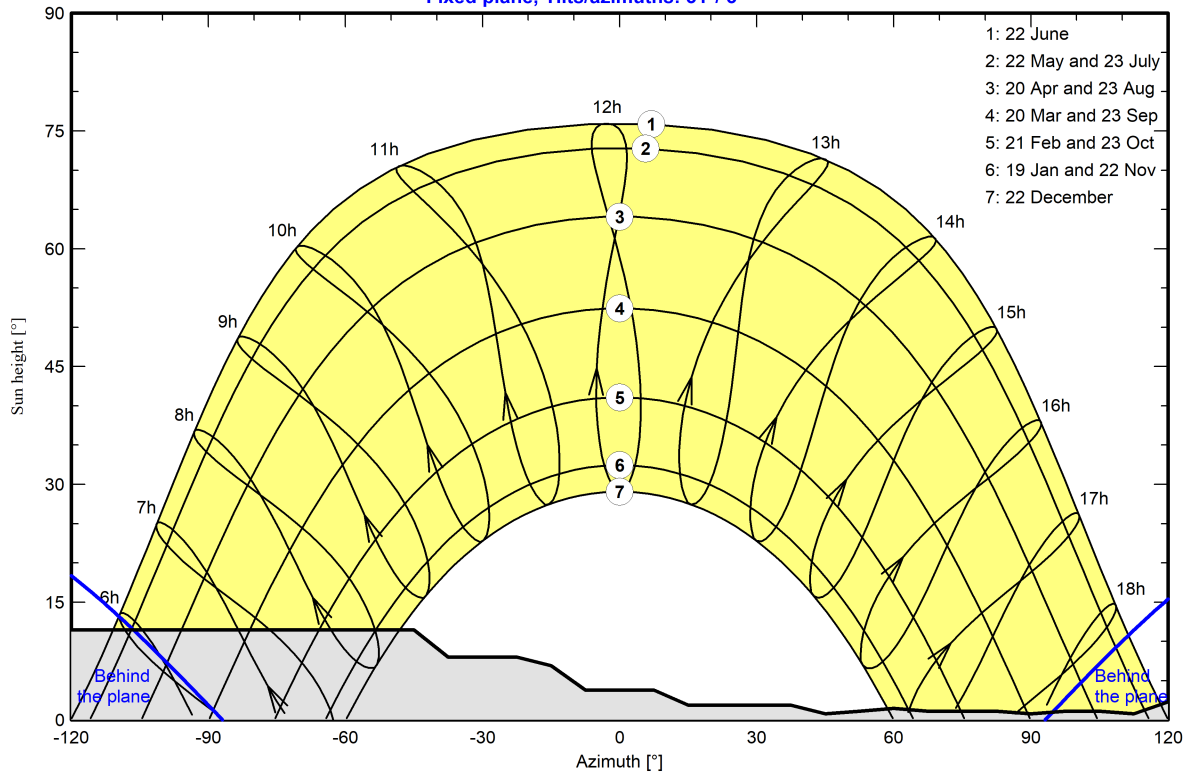
Average Height	5.7 °	Albedo Factor	0.77
Diffuse Factor	0.96	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-45	-38	-23	-15
Height [°]	4.6	4.6	4.2	7.3	7.3	11.5	11.5	8.0	8.0	6.9
Azimuth [°]	-8	8	15	38	45	53	60	68	83	90
Height [°]	3.8	3.8	1.9	1.9	0.8	1.1	1.5	1.1	1.1	0.8
Azimuth [°]	98	105	113	120	128	135	143	165	173	180
Height [°]	1.1	1.1	0.8	2.3	3.1	2.7	4.2	4.2	4.6	4.6

Sun Paths (Height / Azimuth diagram)

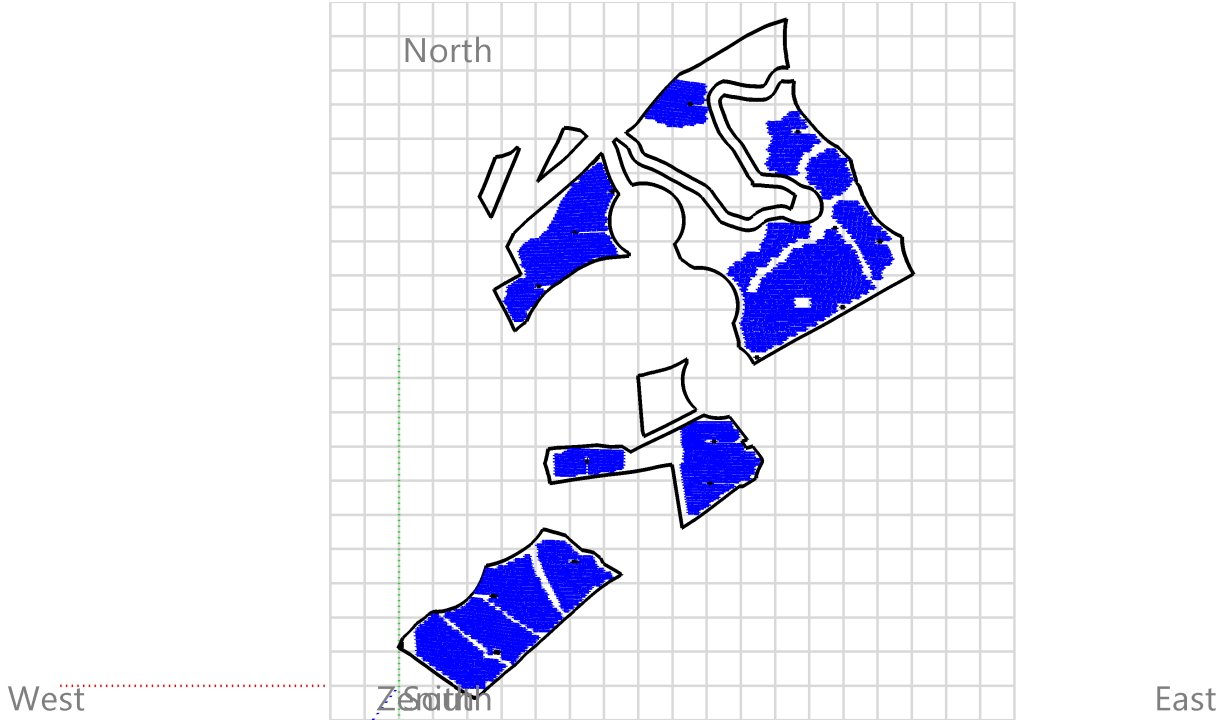
Fixed plane, Tilts/azimuths: 31°/ 3°





Near shadings parameter

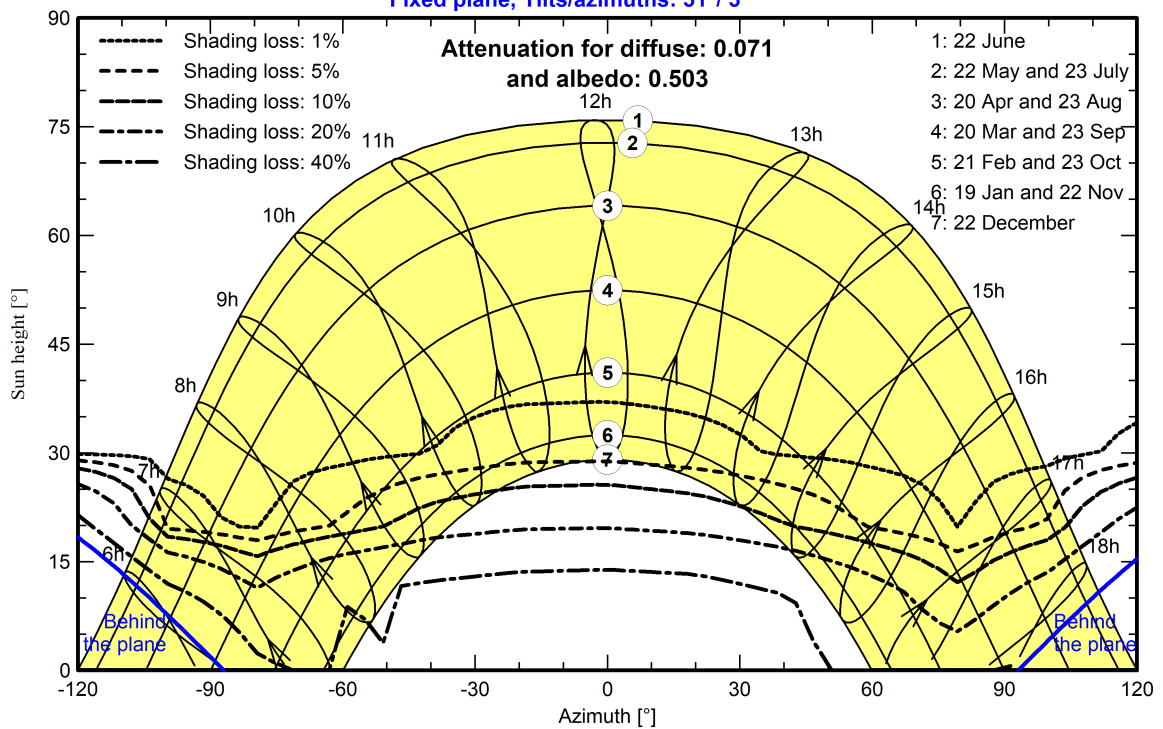
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 31°/ 3°





Main results

System Production

Produced Energy 51.76 GWh/year

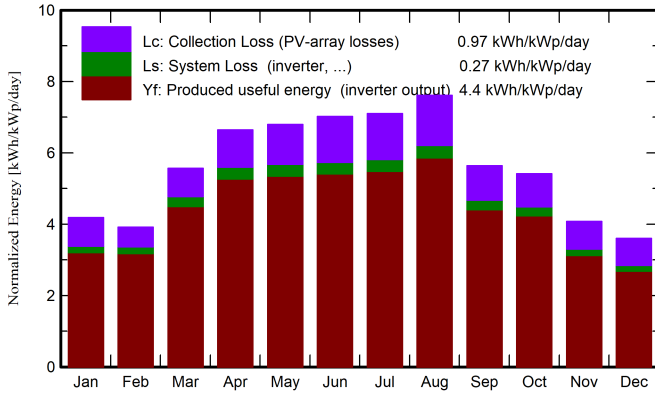
Specific production

1607 kWh/kWp/year

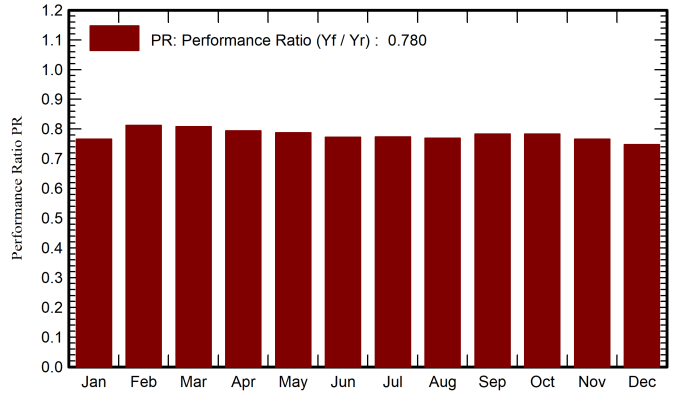
Perf. Ratio PR

78.04 %

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 GWh	E_Grid GWh	PR ratio
January	80.2	32.26	8.57	129.8	111.4	3.386	3.200	0.766
February	80.2	39.47	6.34	109.6	99.1	3.038	2.869	0.813
March	140.2	49.96	11.89	172.5	161.3	4.773	4.491	0.808
April	184.9	62.10	17.22	199.2	187.5	5.410	5.090	0.794
May	214.9	68.57	20.23	210.7	198.3	5.674	5.345	0.788
June	226.4	66.87	25.16	210.5	197.9	5.546	5.234	0.772
July	232.3	61.52	26.44	220.1	207.5	5.810	5.480	0.773
August	226.8	55.16	27.51	236.1	223.5	6.206	5.851	0.769
September	146.3	55.78	22.54	169.1	158.4	4.522	4.262	0.783
October	122.7	45.82	19.84	167.8	154.9	4.481	4.231	0.783
November	79.8	33.82	14.66	122.3	107.2	3.195	3.018	0.766
December	67.2	29.64	10.07	111.7	93.3	2.842	2.687	0.747
Year	1802.0	600.99	17.61	2059.3	1900.2	54.884	51.759	0.780

Legends

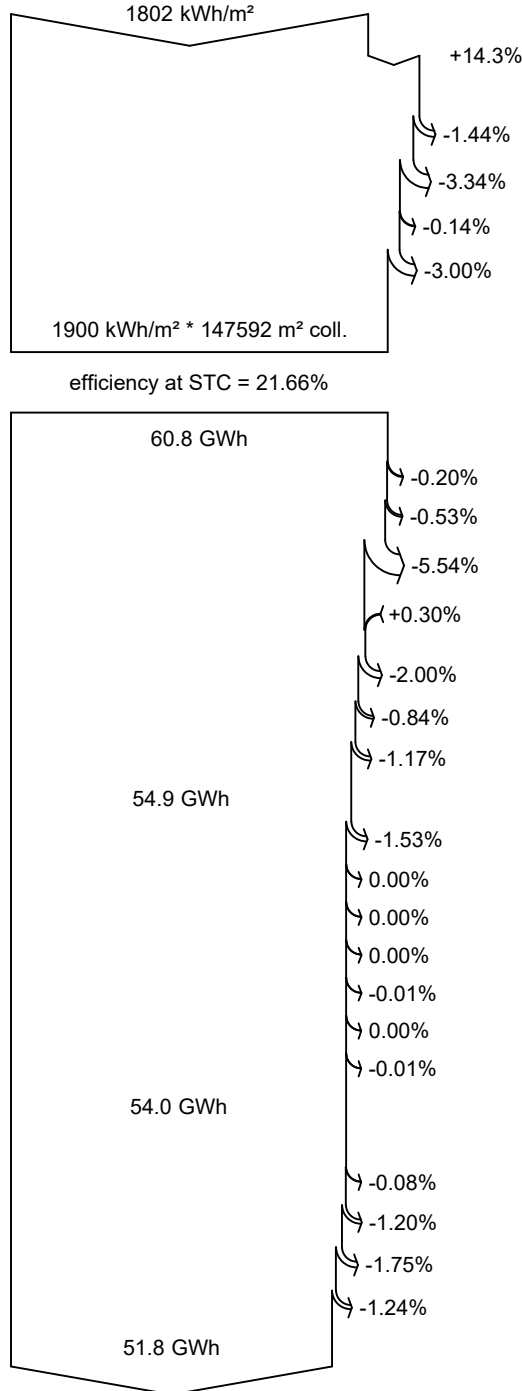
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

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

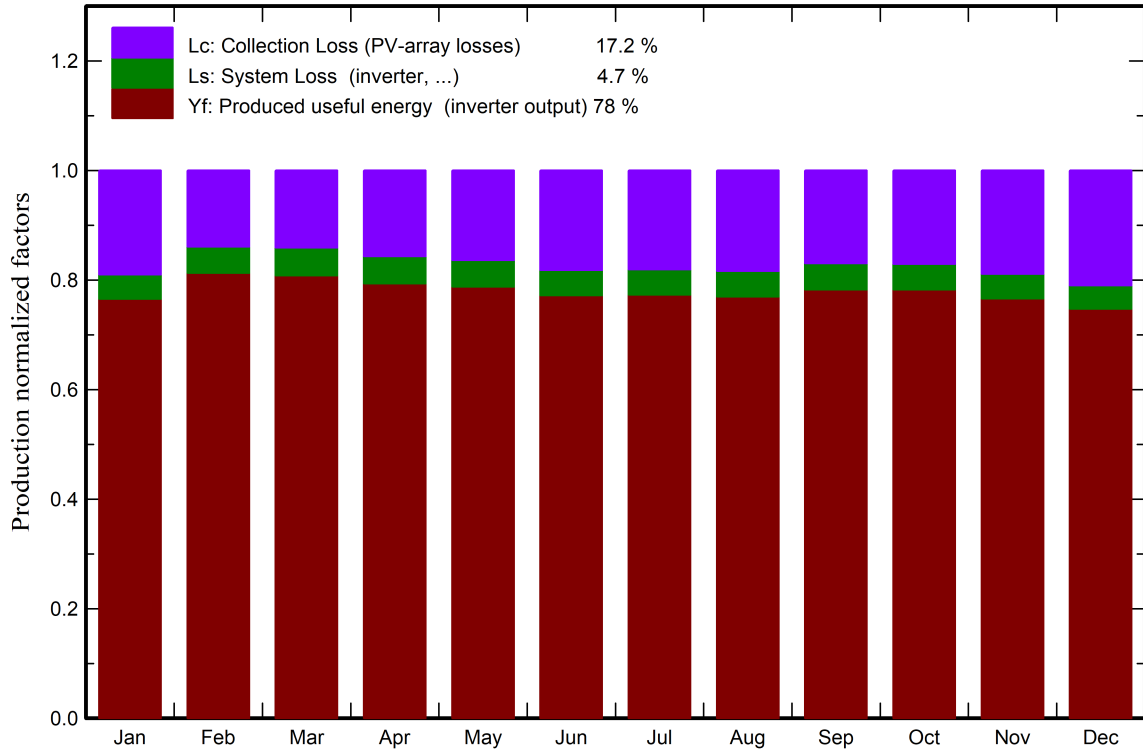
MV line ohmic loss

Energy injected into grid

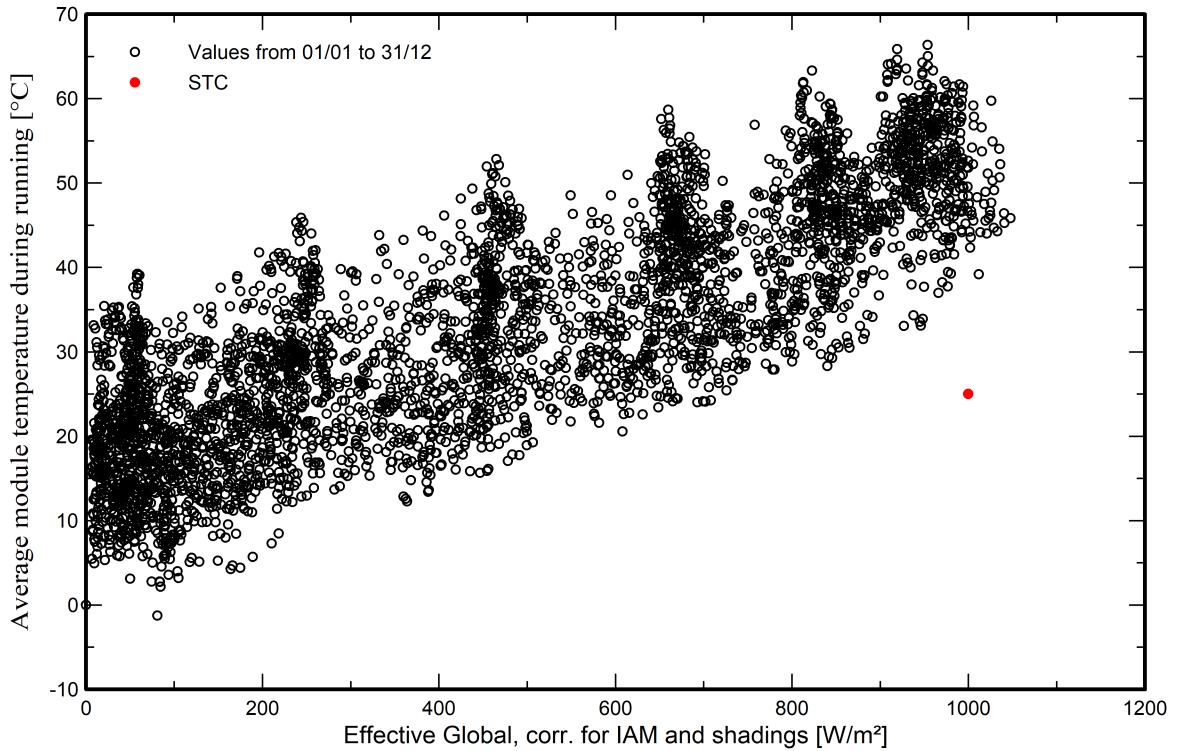


Predef. graphs

Normalized Production and Loss Factors



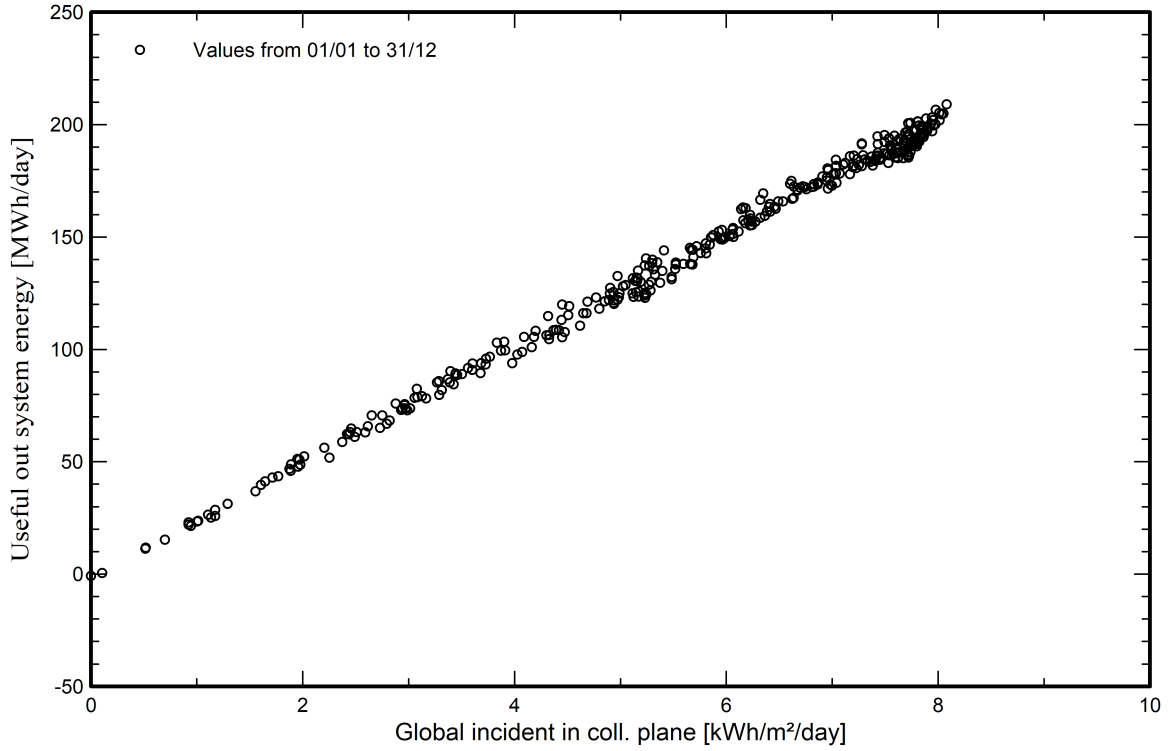
Array Temperature vs. Effective Irradiance



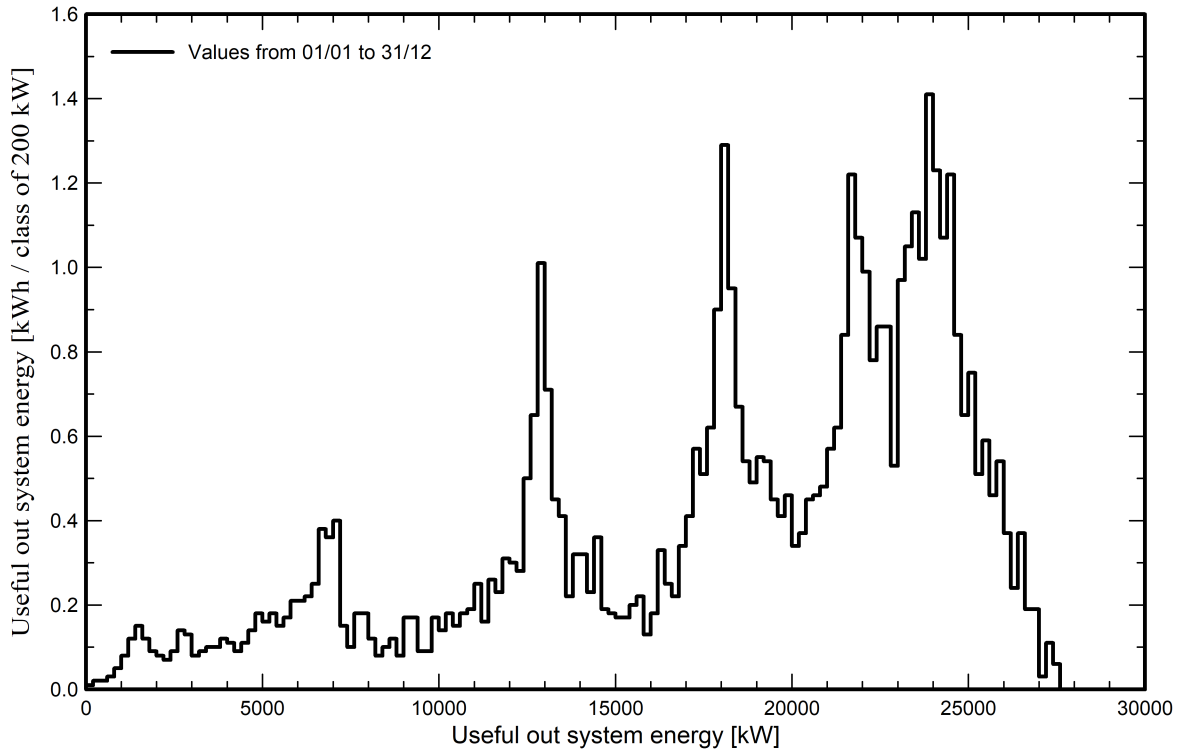


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





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ARATO SRL (Italy)

Aging Tool

Aging Parameters

Time span of simulation 30 years

Module average degradation

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

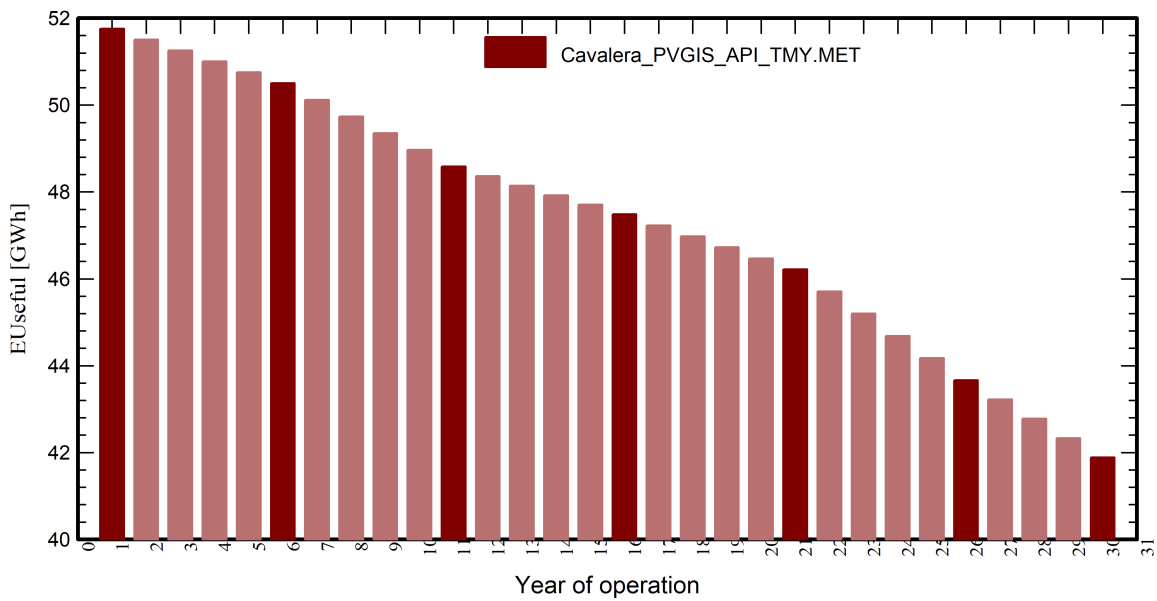
Vmp RMS dispersion 0.4 %/year

Meteo used in the simulation

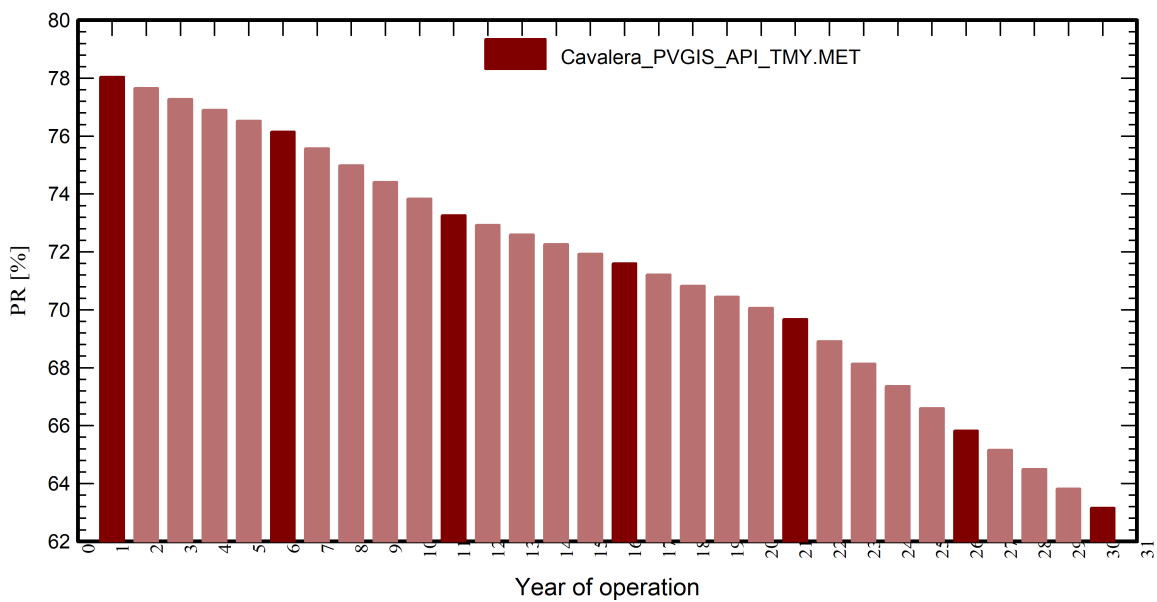
Cavalera PVGIS API TMY

Years reference year

Useful out system energy



Performance Ratio



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ARATO SRL (Italy)

Aging Tool**Aging Parameters**

Time span of simulation 30 years

Module average degradation

Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year

Vmp RMS dispersion 0.4 %/year

Meteo used in the simulation**Cavalera PVGIS API TMY**

Years reference year

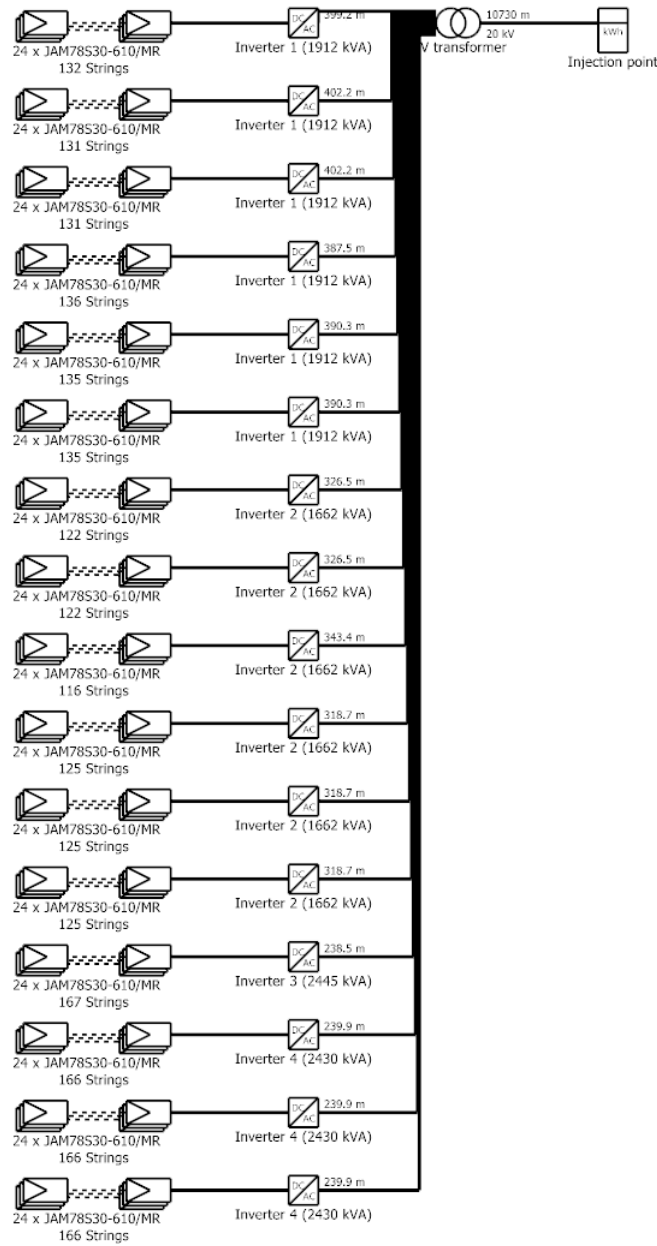
	EUseful	PR	PR loss
Year	GWh	%	%
1	51.76	78.04	-0.24
2	51.51	77.66	-0.72
3	51.26	77.28	-1.21
4	51.01	76.91	-1.69
5	50.75	76.53	-2.17
6	50.50	76.15	-2.66
7	50.12	75.57	-3.40
8	49.74	74.99	-4.14
9	49.35	74.42	-4.87
10	48.97	73.84	-5.61
11	48.59	73.26	-6.35
12	48.37	72.93	-6.78
13	48.15	72.60	-7.20
14	47.93	72.26	-7.63
15	47.71	71.93	-8.05
16	47.49	71.60	-8.47
17	47.23	71.22	-8.96
18	46.98	70.83	-9.46
19	46.72	70.45	-9.95
20	46.47	70.06	-10.44
21	46.22	69.68	-10.93
22	45.71	68.91	-11.91
23	45.20	68.14	-12.90
24	44.69	67.37	-13.88
25	44.17	66.60	-14.87
26	43.66	65.83	-15.85
27	43.22	65.16	-16.70
28	42.78	64.50	-17.56
29	42.33	63.83	-18.41
30	41.89	63.16	-19.26



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Single-line diagram



PV module	JAM78S30-610/MR
Inverter 1	Sunway TG 1800 1500V TE - 690
Inverter 2	Sunway TG 1800 1500V TE - 600
Inverter 3	SUNWAY STATION TG1800&900-1500V-TE 600 (2445kW)
Inverter 4	SUNWAY STATION TG1800&900-1500V-TE 600 (2430kW)
String	24 x JAM78S30-610/MR

Ficurinia lotto #3664

ARATO SRL (Italy)

VC0 : New simulation variant

10/10/23



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CO₂ Emission Balance

Total: 521584.3 tCO₂

Generated emissions

Total: 48320.56 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 656825.6 tCO₂

System production: 51759.31 MWh/yr

Grid Lifecycle Emissions: 423 gCO₂/kWh

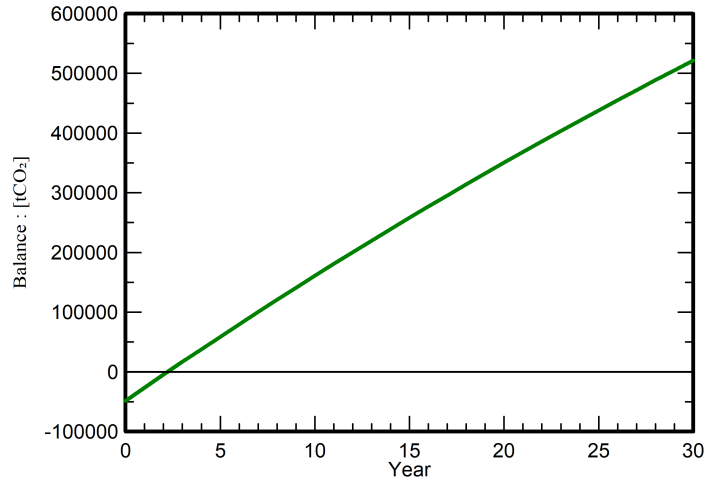
Source: IEA List

Country: Italy

Lifetime: 30 years

Annual degradation: 1.0 %

Saved CO₂ Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal [kgCO ₂]
Modules	915 kgCO ₂ /modules	52800 modules	48312000
Supports	2.36 kgCO ₂ /units	2233 units	5270
Inverters	206 kgCO ₂ /units	16.0 units	3291