



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 Srl
A Company of ILOS New Energy Italy

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. F 16311951002
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:

RS06REL068A0_rev.01

CARTELLA:

VIA_16

TITOLO ELABORATO:

Analisi della risorsa solare e stima di produzione energia lotto 2741

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



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



ACUSTICA

Dott. Ing. Marcello Latanza
Ordine degli Ingegneri, Prov. di Taranto, n. A2166
via Costa 25/b - 74027 S. Giorgio Jonico (TA)
marcellolatanza@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



GEOLOGIA E IDROLOGIA

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



IDRAULICA

I3 Ingegneria S.r.l.
Dott. Ing. Alfredo Foti
Ordine degli Ingegneri, Prov. di Catania, n. A2333
via Galermo, 306 - 95123 Catania (CT)
i3ingegneria@gmail.com



STUDIO PEDO-AGRONOMICO

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



STRUTTURE ED OPERE CIVILI

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

N. REV.	DATA	REVISIONE
0	apr-22	Emissione
1	set-23	Integrazioni con modifica sostanziale del progetto in riscontro a rich esta MASE prot. m_arte.CTVA. REGISTRO UFFICIAI F.U.0006731.58-06-2023

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

PVsyst - Simulation report

Grid-Connected System

Project: Ficurinia lotto #2741

Variant: New simulation variant

Ground system (tables) on a hill

System power: 28.20 MWp

Cavalera - Italy

Author

ARATO SRL (Italy)



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

Project summary

Geographical Site	Situation	Project settings
Cavalera	Latitude 37.52 °N	Albedo 0.20
Italy	Longitude 14.64 °E	
	Altitude 493 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 31.9 / -1.9 °		
System information		
PV Array	Inverters	
Nb. of modules 46224 units	Nb. of units 16 units	
Pnom total 28.20 MWp	Pnom total 28.08 MWac	
	Pnom ratio 1.004	

Results summary

Produced Energy 43.66 GWh/year	Specific production 1548 kWh/kWp/year	Perf. Ratio PR 74.98 %
--------------------------------	---------------------------------------	------------------------

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Horizon definition	9
Near shading definition - Iso-shadings diagram	10
Main results	11
Loss diagram	12
Predef. graphs	13
Aging Tool	15
Single-line diagram	17
CO ₂ Emission Balance	18



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

General parameters

Grid-Connected System		Ground system (tables) on a hill	
PV Field Orientation		Sheds configuration	Models used
Orientation		Nb. of sheds	1990 units
Fixed plane		Sizes	
Tilt/Azimuth	31.9 / -1.9 °	Sheds spacing	12.7 m
		Collector width	4.60 m
		Ground Cov. Ratio (GCR)	36.1 %
Horizon		Near Shadings	User's needs
Average Height	7.2 °	Linear shadings : Fast (table)	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	15864 units	Number of inverters	5 units
Nominal (STC)	9677 kWp	Total power	9560 kWac
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)		Operating voltage	690-1200 V
Pmpp	1750 kWp	Max. power (=>25°C)	2151 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.01
I mpp	1781 A	Power sharing within this inverter	
Array #3 - Sub-array #3			
Number of PV modules	3192 units	Number of inverters	1 unit
Nominal (STC)	1947 kWp	Total power	1912 kWac
Modules	133 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	690-1200 V
Pmpp	1763 kWp	Max. power (=>25°C)	2151 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.02
I mpp	1795 A	Power sharing within this inverter	
Array #14 - Sub-array #14			
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)		Operating voltage	690-1200 V
Pmpp	1750 kWp	Max. power (=>25°C)	2151 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.01
I mpp	1781 A	Power sharing within this inverter	
Array #15 - Sub-array #15			
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		



PV Array Characteristics

Array #15 - Sub-array #15

At operating cond. (50°C)

Pmpp	1750 kWp
U mpp	982 V
I mpp	1781 A

Operating voltage	690-1200 V
Max. power (=>25°C)	2151 kWac
Pnom ratio (DC:AC)	1.01
Power sharing within this inverter	

Array #16 - Sub-array #16

Number of PV modules	3168 units
Nominal (STC)	1932 kWp
Modules	132 Strings x 24 In series

Number of inverters	1 unit
Total power	1912 kWac

At operating cond. (50°C)

Pmpp	1750 kWp
U mpp	982 V
I mpp	1781 A

Operating voltage	690-1200 V
Max. power (=>25°C)	2151 kWac
Pnom ratio (DC:AC)	1.01
Power sharing within this inverter	

Array #2 - Sub-array #2

PV module

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

Unit Nom. Power	610 Wp
Number of PV modules	3960 units
Nominal (STC)	2416 kWp
Modules	165 Strings x 24 In series

At operating cond. (50°C)

Pmpp	2187 kWp
U mpp	982 V
I mpp	2227 A

Inverter

Manufacturer	Santerno
Model	SUNWAY STATION TG1800&900-1500V-TE 600 (2416kW)
(Custom parameters definition)	

Unit Nom. Power	2416 kWac
Number of inverters	1 unit
Total power	2416 kWac
Operating voltage	860-1200 V
Max. power (=>25°C)	2430 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	7704 units
Nominal (STC)	4699 kWp

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 600 (1566)
(Custom parameters definition)	

Unit Nom. Power	1566 kWac
Number of inverters	3 units
Total power	4698 kWac

Array #4 - Sub-array #4

Number of PV modules	2568 units
Nominal (STC)	1566 kWp
Modules	107 Strings x 24 In series

Number of inverters	1 unit
Total power	1566 kWac

At operating cond. (50°C)

Pmpp	1419 kWp
U mpp	982 V
I mpp	1444 A

Operating voltage	860-1200 V
Pnom ratio (DC:AC)	1.00
Power sharing within this inverter	

Array #9 - Sub-array #9

Number of PV modules	2568 units
Nominal (STC)	1566 kWp
Modules	107 Strings x 24 In series

Number of inverters	1 unit
Total power	1566 kWac

At operating cond. (50°C)

Pmpp	1419 kWp
U mpp	982 V
I mpp	1444 A

Operating voltage	860-1200 V
Pnom ratio (DC:AC)	1.00
Power sharing within this inverter	



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

PV Array Characteristics

Array #10 - Sub-array #10

Number of PV modules 2568 units
Nominal (STC) 1566 kWp
Modules 107 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1419 kWp
U mpp 982 V
I mpp 1444 A

Number of inverters 1 unit
Total power 1566 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

Array #5 - Sub-array #5

PV module

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

Unit Nom. Power 610 Wp
Number of PV modules 2544 units
Nominal (STC) 1552 kWp
Modules 106 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1405 kWp
U mpp 982 V
I mpp 1430 A

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600 (1552)
(Custom parameters definition)

Unit Nom. Power 1552 kWac
Number of inverters 1 unit
Total power 1552 kWac
Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

Array #6 - Sub-array #6

PV module

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

Unit Nom. Power 610 Wp
Number of PV modules 1992 units
Nominal (STC) 1215 kWp
Modules 83 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1100 kWp
U mpp 982 V
I mpp 1120 A

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600 (1215)
(Custom parameters definition)

Unit Nom. Power 1215 kWac
Number of inverters 1 unit
Total power 1215 kWac
Operating voltage 860-1200 V
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 4992 units
Nominal (STC) 3045 kWp

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600 (1522)
(Custom parameters definition)

Unit Nom. Power 1522 kWac
Number of inverters 2 units
Total power 3044 kWac

Array #7 - Sub-array #7

Number of PV modules 2496 units
Nominal (STC) 1523 kWp
Modules 104 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1379 kWp
U mpp 982 V
I mpp 1403 A

Number of inverters 1 unit
Total power 1522 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

PV Array Characteristics

Array #12 - Sub-array #12

Number of PV modules 2496 units
Nominal (STC) 1523 kWp
Modules 104 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1379 kWp
U mpp 982 V
I mpp 1403 A

Number of inverters 1 unit
Total power 1522 kWac

Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

Array #8 - Sub-array #8**PV module**

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

Unit Nom. Power 610 Wp
Number of PV modules 2592 units
Nominal (STC) 1581 kWp
Modules 108 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1432 kWp
U mpp 982 V
I mpp 1457 A

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600 (1581)
(Custom parameters definition)

Unit Nom. Power 1581 kWac
Number of inverters 1 unit
Total power 1581 kWac
Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

Array #11 - Sub-array #11**PV module**

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

Unit Nom. Power 610 Wp
Number of PV modules 2520 units
Nominal (STC) 1537 kWp
Modules 105 Strings x 24 In series

At operating cond. (50°C)

Pmpp 1392 kWp
U mpp 982 V
I mpp 1417 A

Inverter

Manufacturer Santerno
Model Sunway TG 1800 1500V TE - 600 (1537)
(Custom parameters definition)

Unit Nom. Power 1537 kWac
Number of inverters 1 unit
Total power 1537 kWac
Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
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 4056 units
Nominal (STC) 2474 kWp
Modules 169 Strings x 24 In series

At operating cond. (50°C)

Pmpp 2241 kWp
U mpp 982 V
I mpp 2281 A

Inverter

Manufacturer Santerno
Model SUNWAY STATION TG1800&900-1500V-TE 600 (2474kW)
(Custom parameters definition)

Unit Nom. Power 2474 kWac
Number of inverters 1 unit
Total power 2474 kWac
Operating voltage 860-1200 V
Pnom ratio (DC:AC) 1.00
Power sharing within this inverter

Total PV power

Nominal (STC) 28197 kWp
Total 46224 modules
Module area 129210 m²
Cell area 119125 m²

Total inverter power

Total power 28076 kWac
Max. power 29286 kWac
Number of inverters 16 units
Pnom ratio 1.00



PVsyst V7.4.2

VC0, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

Array losses

Array Soiling Losses

Loss Fraction 3.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²KUv (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

DC wiring losses

Global wiring resistance 0.63 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 #2 - Sub-array #2

Global array res. 7.3 mΩ

Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 9.1 mΩ

Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #5 - Sub-array #5

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #6 - Sub-array #6

Global array res. 15 mΩ

Loss Fraction 1.5 % at STC

Array #7 - Sub-array #7

Global array res. 12 mΩ

Loss Fraction 1.5 % at STC

Array #8 - Sub-array #8

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #9 - Sub-array #9

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #10 - Sub-array #10

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #11 - Sub-array #11

Global array res. 11 mΩ

Loss Fraction 1.5 % at STC

Array #12 - Sub-array #12

Global array res. 12 mΩ

Loss Fraction 1.5 % at STC

Array #13 - Sub-array #13

Global array res. 7.1 mΩ

Loss Fraction 1.5 % at STC

Array #14 - Sub-array #14

Global array res. 9.1 mΩ

Loss Fraction 1.5 % at STC

Array #15 - Sub-array #15

Global array res. 9.1 mΩ

Loss Fraction 1.5 % at STC

Array #16 - Sub-array #16

Global array res. 9.1 mΩ

Loss Fraction 1.5 % at STC

System losses

Auxiliaries loss

constant (fans) 10.00 kW

2.2 kW from Power thresh.



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

ARATO SRL (Italy)

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 690 Vac tri
Loss Fraction 1.60 % at STC

Inverters: Sunway TG 1800 1500V TE - 690, SUNWAY STATION TG1800&900-1500V-TE 600 (2416kW), Sunway TG 1800 1500V TE - 600 (1566), Sun

Wire section (16 Inv.) Copper 16 x 3 x 1500 mm²
Average wires length 298 m

MV line up to Injection

MV Voltage 20 kV
Average each inverter
Wires Copper 3 x 50 mm²
Length 12250 m
Loss Fraction 2.00 % at STC

AC losses in transformers

MV transfo

Medium voltage 20 kV

One transfo parameters

Nominal power at STC 1.74 MVA
Iron Loss (24/24 Connexion) 1.82 kVA
Iron loss fraction 0.11 % at STC
Copper loss 34.72 kVA
Copper loss fraction 2.00 % at STC
Coils equivalent resistance 3 x 5.49 mΩ

Operating losses at STC (full system)

Nb. identical MV transfos 16
Nominal power at STC 27.78 MVA
Iron loss (24/24 Connexion) 29.16 kVA
Copper loss 555.51 kVA



Horizon definition

Horizon from PVGIS website API, Lat=37°31'13", Long=14°38'8", Alt=493m

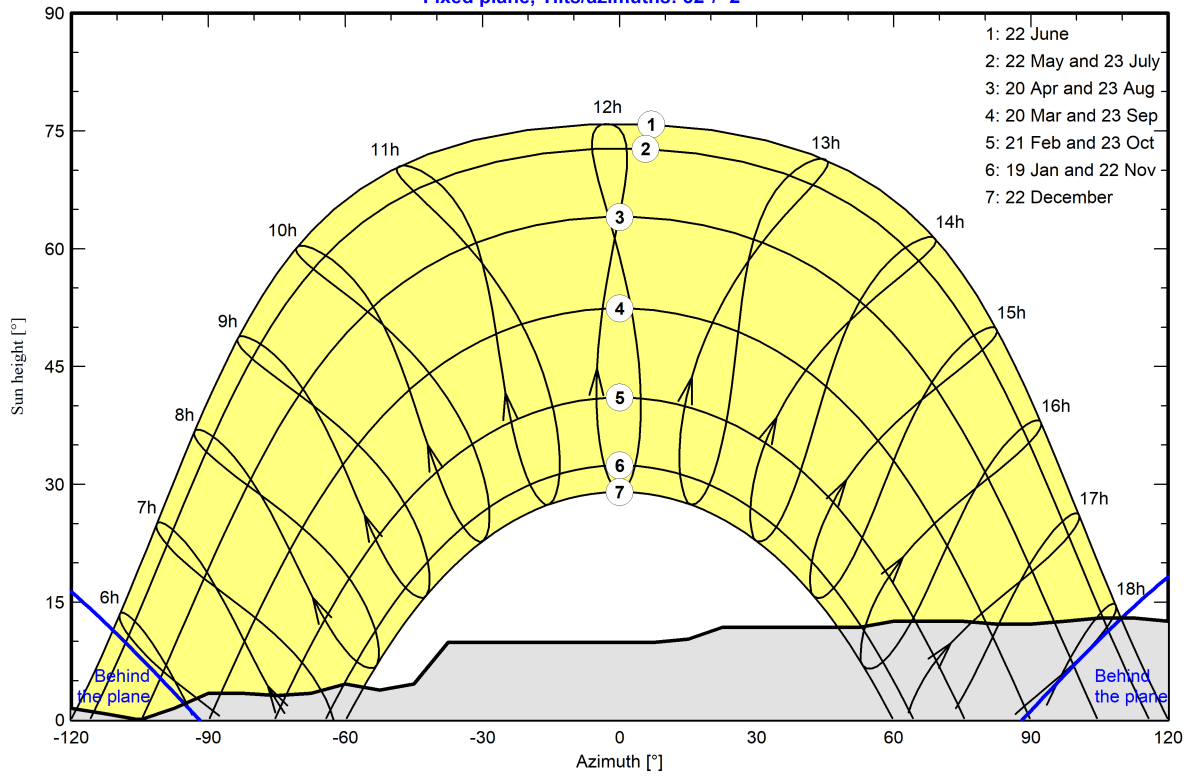
Average Height	7.2 °	Albedo Factor	0.51
Diffuse Factor	0.93	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-150	-143	-135	-128	-120	-113	-105	-98	-90
Height [°]	1.5	1.5	1.1	1.1	0.8	0.8	1.9	3.4	1.5	0.8	0.0	1.5	3.4
Azimuth [°]	-83	-75	-68	-60	-53	-45	-38	8	15	23	53	60	75
Height [°]	3.4	3.1	3.4	4.6	3.8	4.6	9.9	9.9	10.3	11.8	11.8	12.6	12.6
Azimuth [°]	83	90	98	105	113	120	128	135	143	150	158	173	180
Height [°]	12.2	12.2	12.6	13.0	13.0	12.6	10.3	10.3	8.8	8.8	7.3	1.1	1.5

Sun Paths (Height / Azimuth diagram)

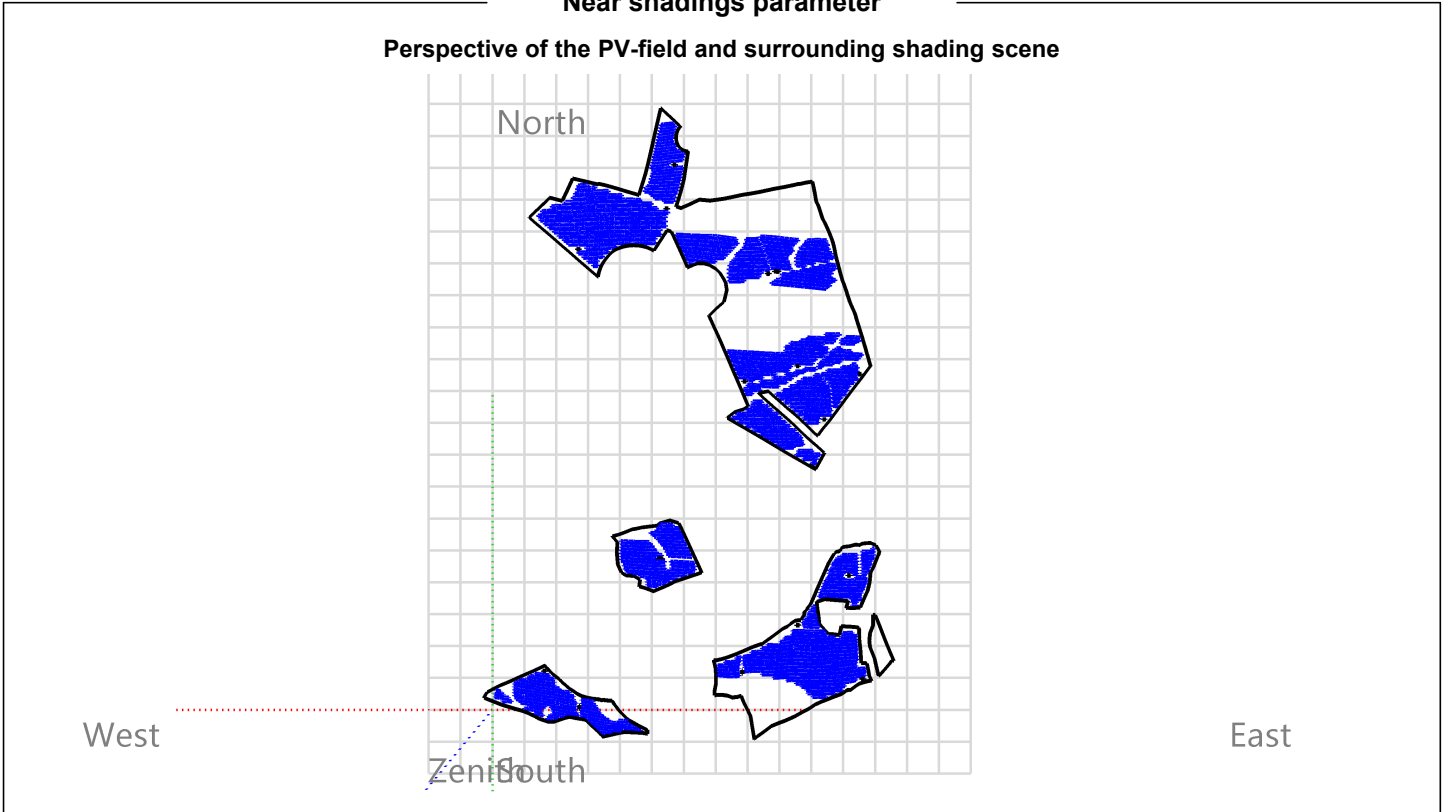
Fixed plane, Tilts/azimuths: 32°/ -2°





Near shadings parameter

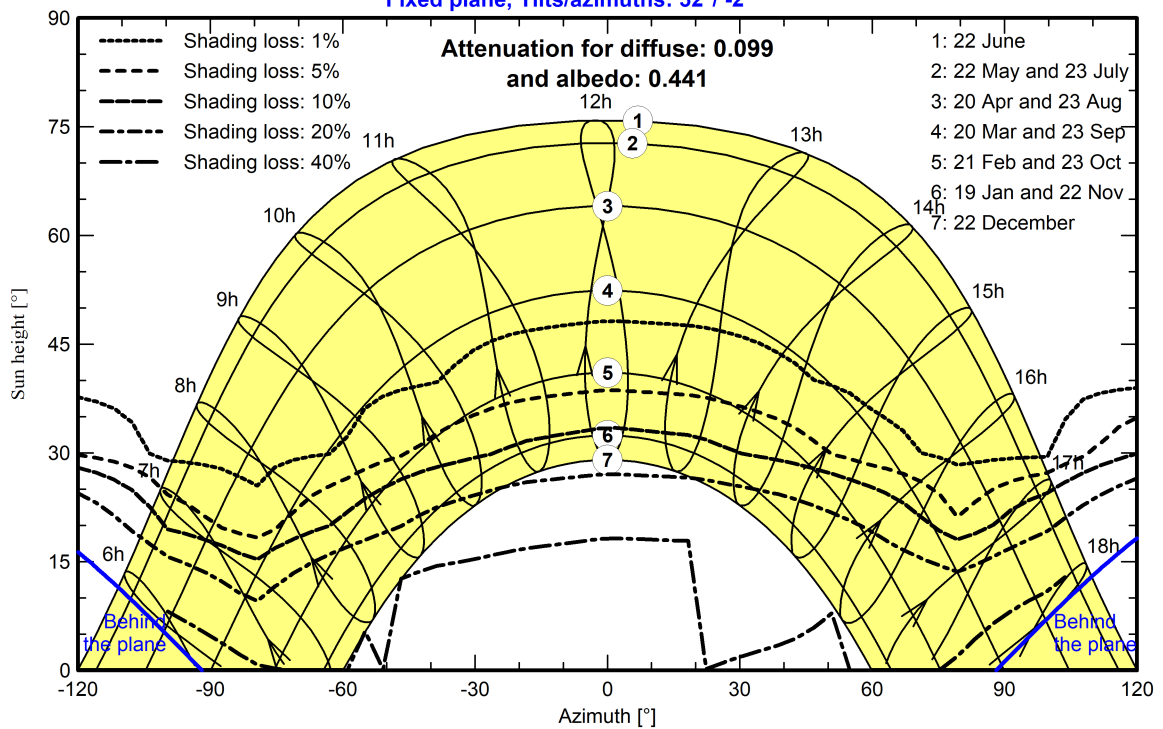
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 32°/-2°





Main results

System Production

Produced Energy 43.66 GWh/year

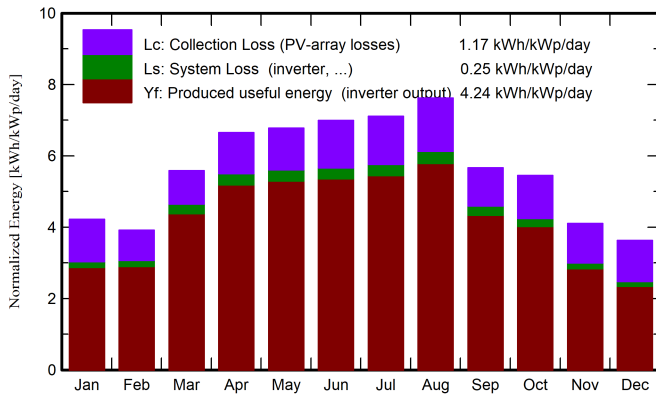
Specific production

1548 kWh/kWp/year

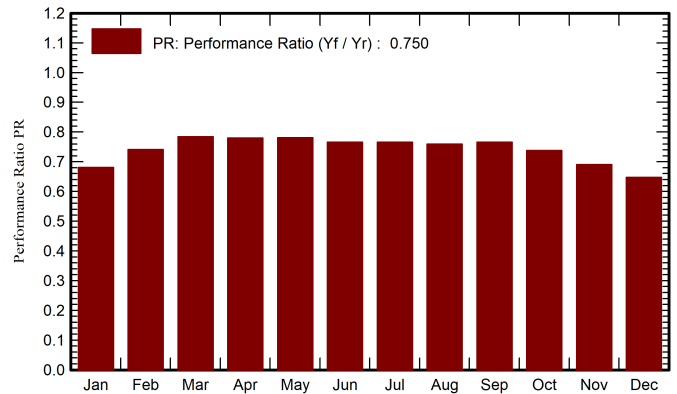
Perf. Ratio PR

74.98 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

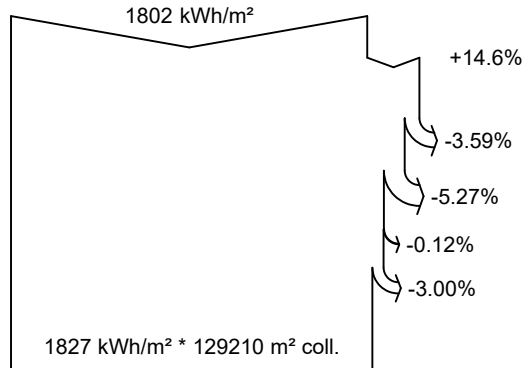
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray GWh	E_Grid GWh	PR ratio
January	80.2	32.26	8.57	131.0	99.2	2.653	2.515	0.681
February	80.2	39.47	6.34	109.7	90.3	2.427	2.295	0.742
March	140.2	49.96	11.89	173.3	156.8	4.064	3.832	0.784
April	184.9	62.10	17.22	199.6	184.3	4.656	4.389	0.780
May	214.9	68.57	20.23	210.2	195.6	4.903	4.631	0.781
June	226.4	66.87	25.16	209.9	195.2	4.792	4.531	0.766
July	232.3	61.52	26.44	220.4	205.4	5.038	4.762	0.766
August	226.8	55.16	27.51	236.1	220.2	5.356	5.060	0.760
September	146.3	55.78	22.54	170.1	155.6	3.888	3.672	0.766
October	122.7	45.82	19.84	168.8	146.5	3.717	3.515	0.738
November	79.8	33.82	14.66	123.2	96.9	2.536	2.399	0.690
December	67.2	29.64	10.07	112.6	81.1	2.172	2.055	0.647
Year	1802.0	600.99	17.61	2064.9	1827.1	46.201	43.656	0.750

Legends

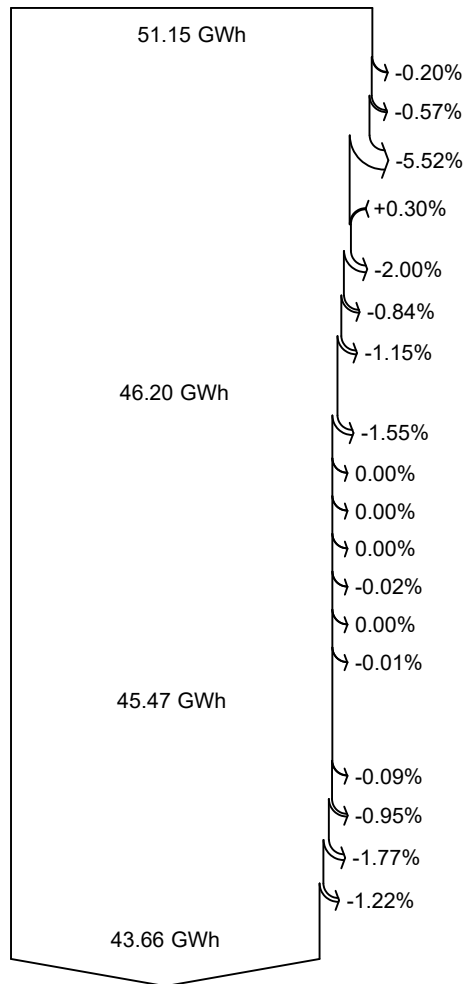
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



Loss diagram



efficiency at STC = 21.66%



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

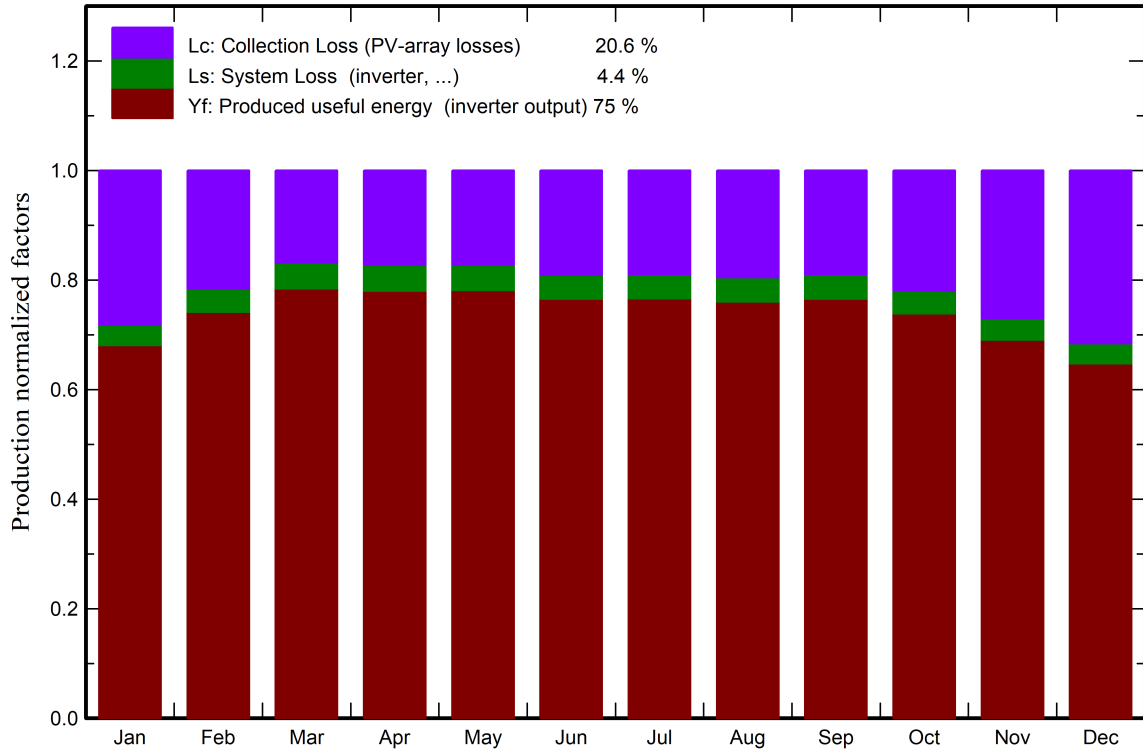
MV line ohmic loss

Energy injected into grid

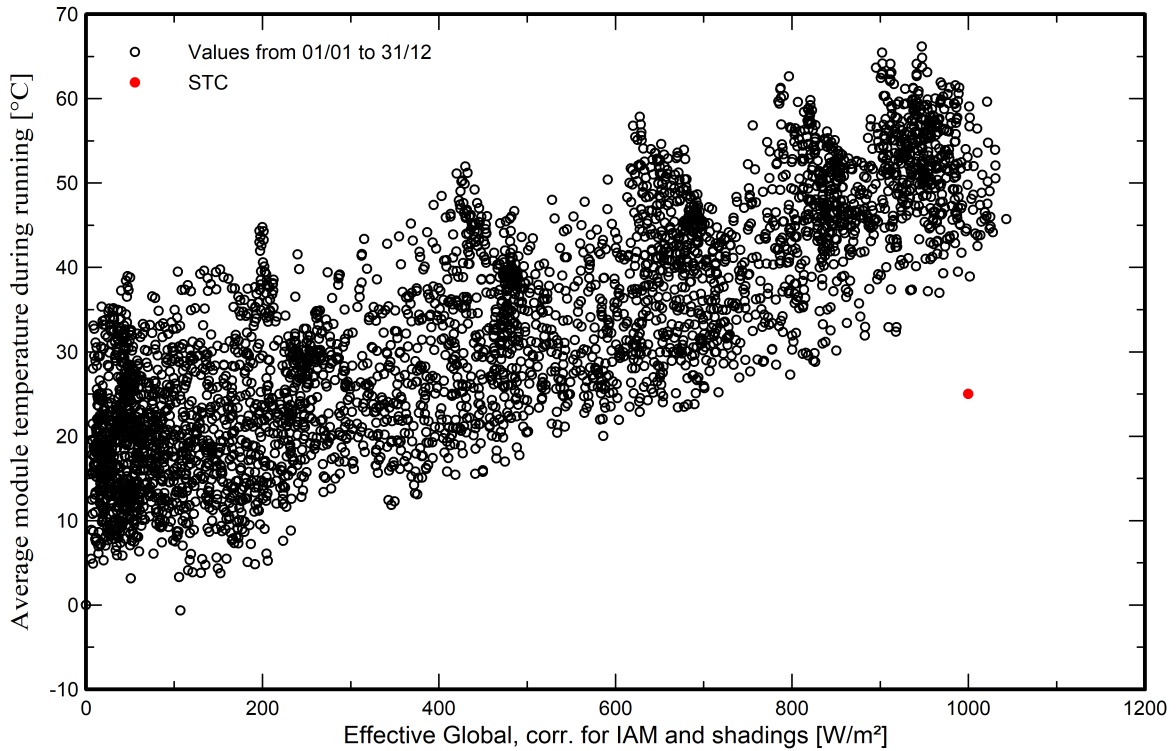


Predef. graphs

Normalized Production and Loss Factors



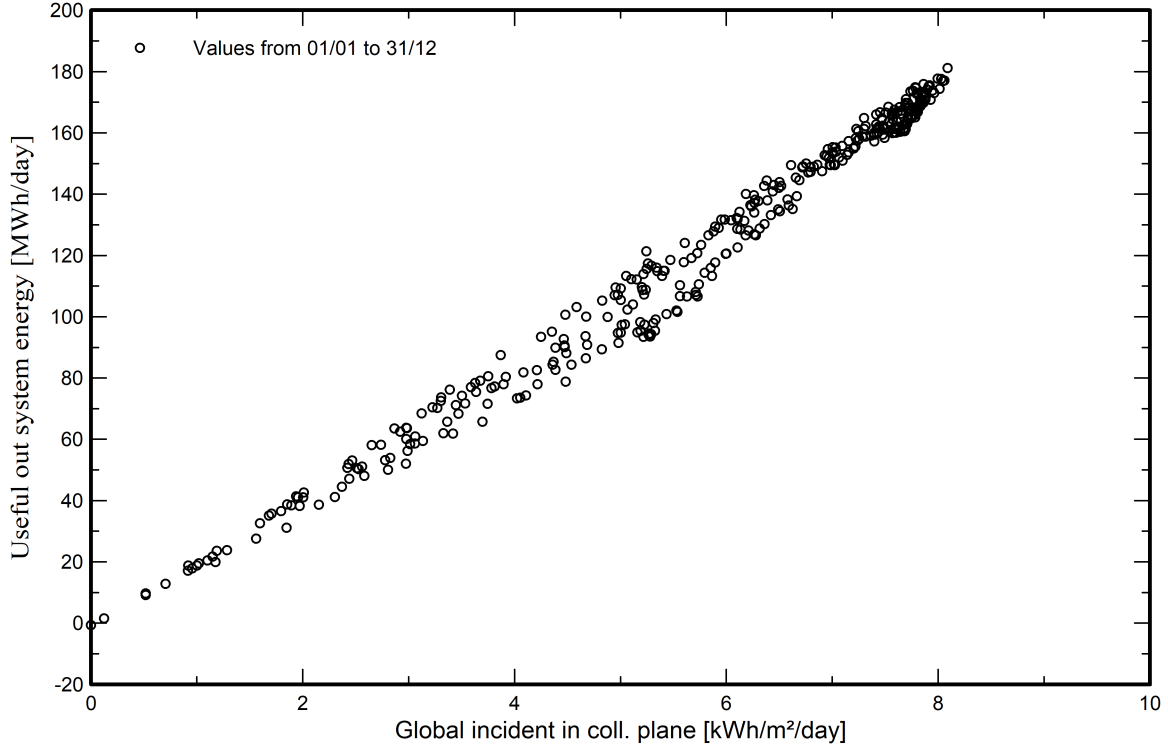
Array Temperature vs. Effective Irradiance



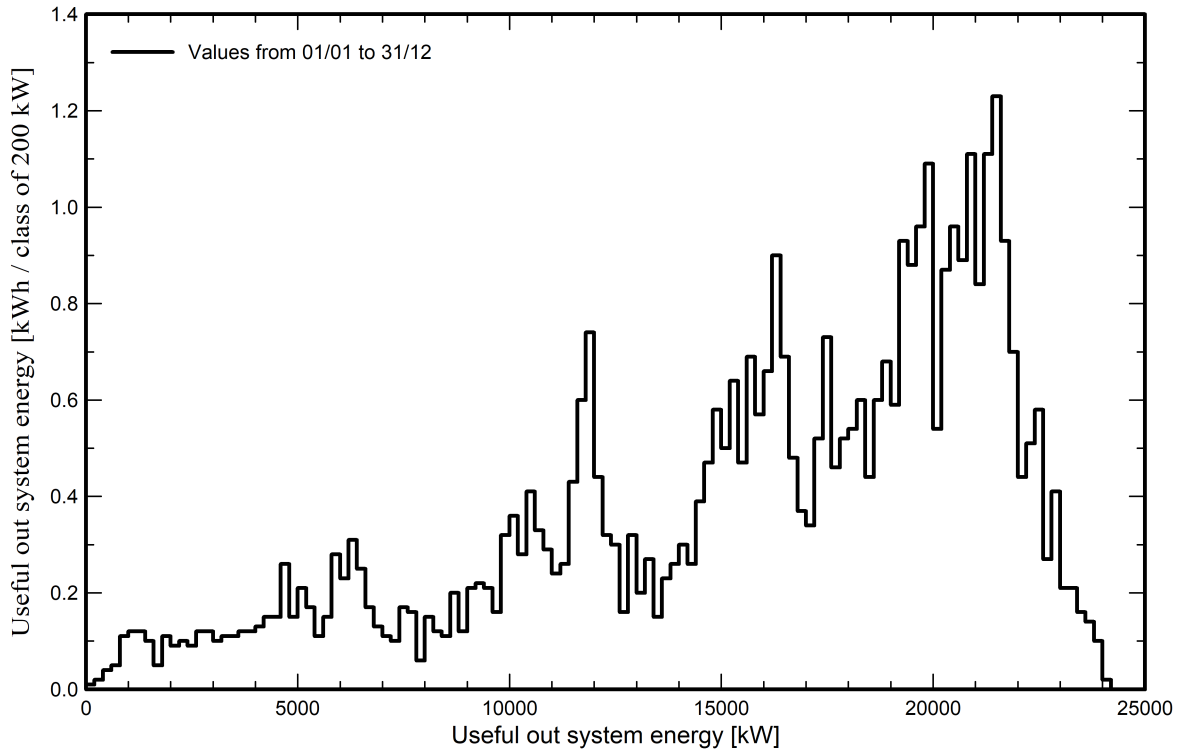


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





PVsyst V7.4.2

VC0, Simulation date:
12/09/23 16:24
with v7.4.2

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

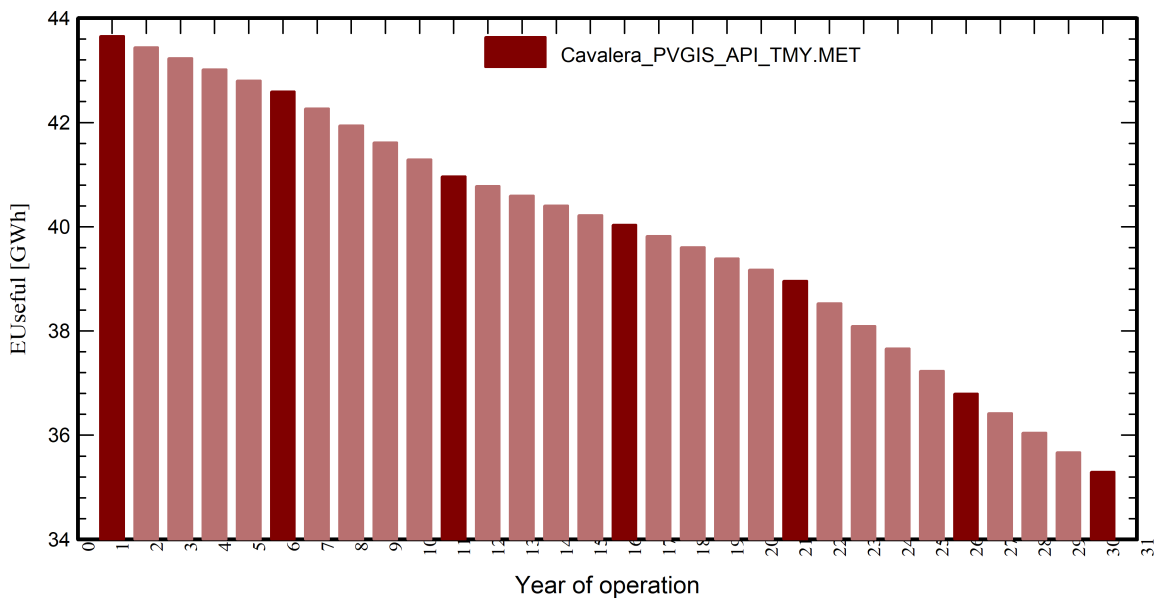
Vmp RMS dispersion 0.4 %/year

Meteo used in the simulation

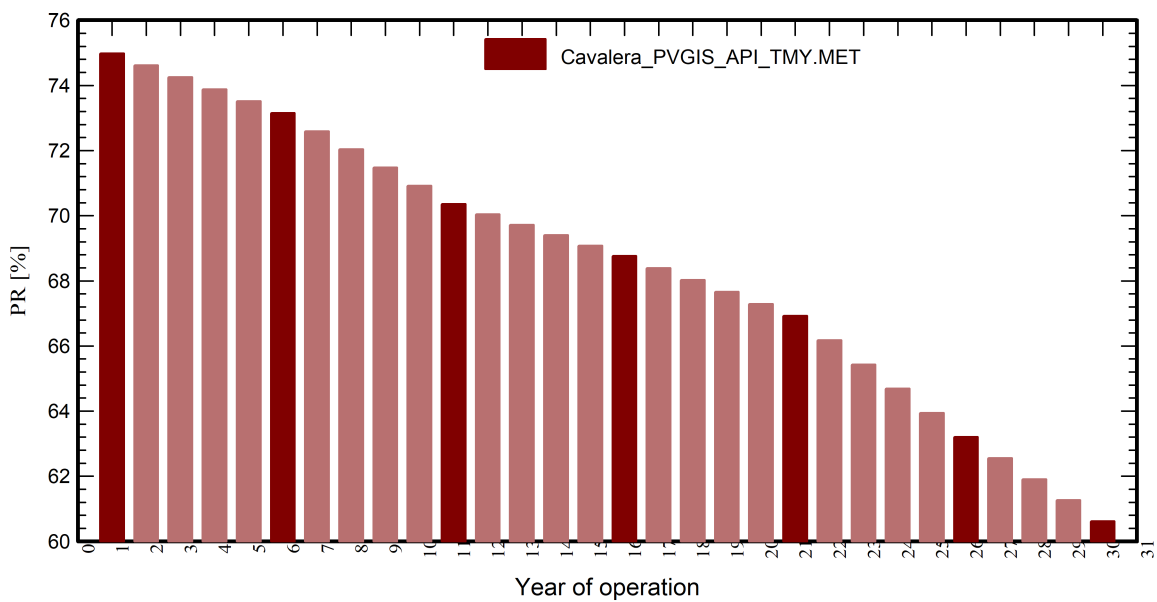
Cavalera PVGIS API TMY

Years reference year

Useful out system energy



Performance Ratio



**PVsyst V7.4.2**VCO, Simulation date:
12/09/23 16:24
with v7.4.2

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

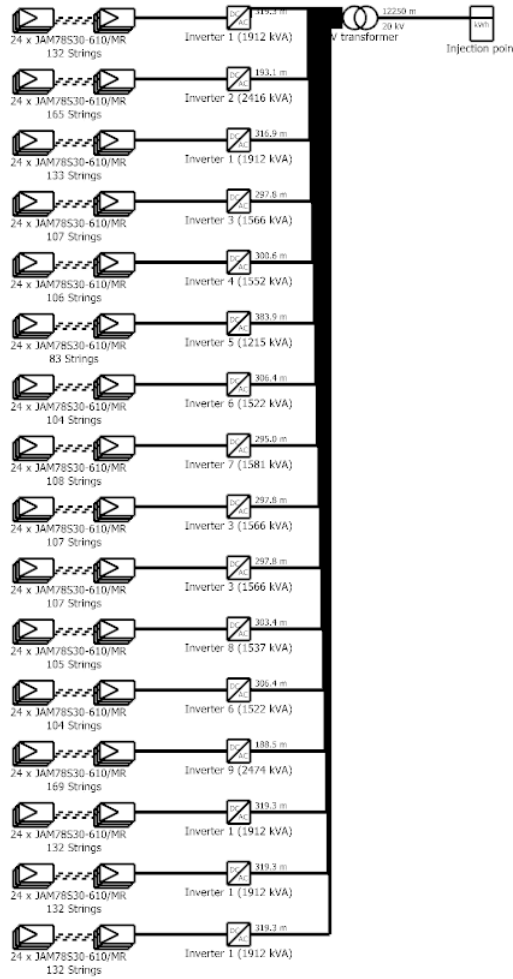
	EUseful	PR	PR loss
Year	GWh	%	%
1	43.66	74.98	-0.24
2	43.44	74.61	-0.73
3	43.23	74.25	-1.22
4	43.02	73.88	-1.70
5	42.80	73.52	-2.19
6	42.59	73.15	-2.68
7	42.27	72.59	-3.42
8	41.94	72.03	-4.16
9	41.62	71.48	-4.91
10	41.29	70.92	-5.65
11	40.97	70.36	-6.39
12	40.78	70.04	-6.82
13	40.59	69.72	-7.24
14	40.41	69.40	-7.67
15	40.22	69.08	-8.09
16	40.03	68.76	-8.52
17	39.82	68.39	-9.01
18	39.60	68.02	-9.50
19	39.39	67.66	-9.99
20	39.18	67.29	-10.48
21	38.96	66.92	-10.97
22	38.53	66.18	-11.96
23	38.10	65.43	-12.95
24	37.66	64.69	-13.94
25	37.23	63.94	-14.93
26	36.80	63.20	-15.92
27	36.42	62.56	-16.77
28	36.05	61.91	-17.63
29	35.67	61.26	-18.49
30	35.29	60.62	-19.35



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

Single-line diagram



PV module	JAM78S30-610/MR
Inverter 1	Sunway TG 1800 1500V TE - 690
Inverter 2	SUNWAY STATION TG1800&900-1500V-TE 600 (2416kW)
Inverter 3	Sunway TG 1800 1500V TE - 600 (1566)
Inverter 4	Sunway TG 1800 1500V TE - 600 (1552)
Inverter 5	Sunway TG 1800 1500V TE - 600 (1215)
Inverter 6	Sunway TG 1800 1500V TE - 600 (1522)
Inverter 7	Sunway TG 1800 1500V TE - 600 (1581)
Inverter 8	Sunway TG 1800 1500V TE - 600 (1537)
Inverter 9	SUNWAY STATION TG1800&900-1500V-TE 600 (2474kW)
String	24 x JAM78S30-610/MR

Ficurinia lotto #2741

ARATO SRL (Italy)

VCO : New simulation variant

10/10/23



PVsyst V7.4.2

VCO, Simulation date:
12/09/23 16:24
with v7.4.2

CO₂ Emission Balance

Total: 438383.3 tCO₂

Generated emissions

Total: 42302.95 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 553999.5 tCO₂

System production: 43656.38 MWh/yr

Grid Lifecycle Emissions: 423 gCO₂/kWh

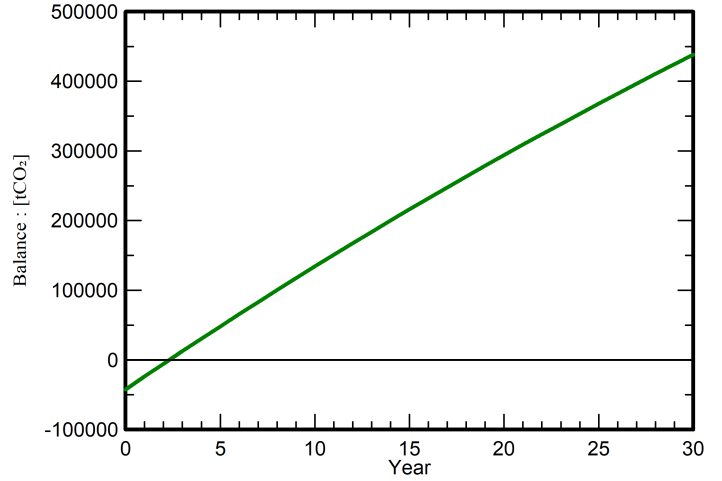
Source: IEA List

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	46224 modules	42294960
Supports	2.36 kgCO ₂ /units	1990 units	4696
Inverters	206 kgCO ₂ /units	16.0 units	3291