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
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RESPONSABILE PROGETTO:
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RS06REL065A0_rev.01

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- Settore industriale
- Settore dell'informazione
ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI REGGIO CALABRIA

TITOLO ELABORATO:

Analisi della risorsa solare e stima di produzione energia lotto 3254

SCALA:

-

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N. REV.	DATA	REVISIONE	ELABORATO	VERIFICATO	VALIDATO
0	apr-22	Emissione	Ing. Balcacconi/Ing. D'Elia/Ing. Vizzarro	Ing. Bolignano	INE FICURINIA S.R.L.
1	sett-23	Integrazioni con modifica sostanziale del progetto in riscontro a richiesta MASE prot. m_amte.CTVA. REGISTRO UFFICIALE.U.0006731.08-06-2023	Ing. Baldacconi/Ing. D'Elia	Ing. Bolignano	INE FICURINIA S.R.L.

Version 7.4.2

PVsyst - Simulation report

Grid-Connected System

Project: Ficurinia lotto #3254

Variant: New simulation variant

Ground system (tables) on a hill

System power: 45.69 MWp

Cavalera - Italy

Author

ARATO SRL (Italy)

Project: Ficurinia lotto #3254

Variant: New simulation variant

ARATO SRL (Italy)

Project summary

Geographical Site
Cavalera
Italy

Situation

Latitude	37.48 °N
Longitude	14.59 °E
Altitude	352 m
Time zone	UTC+1

Project settings

Albedo	0.20

Meteo data
Cavalera
PVGIS api TMY

System summary

Grid-Connected System
Simulation for year no 1

Ground system (tables) on a hill

PV Field Orientation
Fixed plane
Tilt/Azimuth 31.3 / 0.6 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	74904 units	Nb. of units	33 units
Pnom total	45.69 MWp	Pnom total	44.94 MWac
		Pnom ratio	1.017

Results summary

Produced Energy	73.69 GWh/year	Specific production	1613 kWh/kWp/year	Perf. Ratio PR	78.25 %

Table of contents

General parameters

Grid-Connected System — **Ground system (tables) on a hill**

PV Field Orientation

Orientation	
Fixed plane	
Tilt/Azimuth	31.3 / 0.6 °

Sheds configuration	
Nb. of sheds	3307 units
Sizes	
Sheds spacing	8.28 m
Collector width	4.60 m
Ground Cov. Ratio (GCR)	55.5 %
Shading limit angle	
Limit profile angle	28.8 °

Models used	
Transposition	Perez
Diffuse	Imported
Circumsolar	separate

Horizon
Average Height 2.3 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

PV Array Characteristics

Array #1 - Sub-array #1

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	3888 units
Nominal (STC)	2372 kWp
Modules	162 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	2148 kWp
U mpp	982 V
I mpp	2186 A

Inverter

Manufacturer	Santerno
Model	SUNWAY STATION TG1800&900-1500V-TE 600 (2372kW)
(Custom parameters definition)	
Unit Nom. Power	2372 kWac
Number of inverters	1 unit
Total power	2372 kWac
Operating voltage	860-1200 V
Max. power (=>25°C)	23716 kWac
Pnom ratio (DC:AC)	1.00
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	3864 units
Nominal (STC)	2357 kWp
Modules	161 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	2134 kWp
U mpp	982 V
I mpp	2173 A

Inverter

Manufacturer	Santerno
Model	SUNWAY STATION TG1800&900-1500V-TE 600 (2357kW)
(Custom parameters definition)	
Unit Nom. Power	2357 kWac
Number of inverters	1 unit
Total power	2357 kWac
Operating voltage	860-1200 V
Max. power (=>25°C)	23716 kWac
Pnom ratio (DC:AC)	1.00
Power sharing within this inverter	

PV Array Characteristics

Array #3 - Sub-array #3

PV module		Inverter	
Manufacturer	JA Solar	Manufacturer	Sungrow
Model	JAM78S30-610/MR	Model	SG250HX (limit 209 kVA)
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	610 Wp	Unit Nom. Power	209 kWac
Number of PV modules	1032 units	Number of inverters	3 units
Nominal (STC)	630 kWp	Total power	627 kWac
Modules	43 Strings x 24 In series	Operating voltage	500-1500 V
At operating cond. (50°C)		Max. power (=>30°C)	250 kWac
Pmpp	570 kWp	Pnom ratio (DC:AC)	1.00
U mpp	982 V	Power sharing within this inverter	
I mpp	580 A		

PV module		Inverter	
Manufacturer	JA Solar	Manufacturer	Sungrow
Model	JAM78S30-610/MR	Model	SG125HX (limit 107 kVA)
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	610 Wp	Unit Nom. Power	107 kWac
Number of PV modules	1056 units	Number of inverters	6 units
Nominal (STC)	644 kWp	Total power	642 kWac

Array #4 - Sub-array #4

Number of PV modules	528 units	Number of inverters	3 units
Nominal (STC)	322 kWp	Total power	321 kWac
Modules	22 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	500-1500 V
Pmpp	292 kWp	Pnom ratio (DC:AC)	1.00
U mpp	982 V	Power sharing within this inverter	
I mpp	297 A		

Array #12 - Sub-array #12

Number of PV modules	528 units	Number of inverters	3 units
Nominal (STC)	322 kWp	Total power	321 kWac
Modules	22 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	500-1500 V
Pmpp	292 kWp	Pnom ratio (DC:AC)	1.00
U mpp	982 V	Power sharing within this inverter	
I mpp	297 A		

PV module		Inverter	
Manufacturer	JA Solar	Manufacturer	Santerno
Model	JAM78S30-610/MR	Model	Sunway TG 1800 1500V TE - 600 (1639W)
(Custom parameters definition)		(Custom parameters definition)	
Unit Nom. Power	610 Wp	Unit Nom. Power	1639 kWac
Number of PV modules	5376 units	Number of inverters	2 units
Nominal (STC)	3279 kWp	Total power	3278 kWac

Array #5 - Sub-array #5

Number of PV modules	2688 units	Number of inverters	1 unit
Nominal (STC)	1640 kWp	Total power	1639 kWac
Modules	112 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1485 kWp	Max. power (=>25°C)	1640 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	1511 A	Power sharing within this inverter	

PV Array Characteristics

Array #6 - Sub-array #6

Number of PV modules	2688 units	Number of inverters	1 unit
Nominal (STC)	1640 kWp	Total power	1639 kWac
Modules	112 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1485 kWp	Max. power (=>25°C)	1640 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	1511 A	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

Array #7 - Sub-array #7

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 #8 - Sub-array #8

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 #9 - Sub-array #9

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	

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	7920 units
Nominal (STC)	4831 kWp

Inverter

Manufacturer	Santerno
Model	SUNWAY STATION TG1800&900-1500V-TE 600 (2416kW)
(Custom parameters definition)	
Unit Nom. Power	2416 kWac
Number of inverters	2 units
Total power	4831 kWac

PV Array Characteristics

Array #10 - Sub-array #10

Number of PV modules	3960 units	Number of inverters	1 unit
Nominal (STC)	2416 kWp	Total power	2416 kWac
Modules	165 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	2187 kWp	Max. power (=>25°C)	2430 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	2227 A	Power sharing within this inverter	

Array #22 - Sub-array #22

Number of PV modules	3960 units	Number of inverters	1 unit
Nominal (STC)	2416 kWp	Total power	2416 kWac
Modules	165 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	2187 kWp	Max. power (=>25°C)	2430 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	2227 A	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	1632 units
Nominal (STC)	996 kWp
Modules	68 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	902 kWp
U mpp	982 V
I mpp	918 A

Inverter

Manufacturer	Santerno
Model	Sunway TG 900 1500V TE - 600 (956kW)
(Custom parameters definition)	
Unit Nom. Power	956 kWac
Number of inverters	1 unit
Total power	956 kWac
Operating voltage	860-1200 V
Max. power (=>25°C)	957 kWac
Pnom ratio (DC:AC)	1.04

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	12816 units
Nominal (STC)	7818 kWp

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 690
(Custom parameters definition)	
Unit Nom. Power	1912 kWac
Number of inverters	4 units
Total power	7648 kWac

Array #13 - Sub-array #13

Number of PV modules	3216 units	Number of inverters	1 unit
Nominal (STC)	1962 kWp	Total power	1912 kWac
Modules	134 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	690-1200 V
Pmpp	1777 kWp	Max. power (=>25°C)	2151 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.03
I mpp	1808 A	Power sharing within this inverter	

Array #14 - Sub-array #14

Number of PV modules	3216 units	Number of inverters	1 unit
Nominal (STC)	1962 kWp	Total power	1912 kWac
Modules	134 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	690-1200 V
Pmpp	1777 kWp	Max. power (=>25°C)	2151 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.03
I mpp	1808 A	Power sharing within this inverter	

PV Array Characteristics

Array #15 - Sub-array #15

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 #16 - Sub-array #16

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	

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	14496 units
Nominal (STC)	8843 kWp

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 600
(Custom parameters definition)	
Unit Nom. Power	1662 kWac
Number of inverters	5 units
Total power	8310 kWac

Array #17 - Sub-array #17

Number of PV modules	2808 units	Number of inverters	1 unit
Nominal (STC)	1713 kWp	Total power	1662 kWac
Modules	117 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1551 kWp	Pnom ratio (DC:AC)	1.03
U mpp	982 V	Power sharing within this inverter	
I mpp	1579 A		

Array #18 - Sub-array #18

Number of PV modules	2784 units	Number of inverters	1 unit
Nominal (STC)	1698 kWp	Total power	1662 kWac
Modules	116 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1538 kWp	Pnom ratio (DC:AC)	1.02
U mpp	982 V	Power sharing within this inverter	
I mpp	1565 A		

Array #25 - Sub-array #25

Number of PV modules	2976 units	Number of inverters	1 unit
Nominal (STC)	1815 kWp	Total power	1662 kWac
Modules	124 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1644 kWp	Pnom ratio (DC:AC)	1.09
U mpp	982 V	Power sharing within this inverter	
I mpp	1673 A		

PV Array Characteristics

Array #26 - Sub-array #26

Number of PV modules	2976 units	Number of inverters	1 unit
Nominal (STC)	1815 kWp	Total power	1662 kWac
Modules	124 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1644 kWp	Pnom ratio (DC:AC)	1.09
U mpp	982 V	Power sharing within this inverter	
I mpp	1673 A		

Array #27 - Sub-array #27

Number of PV modules	2952 units	Number of inverters	1 unit
Nominal (STC)	1801 kWp	Total power	1662 kWac
Modules	123 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1631 kWp	Pnom ratio (DC:AC)	1.08
U mpp	982 V	Power sharing within this inverter	
I mpp	1660 A		

Array #19 - Sub-array #19

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	2256 units
Nominal (STC)	1376 kWp
Modules	94 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	1246 kWp
U mpp	982 V
I mpp	1269 A

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 600 (1376W)
(Custom parameters definition)	
Unit Nom. Power	1376 kWac
Number of inverters	1 unit
Total power	1376 kWac
Operating voltage	860-1200 V
Max. power (=>25°C)	1871 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	4464 units
Nominal (STC)	2723 kWp

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 600 (1361W)
(Custom parameters definition)	
Unit Nom. Power	1361 kWac
Number of inverters	2 units
Total power	2722 kWac

Array #20 - Sub-array #20

Number of PV modules	2232 units	Number of inverters	1 unit
Nominal (STC)	1362 kWp	Total power	1361 kWac
Modules	93 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1233 kWp	Max. power (=>25°C)	1871 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	1255 A	Power sharing within this inverter	

Array #21 - Sub-array #21

Number of PV modules	2232 units	Number of inverters	1 unit
Nominal (STC)	1362 kWp	Total power	1361 kWac
Modules	93 Strings x 24 In series		
At operating cond. (50°C)		Operating voltage	860-1200 V
Pmpp	1233 kWp	Max. power (=>25°C)	1871 kWac
U mpp	982 V	Pnom ratio (DC:AC)	1.00
I mpp	1255 A	Power sharing within this inverter	

PV Array Characteristics

Array #23 - Sub-array #23

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	1536 units
Nominal (STC)	937 kWp
Modules	64 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	848 kWp
U mpp	982 V
I mpp	864 A

Inverter

Manufacturer	Santerno
Model	Sunway TG 900 1500V TE - 600 EV
(Original PVsyst database)	
Unit Nom. Power	936 kWac
Number of inverters	1 unit
Total power	936 kWac
Operating voltage	860-1300 V
Pnom ratio (DC:AC)	1.00

Array #24 - Sub-array #24

PV module

Manufacturer	JA Solar
Model	JAM78S30-610/MR
(Custom parameters definition)	
Unit Nom. Power	610 Wp
Number of PV modules	2616 units
Nominal (STC)	1596 kWp
Modules	109 Strings x 24 In series
At operating cond. (50°C)	
Pmpp	1445 kWp
U mpp	982 V
I mpp	1471 A

Inverter

Manufacturer	Santerno
Model	Sunway TG 1800 1500V TE - 600 (1595)
(Custom parameters definition)	
Unit Nom. Power	1595 kWac
Number of inverters	1 unit
Total power	1595 kWac
Operating voltage	860-1200 V
Pnom ratio (DC:AC)	1.00
Power sharing within this inverter	

Total PV power

Nominal (STC)	45691 kWp
Total	74904 modules
Module area	209380 m²
Cell area	193037 m²

Total inverter power

Total power	44940 kWac
Max. power	90270 kWac
Number of inverters	33 units
Pnom ratio	1.02

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

DC wiring losses

Global wiring resistance 0.39 mΩ
Loss Fraction 1.5 % at STC

Array #1 - Sub-array #1
Global array res. 7.5 mΩ
Loss Fraction 1.5 % at STC

Array #2 - Sub-array #2
Global array res. 7.5 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3
Global array res. 28 mΩ
Loss Fraction 1.5 % at STC

Array #4 - Sub-array #4
Global array res. 55 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. 11 mΩ
Loss Fraction 1.5 % at STC

Array #7 - Sub-array #7
Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #8 - Sub-array #8
Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #9 - Sub-array #9
Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #10 - Sub-array #10
Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #11 - Sub-array #11
Global array res. 18 mΩ
Loss Fraction 1.5 % at STC

Array #12 - Sub-array #12
Global array res. 55 mΩ
Loss Fraction 1.5 % at STC

Array #13 - Sub-array #13
Global array res. 9.0 mΩ
Loss Fraction 1.5 % at STC

Array #14 - Sub-array #14
Global array res. 9.0 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

Array #17 - Sub-array #17
Global array res. 10 mΩ
Loss Fraction 1.5 % at STC

Array #18 - Sub-array #18
Global array res. 10 mΩ
Loss Fraction 1.5 % at STC

Array #19 - Sub-array #19
Global array res. 13 mΩ
Loss Fraction 1.5 % at STC

Array #20 - Sub-array #20
Global array res. 13 mΩ
Loss Fraction 1.5 % at STC

Array #21 - Sub-array #21
Global array res. 13 mΩ
Loss Fraction 1.5 % at STC

Array #22 - Sub-array #22
Global array res. 7.3 mΩ
Loss Fraction 1.5 % at STC

Array #23 - Sub-array #23
Global array res. 19 mΩ
Loss Fraction 1.5 % at STC

Array #24 - Sub-array #24
Global array res. 11 mΩ
Loss Fraction 1.5 % at STC

Array #25 - Sub-array #25
Global array res. 9.7 mΩ
Loss Fraction 1.5 % at STC

Array #26 - Sub-array #26
Global array res. 9.7 mΩ
Loss Fraction 1.5 % at STC

Array #27 - Sub-array #27
Global array res. 9.8 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	600	Vac tri
Loss Fraction	1.54	% at STC

Inverters: SUNWAY STATION TG1800&900-1500V-TE 600 (2372kW), SUNWAY STATION TG1800&900-1500V-TE 600 (2357kW), SG250HX (limit 209

Wire section (33 Inv.)	Copper 33 x 3 x 1500	mm²
Average wires length	246	m

MV line up to Injection

MV Voltage	20	kV
Average each inverter		
Wires	Copper 3 x 50	mm²
Length	12763	m
Loss Fraction	2.00	% at STC

AC losses in transformers

MV transfo

Medium voltage	20	kV

One transfo parameters			Operating losses at STC (full system)	
Nominal power at STC	1.67	MVA	Nb. identical MV transfos	27
Iron Loss (24/24 Connexion)	1.95	kVA	Nominal power at STC	45.01 MVA
Iron loss fraction	0.12	% at STC	Iron loss (24/24 Connexion)	52.66 kVA
Copper loss	33.34	kVA	Copper loss	900.19 kVA
Copper loss fraction	2.00	% at STC		
Coils equivalent resistance	3 x 4.32	mΩ		

Horizon definition

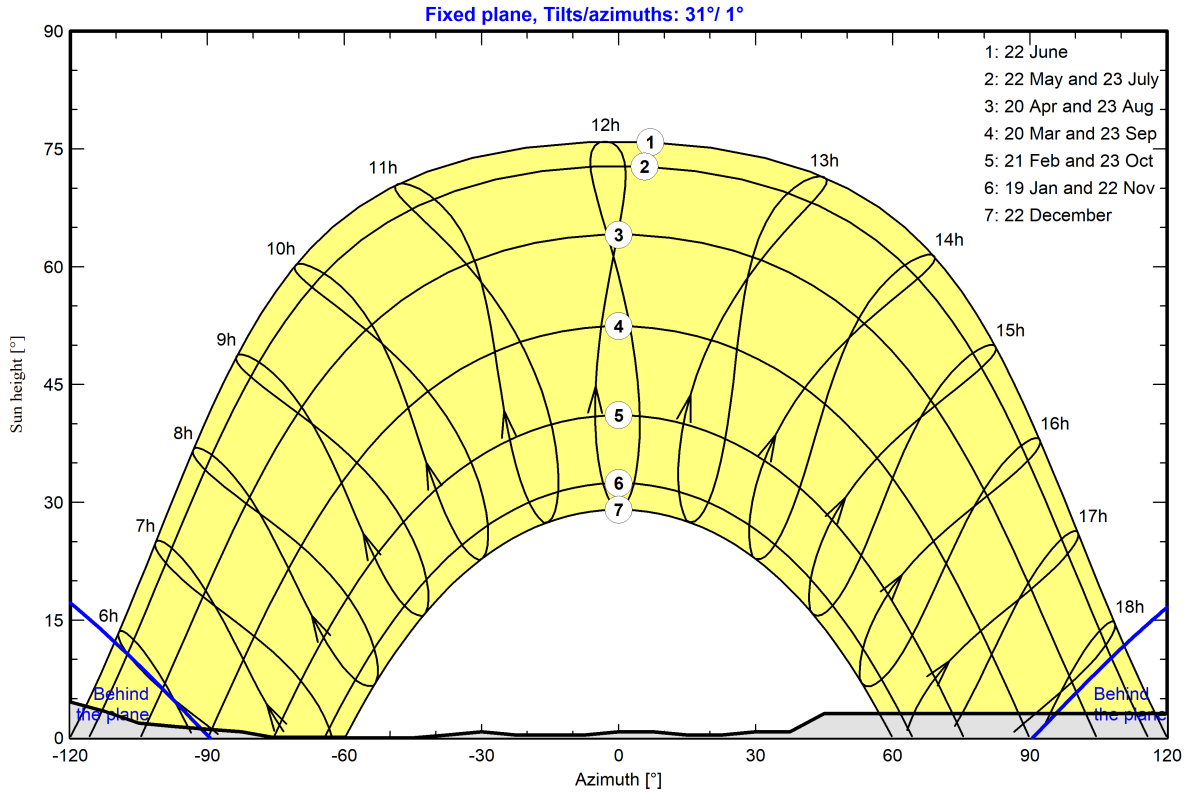
Horizon from PVGIS website API, Lat=37°29'0", Long=14°35'28", Alt=352m

Average Height	2.3 °	Albedo Factor	0.96
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

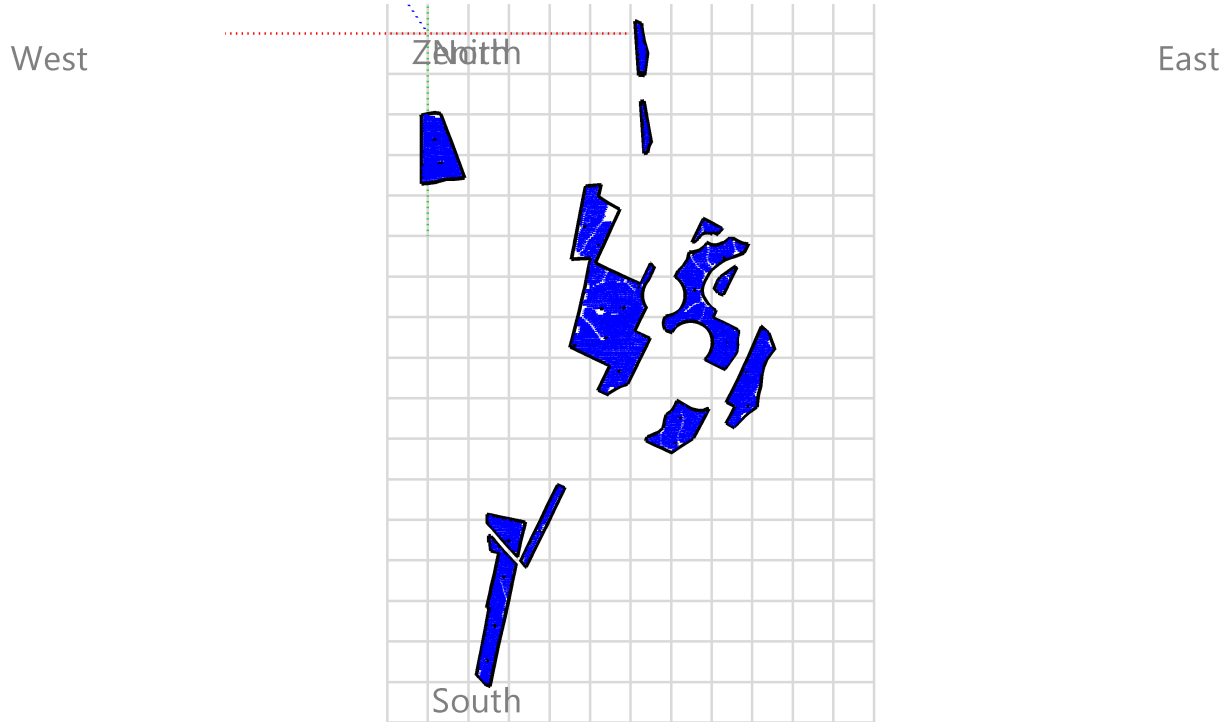
Azimuth [°]	-180	-143	-135	-128	-120	-113	-105	-98	-90	-83	-75	-45	-38
Height [°]	4.2	4.2	2.3	3.1	4.6	3.4	1.9	1.5	1.1	0.8	0.0	0.0	0.4
Azimuth [°]	-30	-23	-8	0	8	15	23	30	38	45	135	143	180
Height [°]	0.8	0.4	0.4	0.8	0.8	0.4	0.4	0.8	0.8	3.1	3.1	4.2	4.2

Sun Paths (Height / Azimuth diagram)



Near shadings parameter

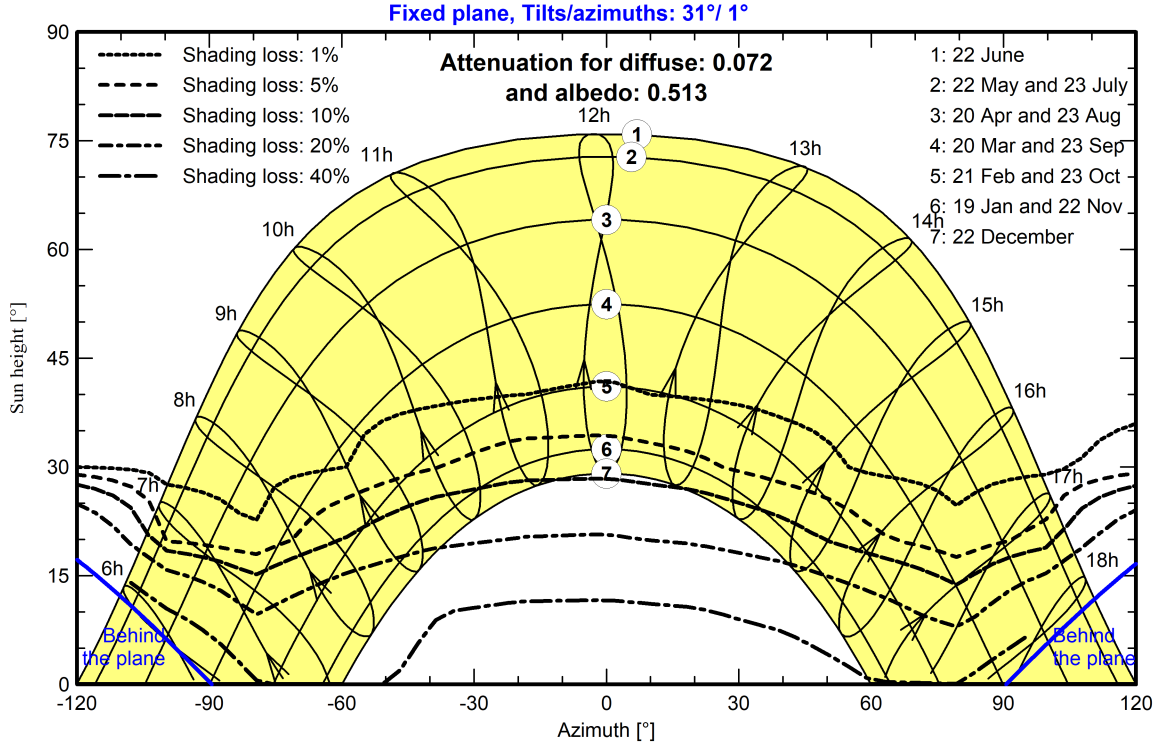
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 31°/ 1°



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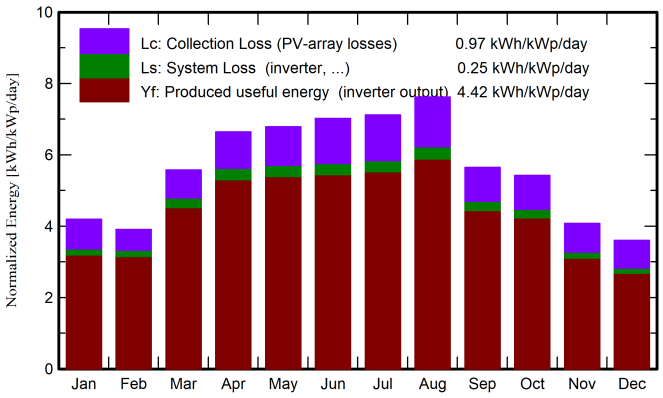
Main results

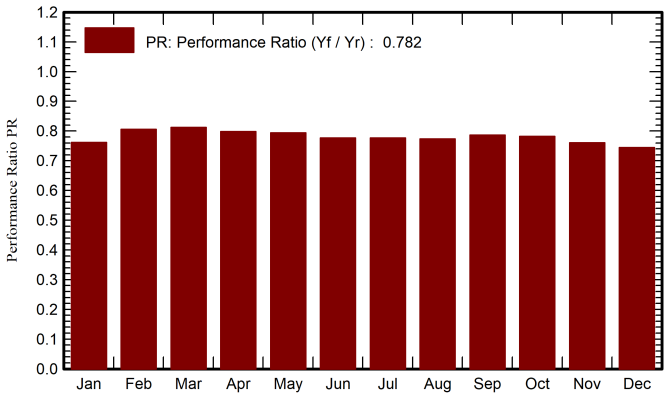
System Production

Produced Energy	73.69 GWh/year	Specific production	1613 kWh/kWp/year
		Perf. Ratio PR	78.25 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray GWh	E_Grid GWh	PR ratio
January	80.2	32.26	8.57	130.0	110.4	4.773	4.526	0.762
February	80.2	39.47	6.34	109.5	97.9	4.261	4.032	0.806
March	140.2	49.96	11.89	172.7	161.8	6.794	6.410	0.812
April	184.9	62.10	17.22	199.4	188.3	7.711	7.274	0.798
May	214.9	68.57	20.23	210.5	199.2	8.087	7.639	0.794
June	226.4	66.87	25.16	210.5	198.8	7.904	7.477	0.777
July	232.3	61.52	26.44	220.6	208.6	8.284	7.834	0.777
August	226.8	55.16	27.51	236.2	224.1	8.831	8.346	0.773
September	146.3	55.78	22.54	169.5	159.3	6.449	6.094	0.787
October	122.7	45.82	19.84	168.0	154.4	6.345	6.006	0.782
November	79.8	33.82	14.66	122.5	106.1	4.492	4.257	0.761
December	67.2	29.64	10.07	111.8	92.6	4.011	3.801	0.744
Year	1802.0	600.99	17.61	2061.3	1901.5	77.942	73.695	0.782

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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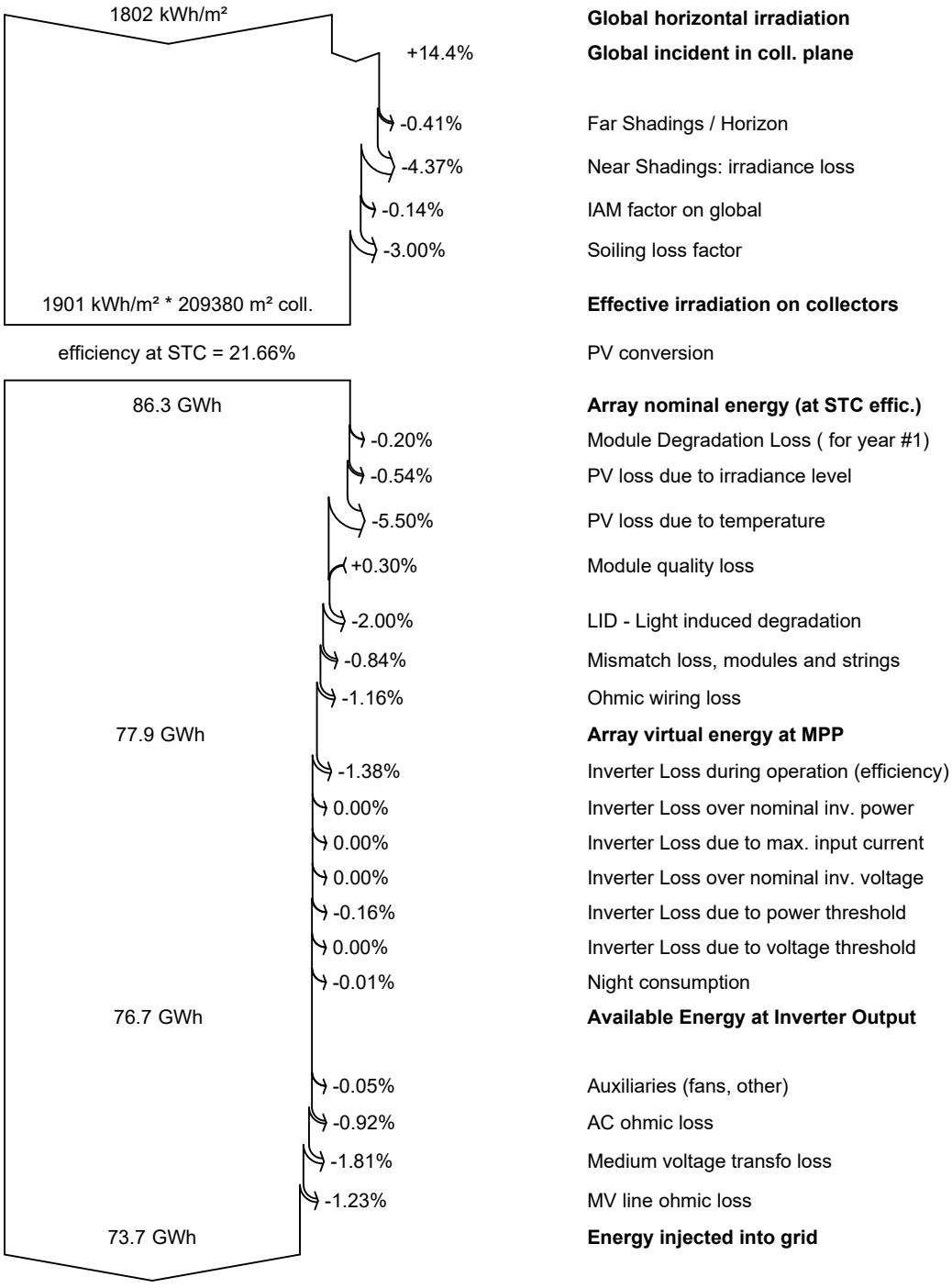
Loss diagram



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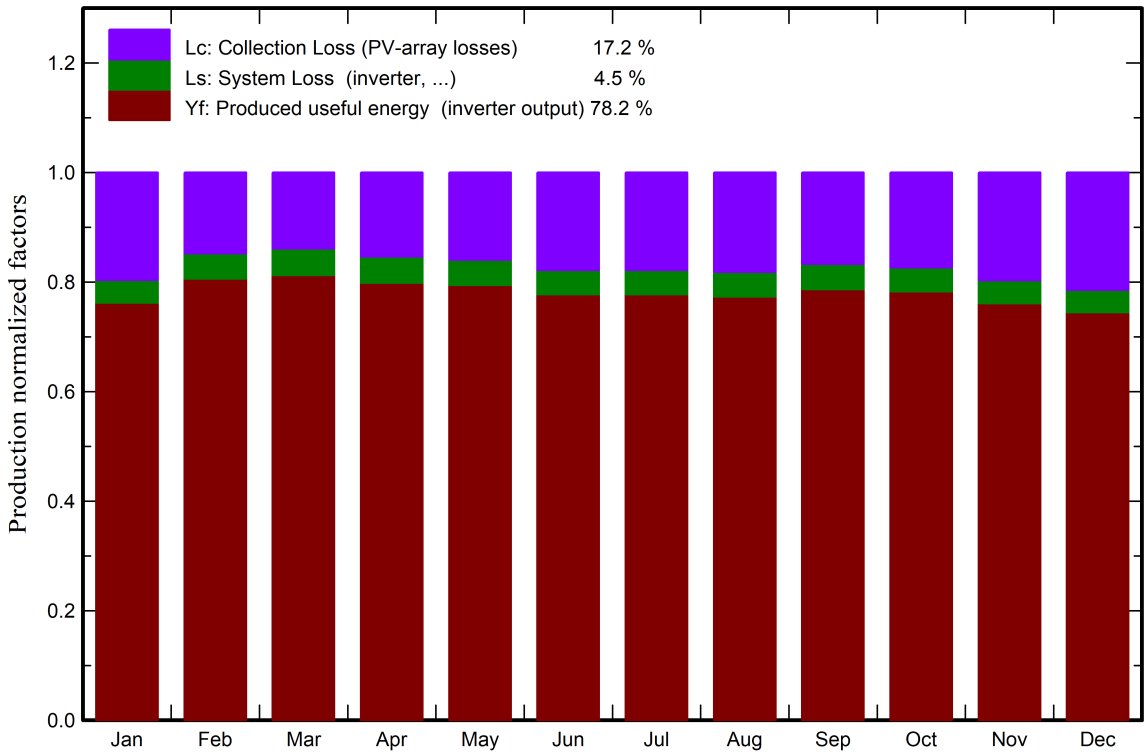
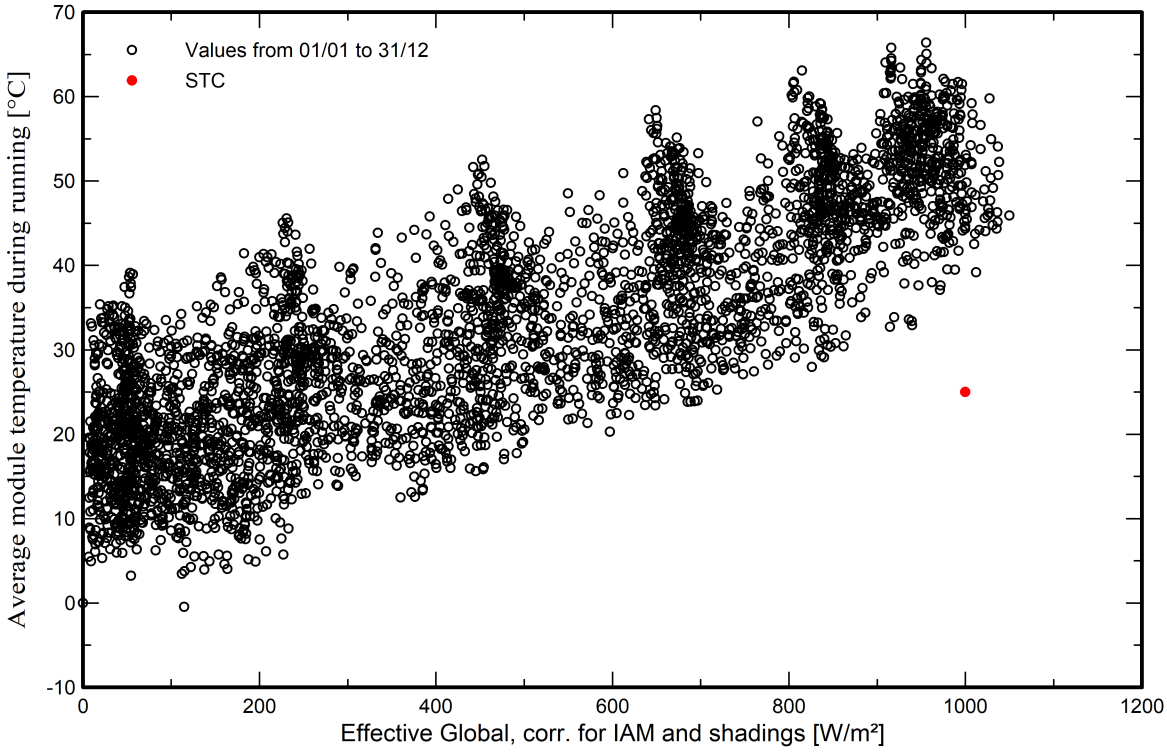
Predef. graphs

Normalized Production and Loss Factors



Array Temperature vs. Effective Irradiance



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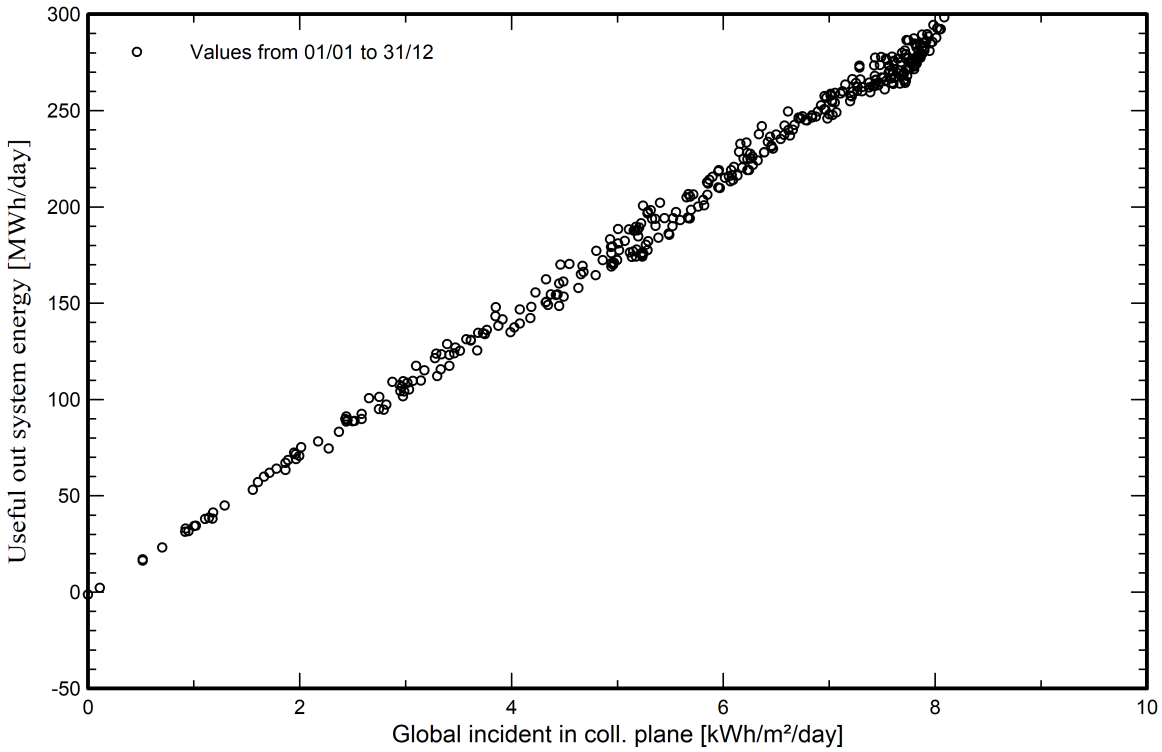
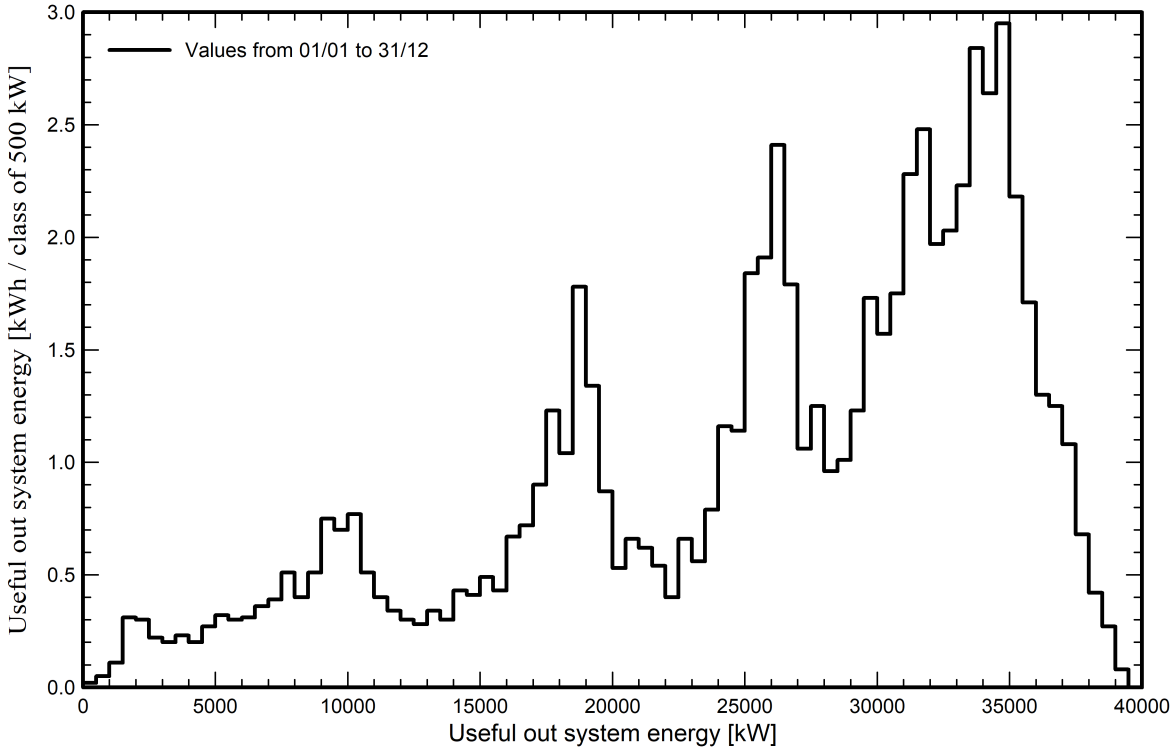
Predef. graphs

Daily Input/Output diagram



System Output Power Distribution



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VC0, Simulation date:
12/09/23 14:20
with v7.4.2

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

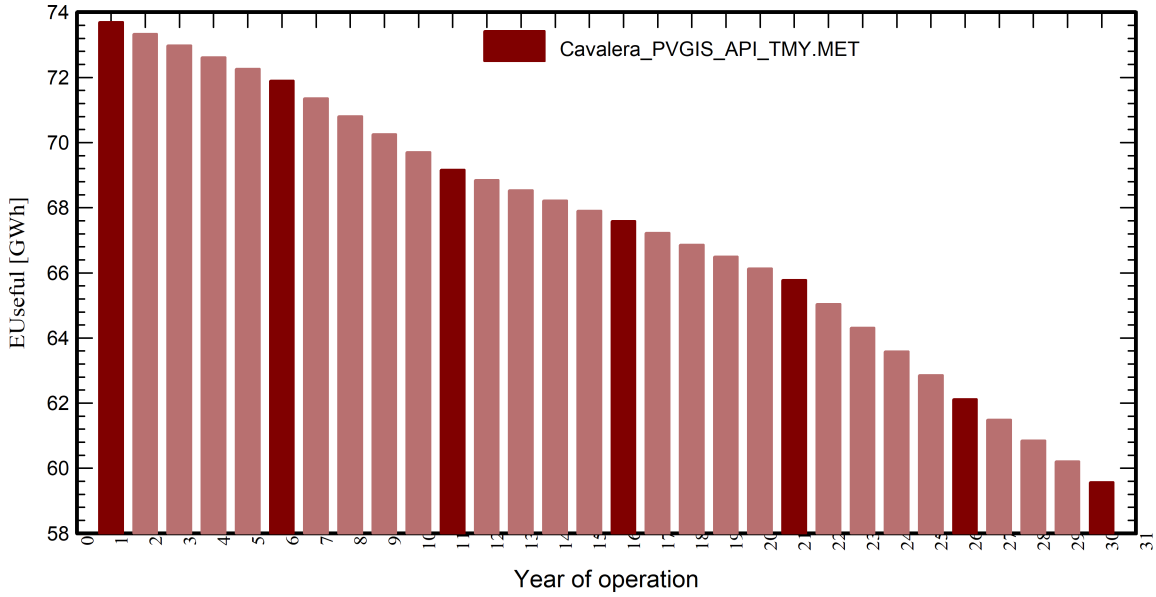
Vmp RMS dispersion 0.4 %/year

Meteo used in the simulation

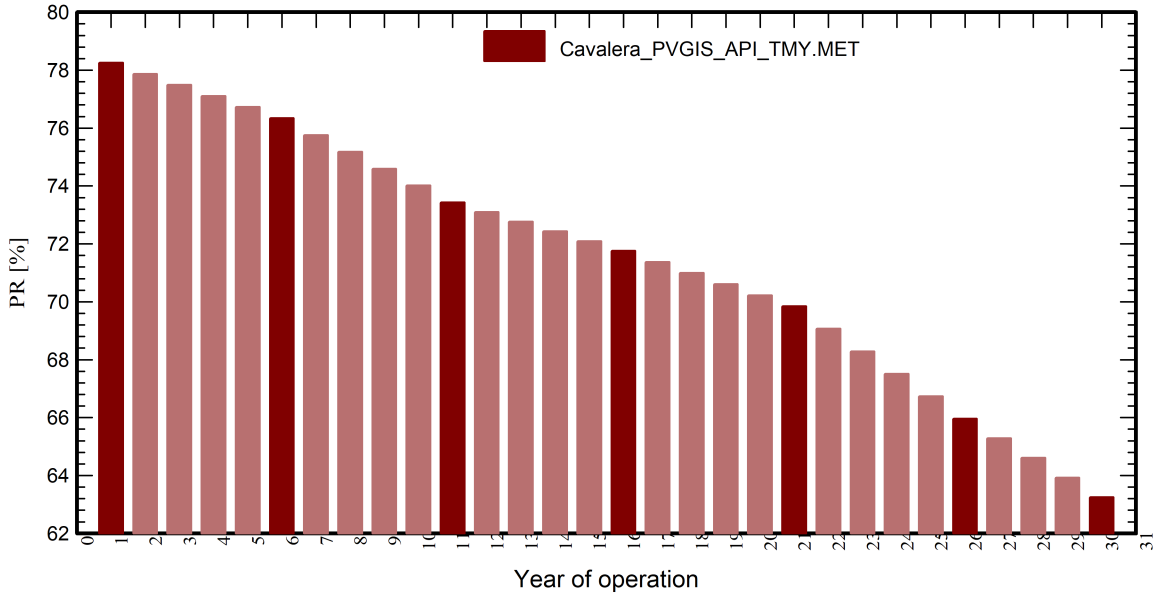
Cavalera PVGIS API TMY

Years reference year

Useful out system energy



Performance Ratio



Aging Tool

Aging Parameters

Time span of simulation 30 years

Module average degradation

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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	73.69	78.25	-0.24
2	73.34	77.87	-0.73
3	72.98	77.49	-1.22
4	72.62	77.10	-1.70
5	72.26	76.72	-2.19
6	71.90	76.34	-2.68
7	71.35	75.76	-3.42
8	70.80	75.18	-4.16
9	70.26	74.59	-4.90
10	69.71	74.01	-5.65
11	69.16	73.43	-6.39
12	68.84	73.10	-6.81
13	68.53	72.76	-7.24
14	68.22	72.43	-7.67
15	67.90	72.09	-8.09
16	67.59	71.76	-8.52
17	67.22	71.38	-9.01
18	66.86	70.99	-9.50
19	66.50	70.61	-9.99
20	66.14	70.22	-10.48
21	65.77	69.84	-10.96
22	65.04	69.06	-11.95
23	64.31	68.29	-12.94
24	63.58	67.51	-13.93
25	62.85	66.74	-14.92
26	62.12	65.96	-15.91
27	61.49	65.28	-16.78
28	60.85	64.61	-17.64
29	60.21	63.93	-18.50
30	59.57	63.25	-19.37

Single-line diagram

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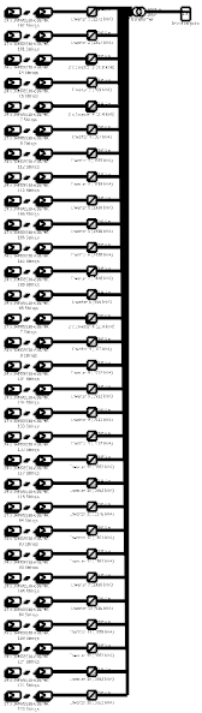


PV module	JAM78S30-610/MR
Inverter 1	SUNWAY STATION TG1800&900-1500V-TE 600 (2372kW)
Inverter 10	Sunway TG 1800 1500V TE - 600
Inverter 11	Sunway TG 1800 1500V TE - 600 (1376W)
Inverter 12	Sunway TG 1800 1500V TE - 600 (1361W)
Inverter 13	Sunway TG 900 1500V TE - 600 EV
Inverter 14	Sunway TG 1800 1500V TE - 600 (1595)
Inverter 2	SUNWAY STATION TG1800&900-1500V-TE 600 (2357kW)
Inverter 3	SG250HX (limit 209 kVA)
Inverter 4	SG125HX (limit 107 kVA)
Inverter 5	Sunway TG 1800 1500V TE - 600 (1639W)
Inverter 6	SUNWAY STATION TG1800&900-1500V-TE 600 (2430kW)
Inverter 7	SUNWAY STATION TG1800&900-1500V-TE 600 (2416kW)
Inverter 8	Sunway TG 900 1500V TE - 600 (956kW)
Inverter 9	Sunway TG 1800 1500V TE - 690
String	24 x JAM78S30-610/MR

Ficurinia lotto #3254	ARATO SRL (Italy)
VC0 : New simulation variant	10/10/23

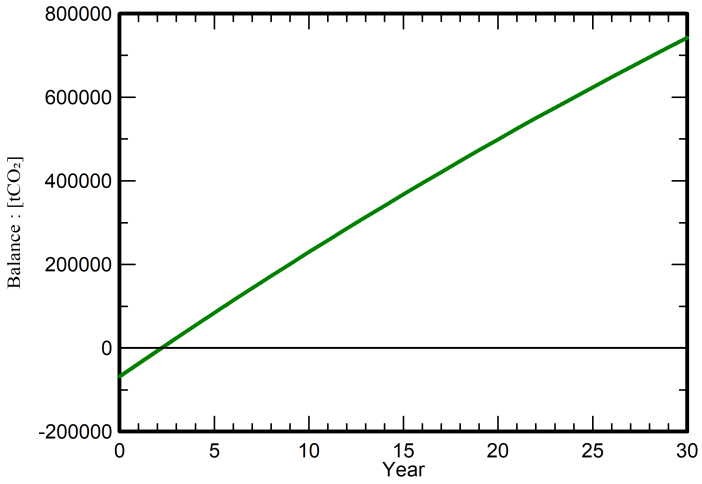
CO_2 Emission Balance

Total: 742878.3 tCO_2

Generated emissions
Total: 68551.75 tCO_2
Source: Detailed calculation from table below

Replaced Emissions
Total: 935187.8 tCO_2
System production: 73694.86 MWh/yr
Grid Lifecycle Emissions: 423 gCO_2/kWh
Source: IEA List
Country: Italy
Lifetime: 30 years
Annual degradation: 1.0 %

Saved CO_2 Emission vs. Time



System Lifecycle Emissions Details

Item	LCE	Quantity	Subtotal
			[$kgCO_2$]
Modules	915 kgCO2/modules	74904 modules	68537160
Supports	2.36 kgCO2/units	3307 units	7805
Inverters	206 kgCO2/units	33.0 units	6788