PROVINCIA DI SASSARI

COMUNE DI PLOAGHE

REGIONE SARDEGNA

PROGETTO PER LA REALIZZAZIONE DI UN IMPIANTO AGRIVOLTAICO DA REALIZZARSI NEL COMUNE DI PLOAGHE (SS) CON POTENZA MASSIMA DI PICCO 32,78 MWp E POTENZA MASSIMA DI IMMISSIONE 30,67 MW

ELABORATI PROGETTUALI

CODICE ELABORATO	TITOLO ELABORATO
AF.R15	**CALCOLO DI PRODUCIBILITÀ IMPIANTO**

COMMITTENTE

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ORDINE PROVINCIALE INGEGNERI - CATANZARO - Dott. Ing. Mattia SICILIA N. 2886

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ENTI

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Version 7.4.3

PVsyst - Simulation report

Grid-Connected System

Project: INE Ploaghe 1

Variant: INE Ploaghe 1

Sheds on ground

System power: 32.78 MWp

INE Ploaghe 1 - Italia

Author

Ness SpA SB (italy)

PVsyst V7.4.3
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with v7.4.2

Project summary

Geographical Site
INE Ploaghe 1
Italia

Situation

Latitude	40.67 °N
Longitude	8.78 °E
Altitude	384 m
Time zone	UTC+1

Project settings
Albedo 0.30

Meteo data
INE Ploaghe 1
PVGIS api TMY

System summary

Grid-Connected System

Sheds on ground

PV Field Orientation
Fixed plane
Tilt/Azimuth 15 / 0 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	48924 units
Pnom total	32.78 MWp

Inverters

Nb. of units	11 units
Pnom total	30.67 MWac
Pnom ratio	1.069

Results summary

Produced Energy	58889610 kWh/year	Specific production	1797 kWh/kWp/year	Perf. Ratio PR	97.78 %

Table of contents

General parameters

Grid-Connected System

Sheds on ground

PV Field Orientation

Orientation		Sheds configuration		Models used	
Fixed plane		Nb. of sheds	81 units	Transposition	Perez
Tilt/Azimuth	15 / 0 °	**Sizes**		Diffuse	Imported
		Sheds spacing	7.45 m	Circumsolar	separate
		Collector width	1.30 m		
		Ground Cov. Ratio (GCR)	17.5 %		
		Top inactive band	0.02 m		
		Bottom inactive band	0.02 m		
		Shading limit angle			
		Limit profile angle	3.2 °		

Horizon
Average Height 2.8 °

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

Bifacial system
Model 2D Calculation
unlimited sheds

Bifacial model geometry		Bifacial model definitions	
Sheds spacing	7.45 m	Ground albedo	0.30
Sheds width	1.34 m	Bifaciality factor	80 %
Limit profile angle	3.2 °	Rear shading factor	5.0 %
GCR	18.0 %	Rear mismatch loss	10.0 %
Height above ground	1.50 m	Shed transparent fraction	0.0 %

PV Array Characteristics

PV module

Manufacturer	CSI Solar
Model	CS7N-670TB-AG 1500V
(Original PVsyst database)	
Unit Nom. Power	670 Wp
Number of PV modules	42930 units
Nominal (STC)	28.76 MWp

Inverter

Manufacturer	SMA
Model	Sunny Central 2660 UP
(Original PVsyst database)	
Unit Nom. Power	2667 kWac
Number of inverters	10 units
Total power	26670 kWac

Array #1 - CAMPO SUD

Number of PV modules	29511 units	Number of inverters	7 units
Nominal (STC)	19.77 MWp	Total power	18669 kWac
Modules	1093 string x 27 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	18.29 MWp	Pnom ratio (DC:AC)	1.06
U mpp	966 V		
I mpp	18932 A		

Array #3 - CAMPO OVEST

Number of PV modules	13419 units	Number of inverters	3 units
Nominal (STC)	8991 kWp	Total power	8001 kWac
Modules	497 string x 27 In series		
At operating cond. (50°C)		Operating voltage	880-1325 V
Pmpp	8316 kWp	Pnom ratio (DC:AC)	1.12
U mpp	966 V		
I mpp	8608 A		

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PV Array Characteristics

Array #2 - CAMPO NORD

PV module

Manufacturer	CSI Solar
Model	CS7N-670TB-AG 1500V
(Original PVsyst database)	
Unit Nom. Power	670 Wp
Number of PV modules	5994 units
Nominal (STC)	4016 kWp
Modules	222 string x 27 In series
At operating cond. (50°C)	
Pmpp	3714 kWp
U mpp	966 V
I mpp	3845 A

Inverter

Manufacturer	SMA
Model	Sunny Central 4000 UP
(Original PVsyst database)	
Unit Nom. Power	4000 kWac
Number of inverters	1 unit
Total power	4000 kWac
Operating voltage	880-1325 V
Pnom ratio (DC:AC)	1.00

Total PV power

Nominal (STC)	32779 kWp
Total	48924 modules
Module area	151975 m²

Total inverter power

Total power	30670 kWac
Number of inverters	11 units
Pnom ratio	1.07

Array losses

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

Module Quality Loss
Loss Fraction -0.4 %

Module mismatch losses
Loss Fraction 2.0 % at MPP

Strings Mismatch loss
Loss Fraction 0.2 %

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 0.50 mΩ
Loss Fraction 1.5 % at STC

Array #1 - CAMPO SUD
Global array res. 0.83 mΩ
Loss Fraction 1.5 % at STC

Array #2 - CAMPO NORD
Global array res. 4.1 mΩ
Loss Fraction 1.5 % at STC

Array #3 - CAMPO OVEST
Global array res. 1.8 mΩ
Loss Fraction 1.5 % at STC

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Horizon definition

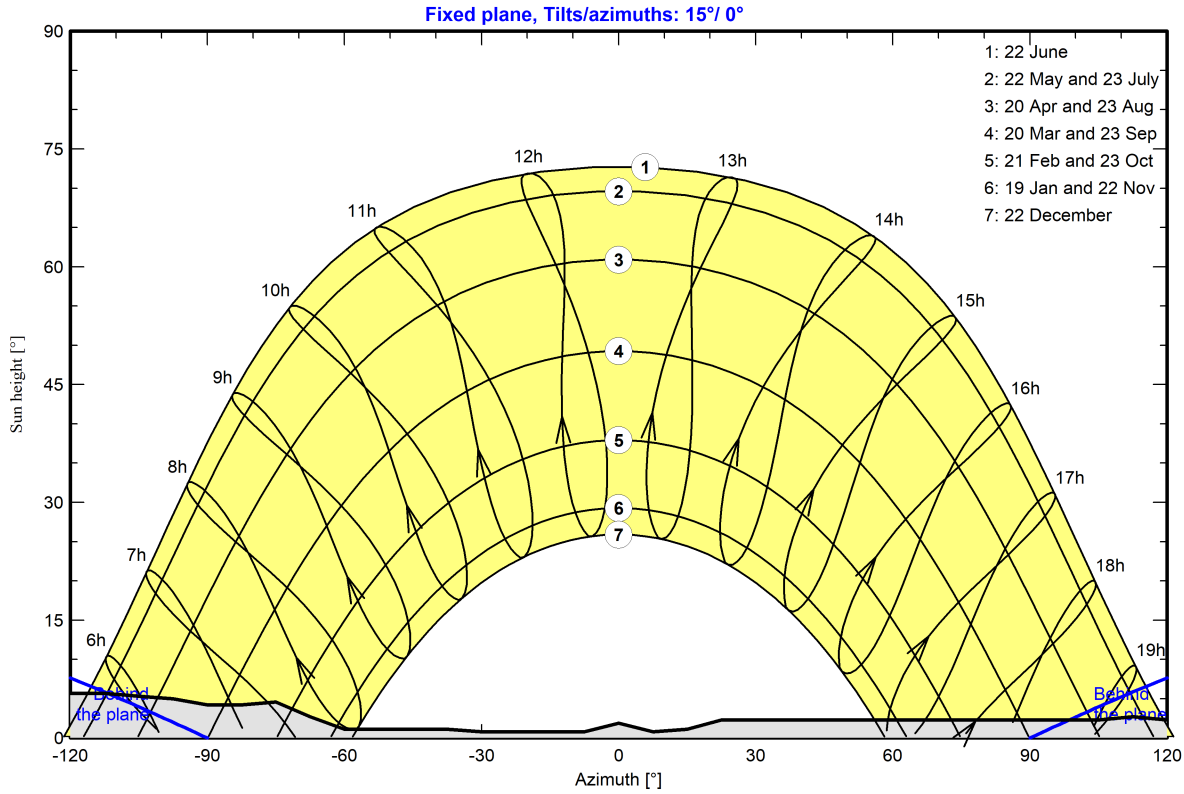
Horizon from PVGIS website API, Lat=40°39'55", Long=8°46'42", Alt=384m

Average Height	2.8 °	Albedo Factor	0.93
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

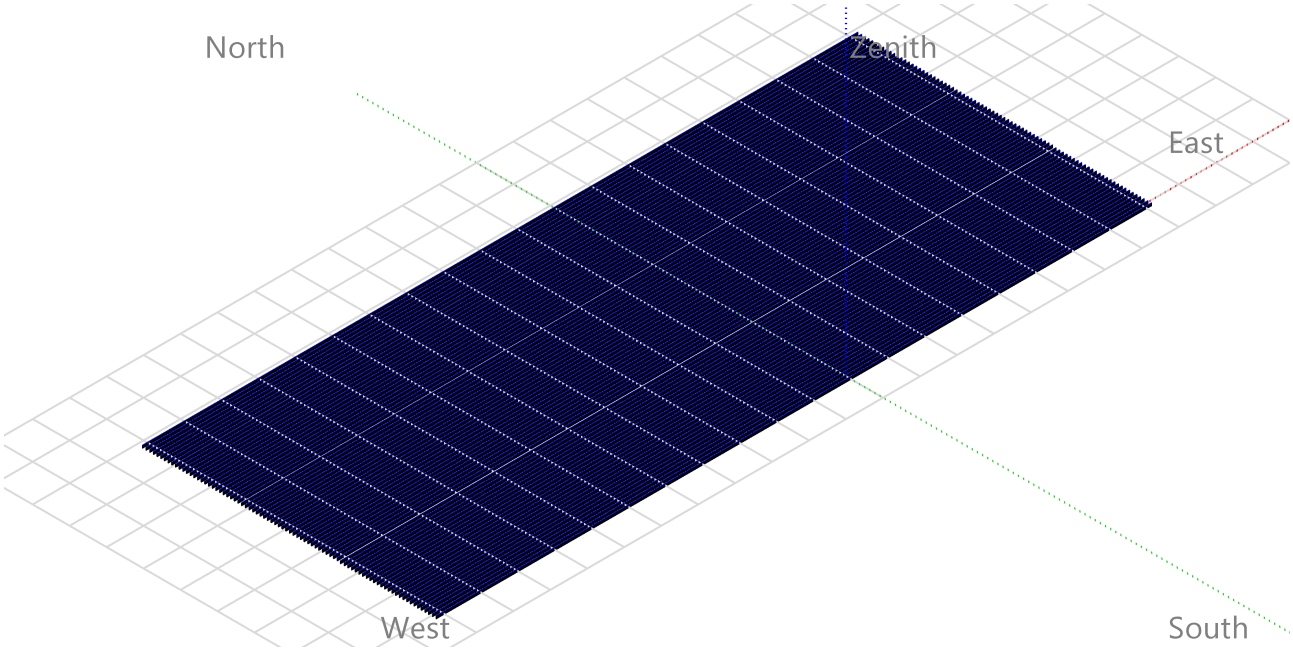
Azimuth [°]	-180	-173	-165	-158	-150	-143	-135	-128	-120	-113	-105	-98
Height [°]	1.5	3.1	3.8	4.2	4.6	4.6	5.0	5.3	5.7	5.7	5.3	5.0
Azimuth [°]	-90	-83	-75	-68	-60	-38	-30	-8	0	8	15	23
Height [°]	4.2	4.2	4.6	2.7	1.1	1.1	0.8	0.8	1.9	0.8	1.1	2.3
Azimuth [°]	105	113	120	128	135	143	150	165	173	180		
Height [°]	2.3	2.7	2.3	2.7	3.8	3.4	3.1	3.1	2.3	1.5		

Sun Paths (Height / Azimuth diagram)



Near shadings parameter

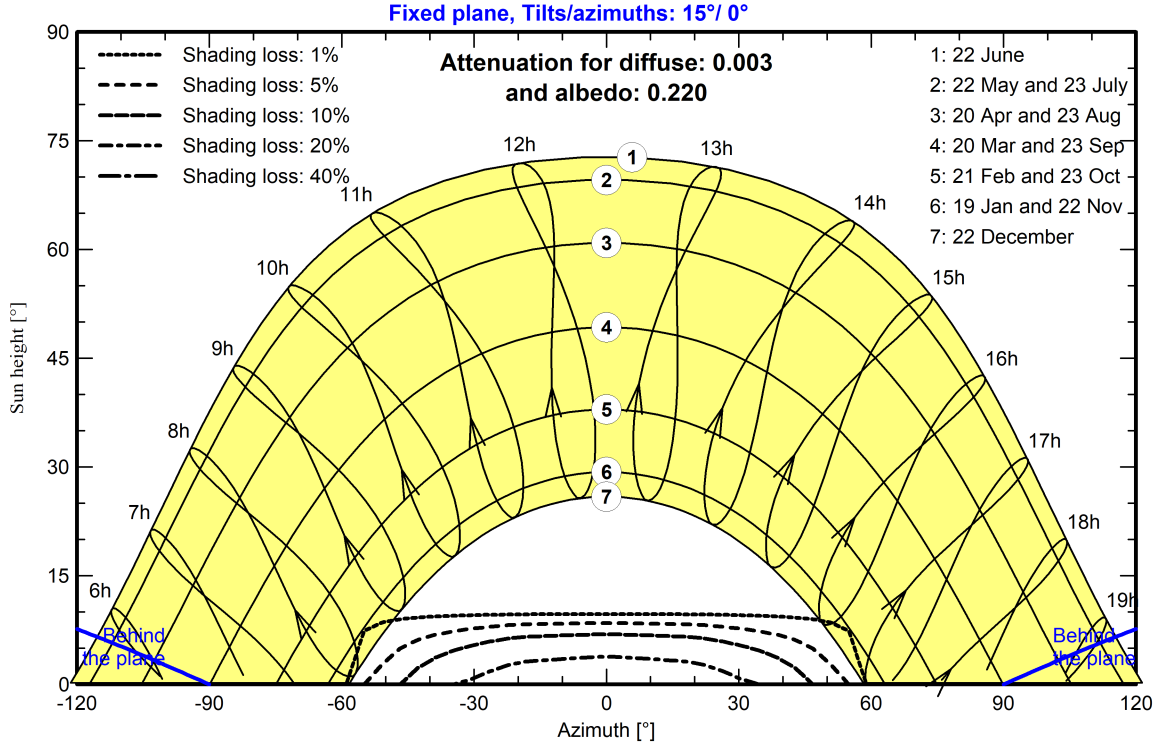
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 15° / 0°

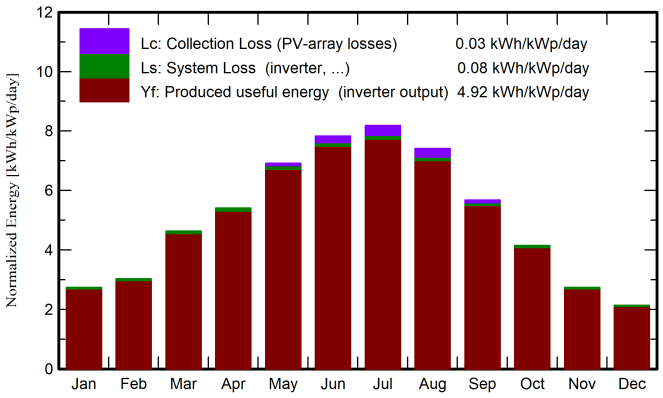


Main results

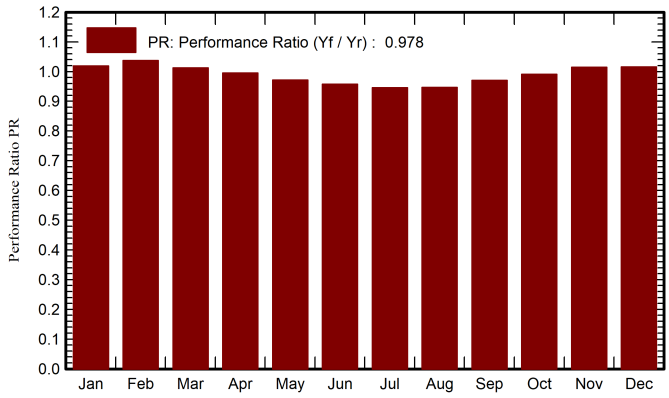
System Production

Produced Energy	58889610 kWh/year	Specific production	1797 kWh/kWp/year
		Perf. Ratio PR	97.78 %

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 kWh	E_Grid kWh	PR ratio
January	60.2	25.83	7.42	81.9	78.8	2780470	2735161	1.019
February	67.5	41.49	6.34	80.5	77.5	2780307	2735350	1.037
March	121.2	56.00	9.16	139.6	135.6	4707852	4631829	1.012
April	149.9	71.76	12.31	160.3	155.8	5314685	5229192	0.995
May	208.3	75.28	16.57	214.5	209.5	6946370	6834337	0.972
June	233.5	63.96	20.60	234.9	229.8	7489411	7369171	0.957
July	249.0	61.23	23.06	253.8	248.5	7992986	7865070	0.946
August	215.2	54.67	22.70	229.8	224.7	7247596	7131934	0.947
September	149.9	54.71	19.66	170.3	166.0	5503795	5416864	0.970
October	105.2	43.60	16.38	127.8	123.8	4217266	4150661	0.990
November	61.9	31.46	10.67	79.8	76.8	2696471	2653340	1.014
December	47.9	27.07	6.87	64.2	61.0	2172769	2136701	1.015
Year	1669.8	607.07	14.36	1837.3	1787.8	59849977	58889610	0.978

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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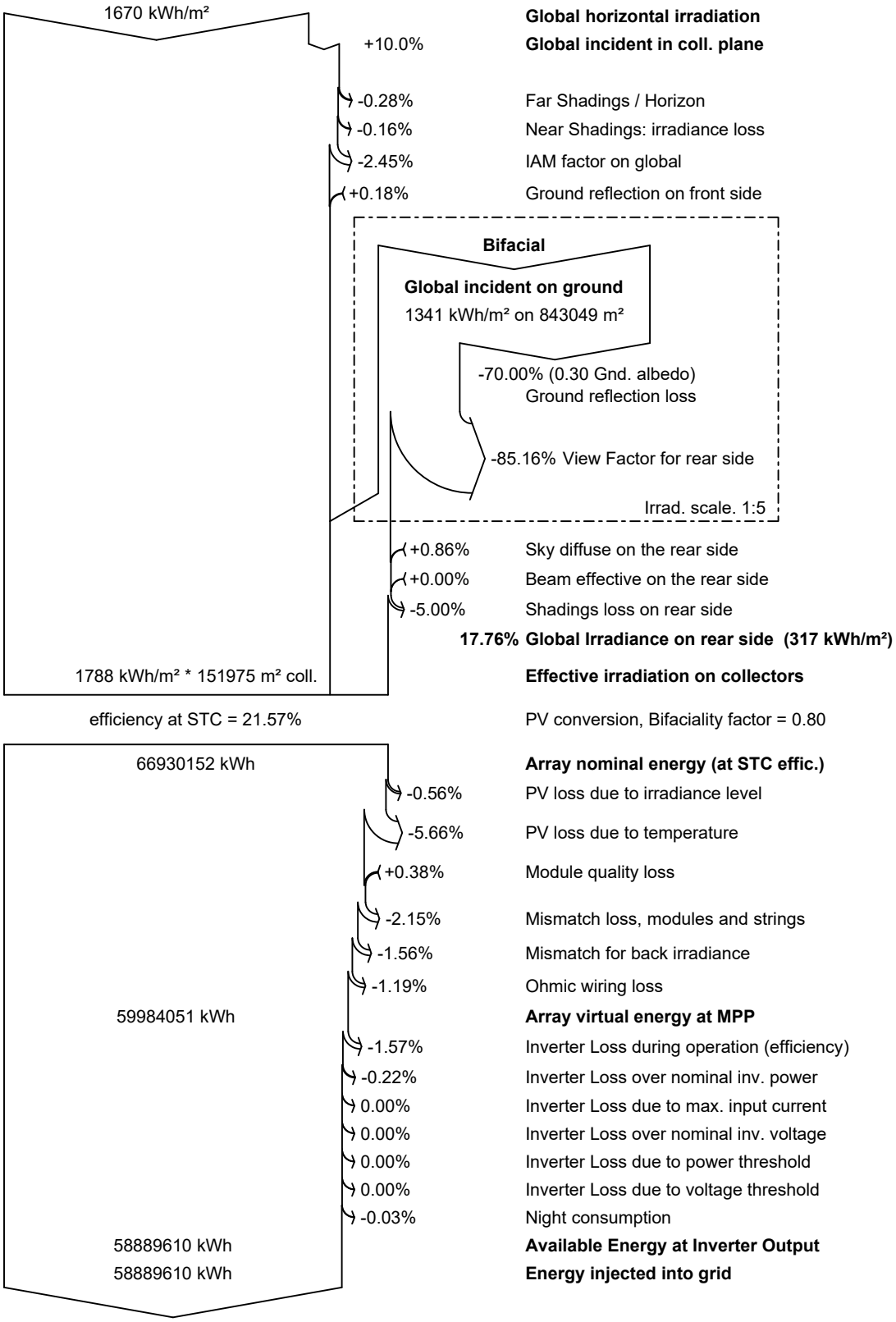
Loss diagram



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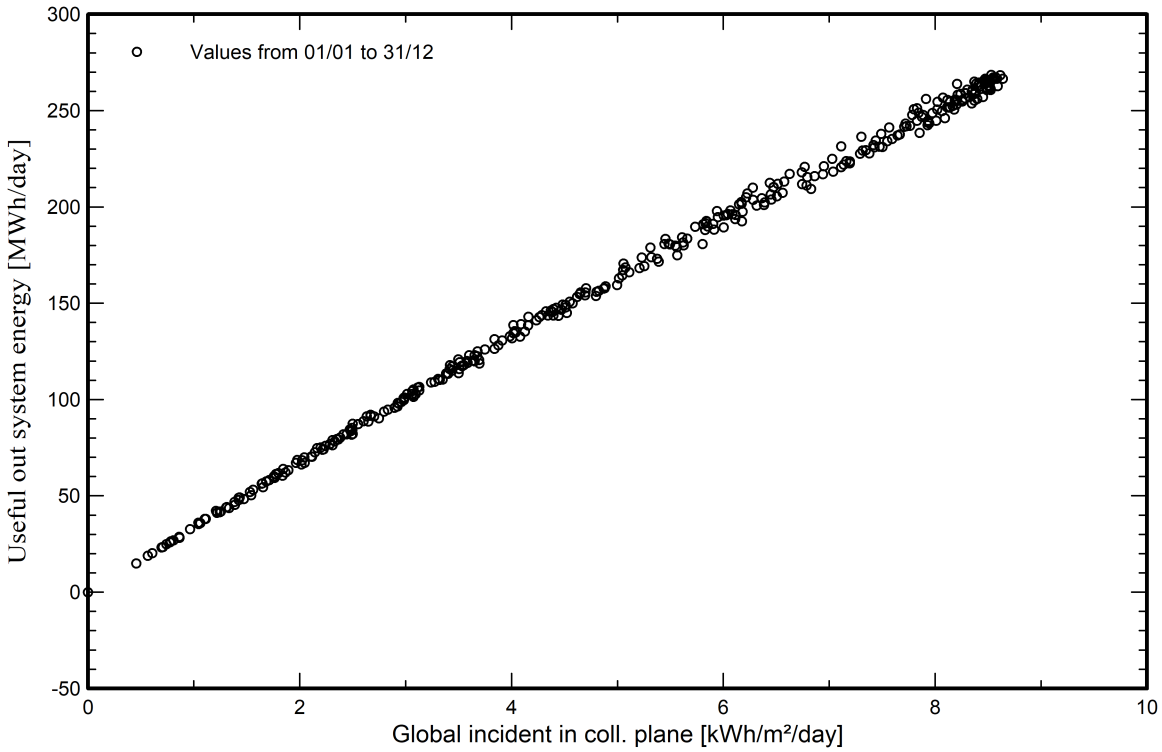
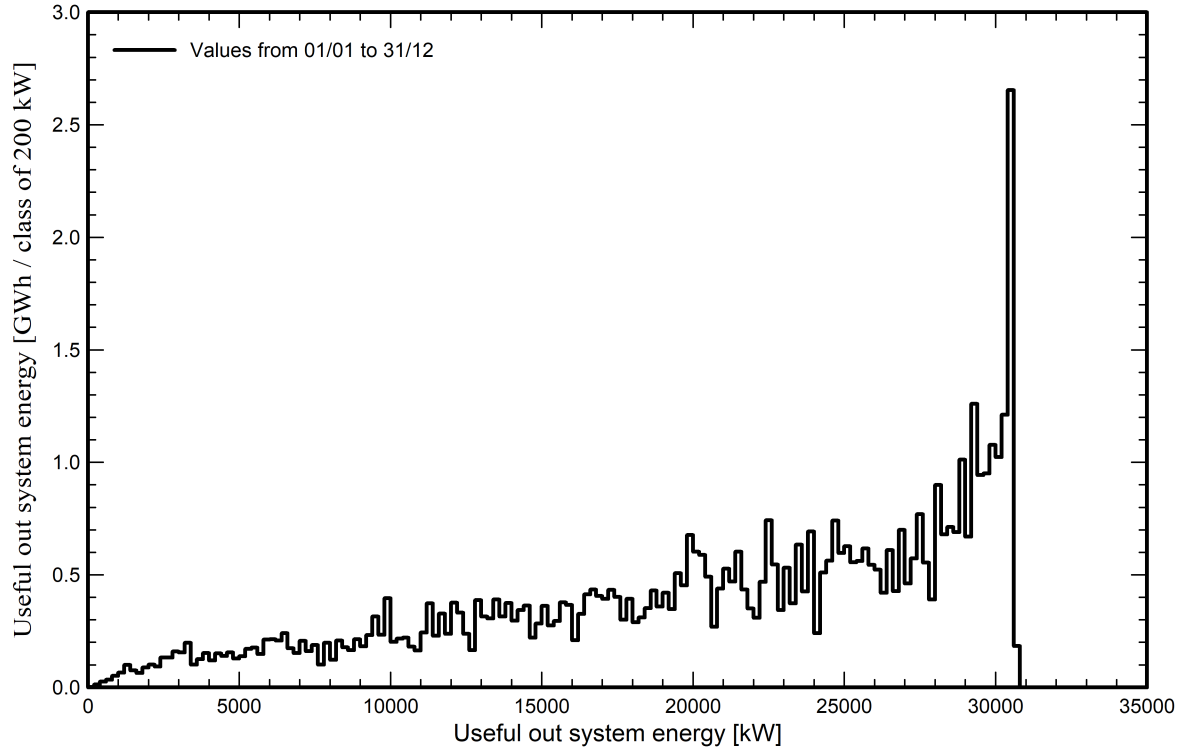
Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema



Single-line diagram

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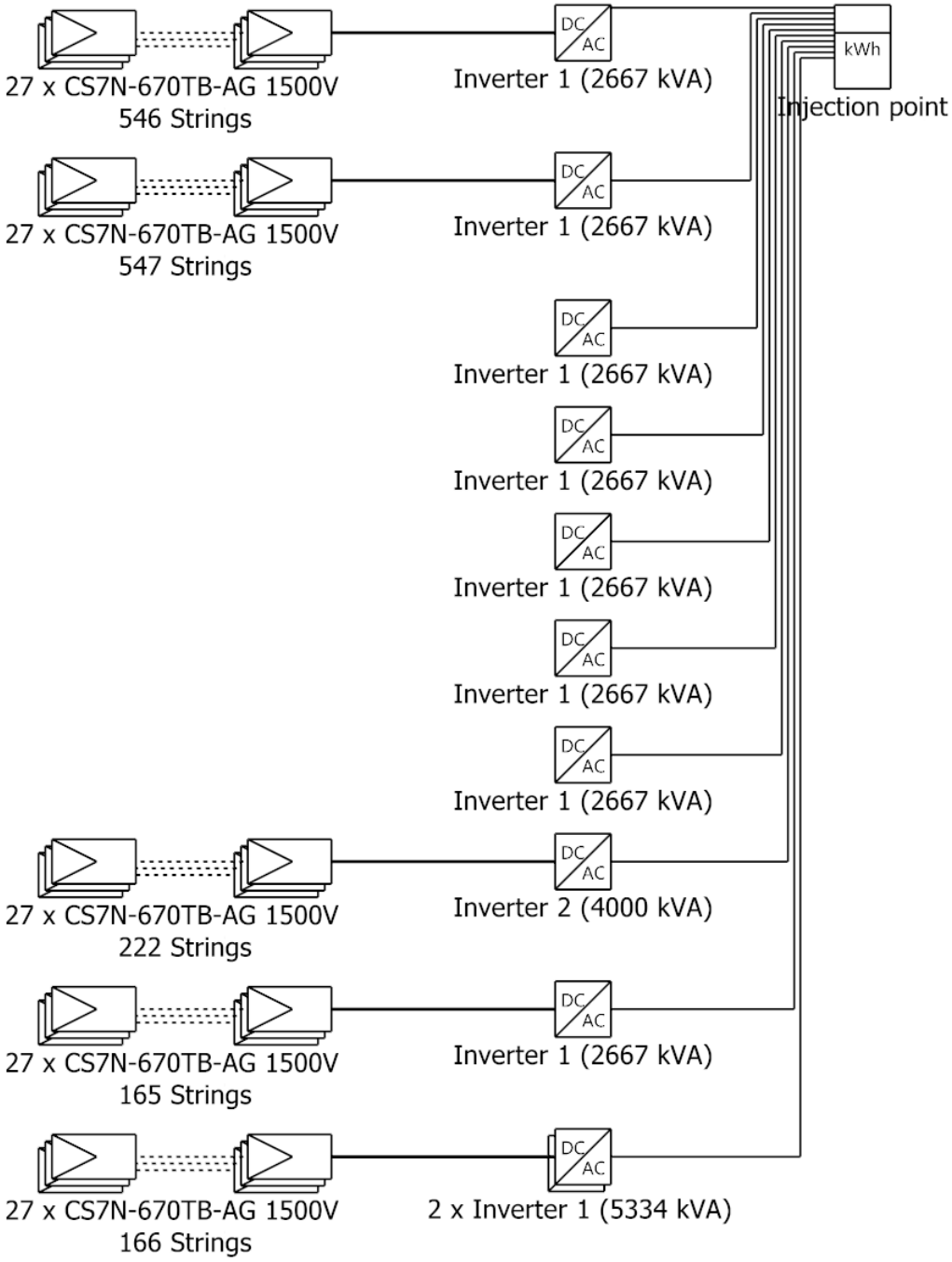

PV module	CS7N-670TB-AG 1500V
Inverter 1	Sunny Central 2660 UP
Inverter 2	Sunny Central 4000 UP
String	27 x CS7N-670TB-AG 1500V

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	VC0 : INE Ploaghe 1	10/11/23