

00	13/05/2024	ELABORATO GRAFICO	ING. G. VICINO	ING. G. VICINO	ING. G. VICINO
REVISIONE	DATA	DESCRIZIONE	PREPARATO	CONTROLLATO	VALIDATO

CODICE IDENTIFICATIVO ELABORATO

07_PD_07

SOCIETÀ PROPONENTE



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TIMBRO E FIRMA

TITOLO INIZIATIVA

PROGETTO DEFINITIVO DI UN PROGETTO AGRIVOLTAICO DENOMINATO "RAMACCA IUDICA" CON POTENZA INSTALLATA PARI A 40.22592 MWp E POTENZA IN IMMISSIONE PARI A 40 MW CON 20 MW DI ACCUMULO SITO TRA LE CONTRADE ALBOSPINO,VAITA E VAITELLO, COMUNE DI RAMACCA (CT)

SOCIETÀ PROGETTAZIONE



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TIMBRO E FIRMA TECNICO ABILITATO

FORMATO

A4

SCALA

FOGLIO

TITOLO DOCUMENTO

RELAZIONE DI PRODUCIBILITA'

LIVELLO DI PROGETTAZIONE

PROGETTO DEFINITIVO

PVsyst - Simulation report

Grid-Connected System

Project: Ramacca 40 MW

Variant: Variante di simulazione_Fixed

Ground system (tables) on a hill

System power: 37.36 MWp

Raddusa - Italy



Project: Ramacca 40 MW
Variant: Variante di simulazione_Fixed

PVsyst V7.4.0

VCO, Simulation date:
14/05/24 11:20
with v7.4.0

Project summary

Geographical Site		Situation		Project settings	
Raddusa		Latitude	37.46 °N	Albedo	0.20
Italy		Longitude	14.59 °E		
		Altitude	206 m		
		Time zone	UTC+1		
Meteo data					
Raddusa					
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		According to strings		Unlimited load (grid)	
Tilt/Azimuth	25.5 / 2.6 °	Electrical effect	100 %		
System information					
PV Array					
Nb. of modules		51184 units	Inverters	Nb. of units	126 units
Pnom total		37.36 MWp		Pnom total	44.10 MWac
				Pnom ratio	0.847

Results summary

Produced Energy	66116057 kWh/year	Specific production	1769 kWh/kWp/year	Perf. Ratio PR	84.54 %
Apparent energy	73992393 kVAh/year				

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General parameters

Grid-Connected System		Ground system (tables) on a hill	
PV Field Orientation		Sheds configuration	
Orientation		Nb. of sheds	1002 units
Fixed plane		Sizes	
Tilt/Azimuth	25.5 / 2.6 °	Sheds spacing	11.1 m
		Collector width	4.79 m
		Ground Cov. Ratio (GCR)	43.1 %
		Shading limit angle	
		Limit profile angle	16.9 °
Horizon		Near Shadings	
Average Height	3.6 °	According to strings	
		Electrical effect	100 %
Bifacial system			
Model	2D Calculation		
	unlimited sheds		
Bifacial model geometry		Bifacial model definitions	
Sheds spacing	11.11 m	Ground albedo	0.25
Sheds width	4.79 m	Bifaciality factor	70 %
Limit profile angle	16.9 °	Rear shading factor	5.0 %
GCR	43.1 %	Rear mismatch loss	5.0 %
Height above ground	1.50 m	Shed transparent fraction	5.0 %
Grid injection point			
Power factor			
Cos(phi) (lagging)	0.900		

PV Array Characteristics

PV module		Inverter	
Manufacturer	HUASUN	Manufacturer	Sungrow
Model	HUASUN	Model	SG350-HX
(Custom parameters definition)		(Original PVsyst database)	
Unit Nom. Power	730 Wp	Unit Nom. Power	350 kWac
Number of PV modules	51184 units	Number of inverters	126 units
Nominal (STC)	37.36 MWp	Total power	44100 kWac
Modules	1828 Strings x 28 In series	Operating voltage	500-1450 V
At operating cond. (50°C)		Pnom ratio (DC:AC)	0.85
Pmpp	34.61 MWp	Power sharing within this inverter	
U mpp	1116 V		
I mpp	31006 A		
Total PV power		Total inverter power	
Nominal (STC)	37364 kWp	Total power	44100 kWac
Total	51184 modules	Number of inverters	126 units
Module area	158996 m²	Pnom ratio	0.85
		PNom limit forced to active power	



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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

DC wiring losses

Global array res. 0.59 mΩ
Loss Fraction 1.5 % at STC

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 -0.4 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.2 %

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): 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

System losses

Auxiliaries loss

Proportionnal to Power 3.0 W/kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 1.86 % at STC

Inverter: SG350-HX

Wire section (126 Inv.) Alu 126 x 3 x 240 mm²
Average wires length 250 m

MV line up to Injection

MV Voltage 36 kV
Average each inverter
Wires Alu 3 x 70 mm²
Length 15000 m
Loss Fraction 1.40 % at STC

AC losses in transformers

MV transfo

Medium voltage 36 kV

One transfo parameters

Nominal power at STC 2.18 MVA
Iron Loss (24/24 Connexion) 2.18 kVA
Iron loss fraction 0.10 % at STC
Copper loss 21.80 kVA
Copper loss fraction 1.00 % at STC
Coils equivalent resistance 3 x 2.94 mΩ

Operating losses at STC (full system)

Nb. identical MV transfos 17
Nominal power at STC 37.07 MVA
Iron loss (24/24 Connexion) 37.07 kVA
Copper loss 370.65 kVA



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Horizon definition

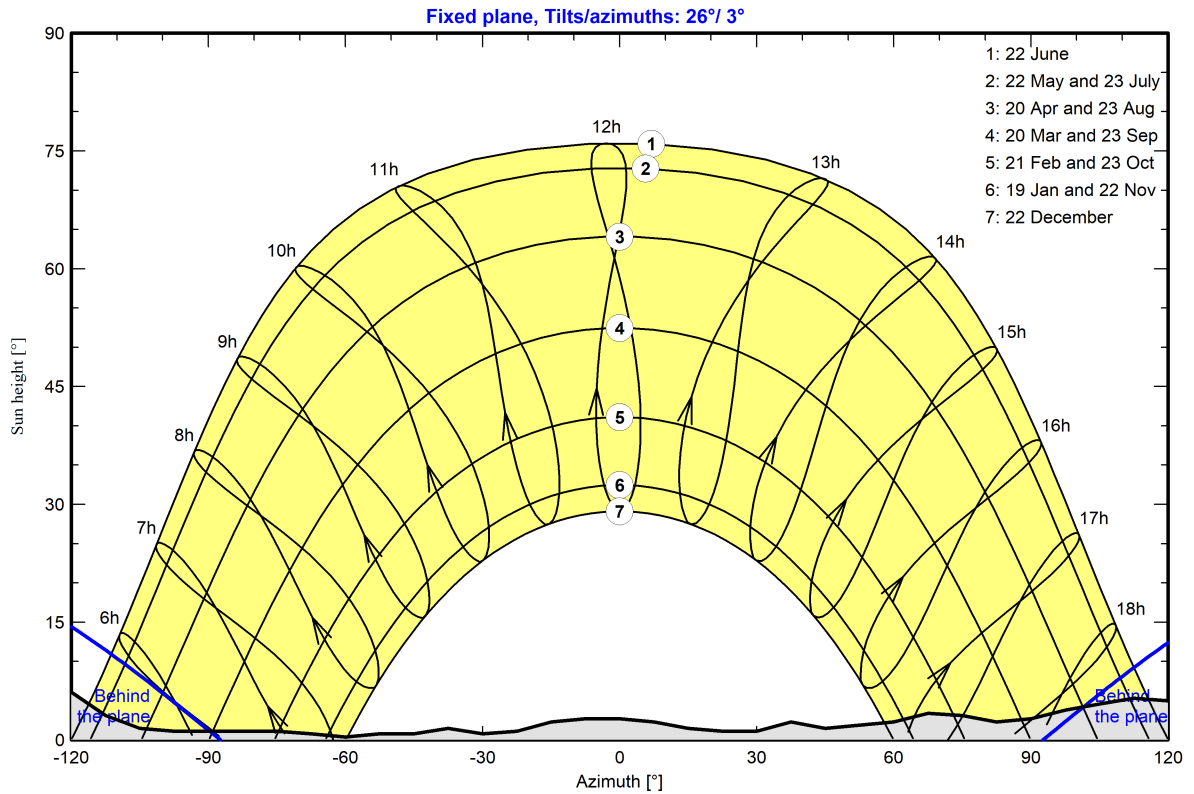
Horizon from PVGIS website API, Lat=37°27'42", Long=14°35'11", Alt=206m

Average Height 3.6 ° Albedo Factor 0.91
 Diffuse Factor 0.99 Albedo Fraction 100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-120	-113	-105	-98	-75	-68	-60	-53
Height [°]	7.3	7.6	7.6	7.3	7.3	6.1	6.1	3.1	1.5	1.1	1.1	0.8	0.4	0.8
Azimuth [°]	-45	-38	-30	-23	-15	-8	0	8	15	23	30	38	45	53
Height [°]	0.8	1.5	0.8	1.1	2.3	2.7	2.7	2.3	1.5	1.1	1.1	2.3	1.5	1.9
Azimuth [°]	60	68	75	83	90	98	105	113	120	128	135	143	180	
Height [°]	2.3	3.4	3.1	2.3	2.7	3.8	4.6	5.3	5.0	3.8	3.8	7.3	7.3	

Sun Paths (Height / Azimuth diagram)

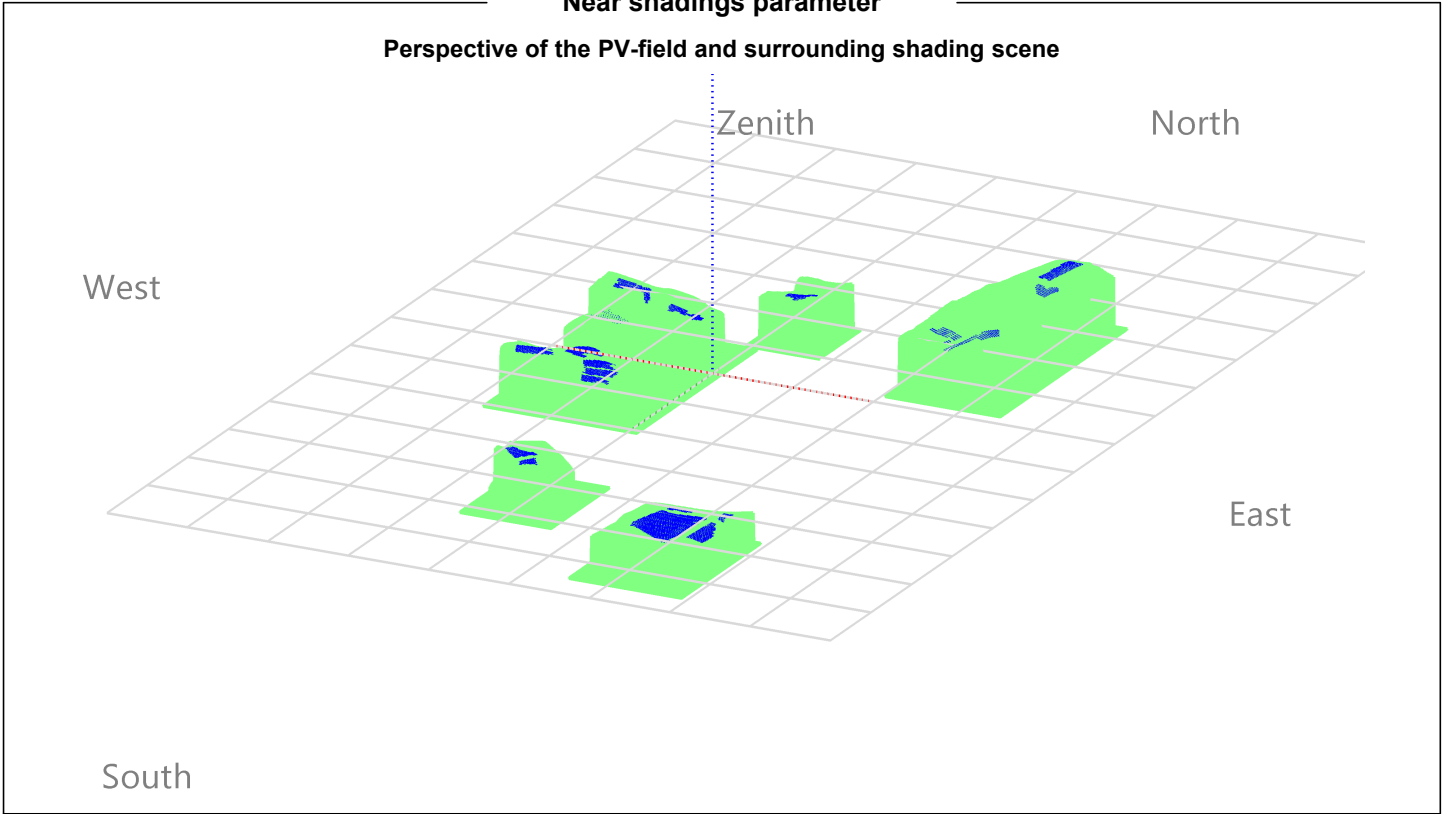




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Near shadings parameter

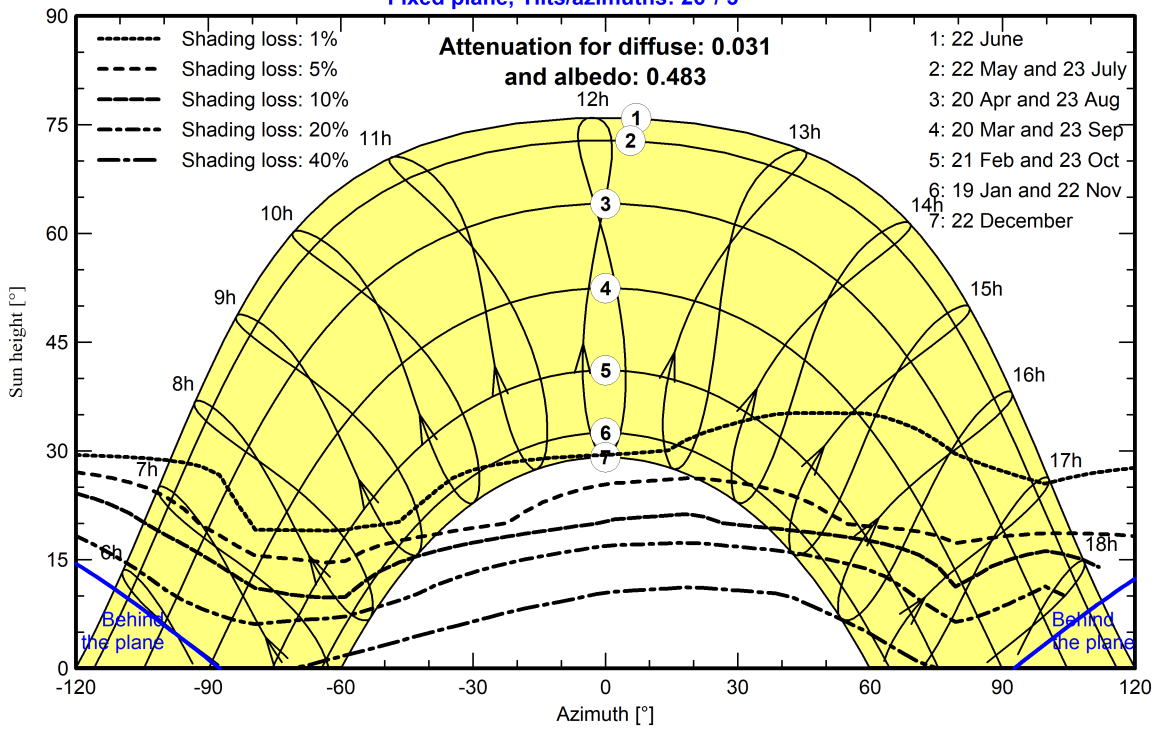
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 26°/ 3°





PVsyst V7.4.0

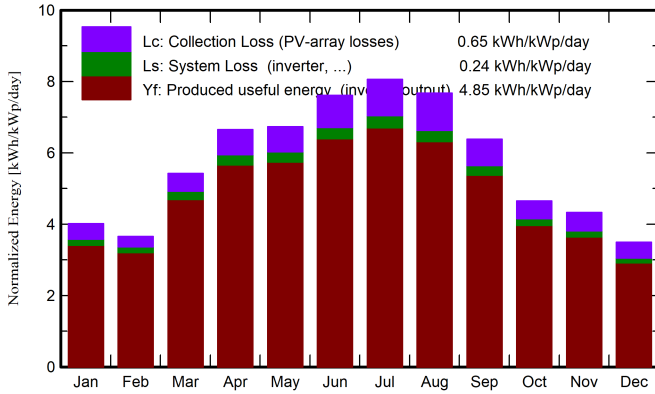
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Main results

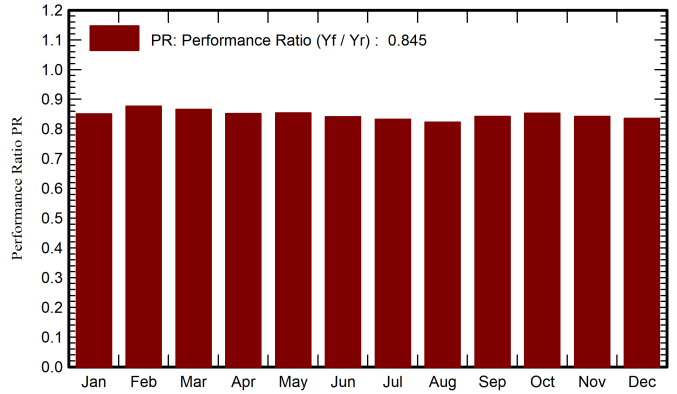
System Production

Produced Energy	66116057 kWh/year	Specific production	1769 kWh/kWp/year
Apparent energy	73992393 kVAh/year	Perf. Ratio PR	84.54 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	79.5	26.20	8.65	124.4	114.9	4148777	3955457	0.851
February	78.3	39.15	5.28	102.4	94.7	3522506	3356867	0.877
March	139.5	53.04	10.84	168.1	157.6	5713167	5442839	0.866
April	184.7	62.91	16.48	199.6	187.8	6676152	6352607	0.852
May	209.9	73.46	18.92	208.6	195.7	6984714	6655725	0.854
June	237.8	63.89	25.04	228.3	214.5	7527074	7172999	0.841
July	255.8	56.88	26.40	249.8	235.1	8158028	7771222	0.832
August	225.9	55.36	27.85	237.9	224.2	7681078	7317872	0.823
September	164.2	54.76	21.25	191.5	180.3	6325683	6025874	0.842
October	112.0	48.31	18.01	144.2	134.9	4815949	4595573	0.853
November	87.4	33.04	11.91	129.9	119.2	4281622	4086841	0.842
December	69.1	30.08	10.35	108.3	98.8	3543089	3382180	0.835
Year	1844.1	597.07	16.82	2093.1	1957.8	69377840	66116057	0.845

Legends

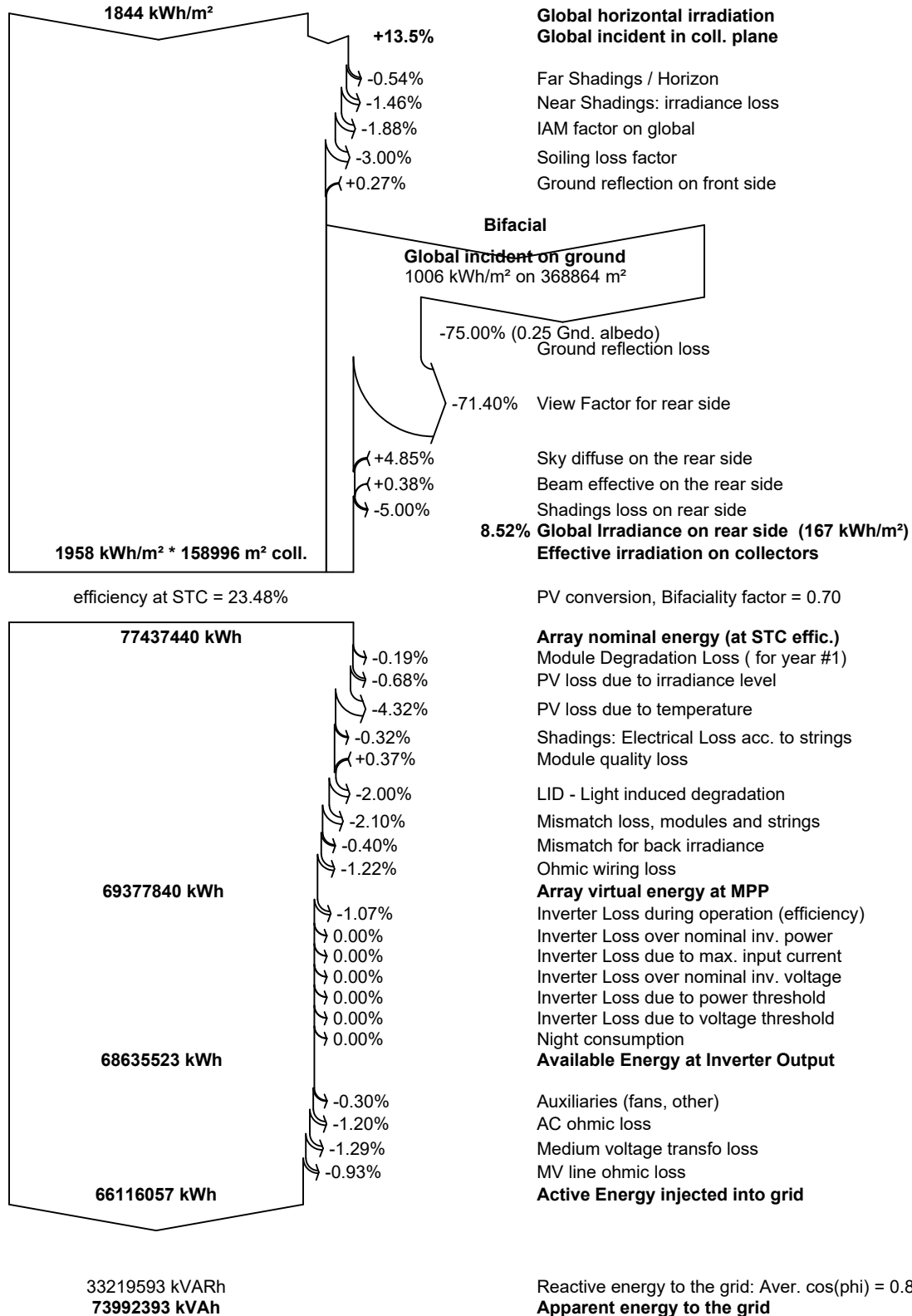
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



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Loss diagram



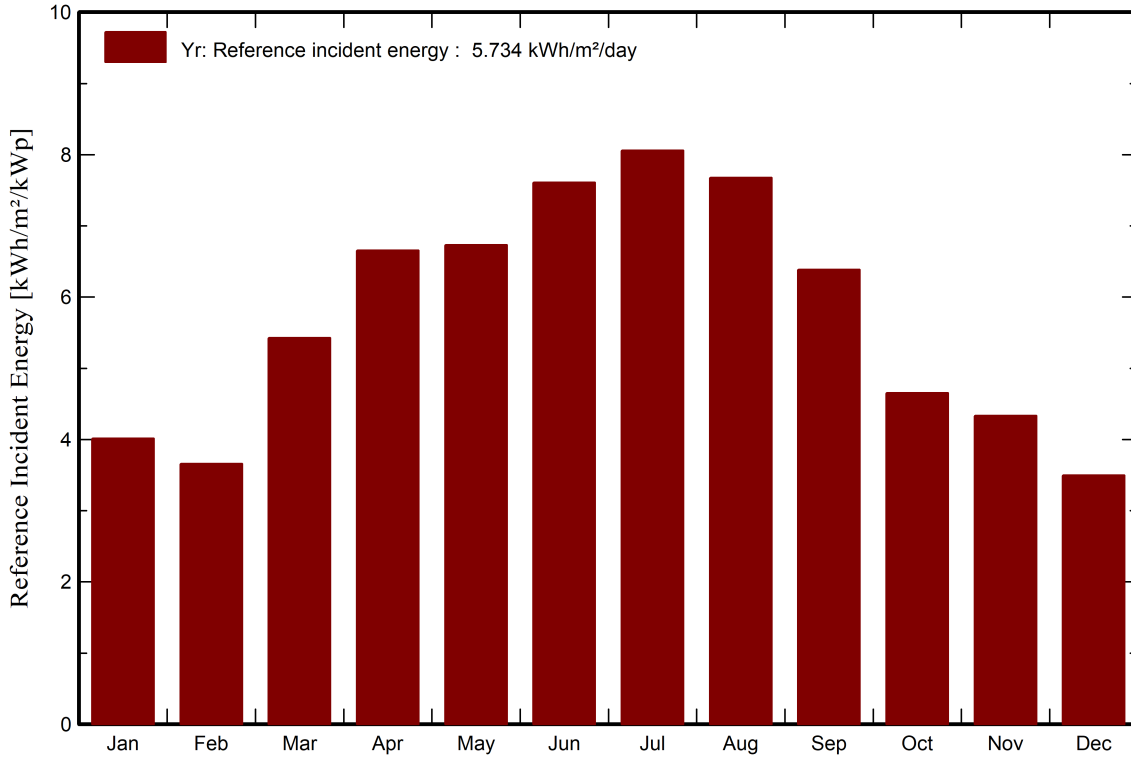


PVsyst V7.4.0

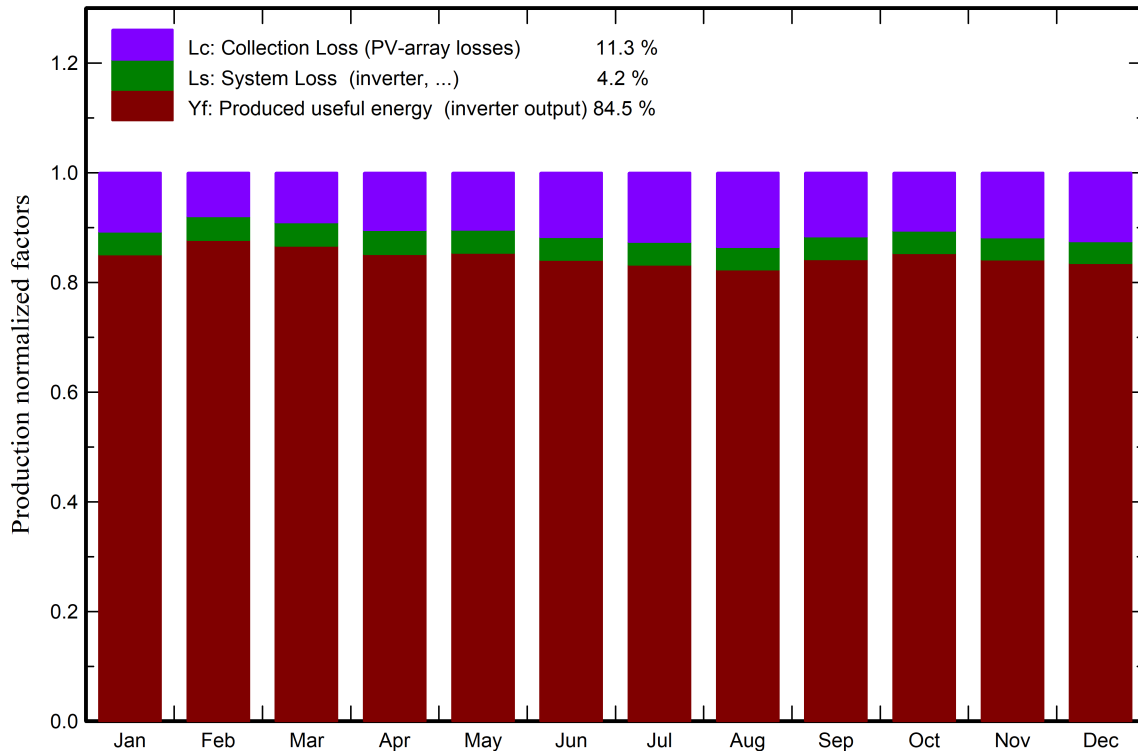
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Predef. graphs

Energia incidente di riferimento su piano collettori



Fattori normalizzati di produzione e di perdita



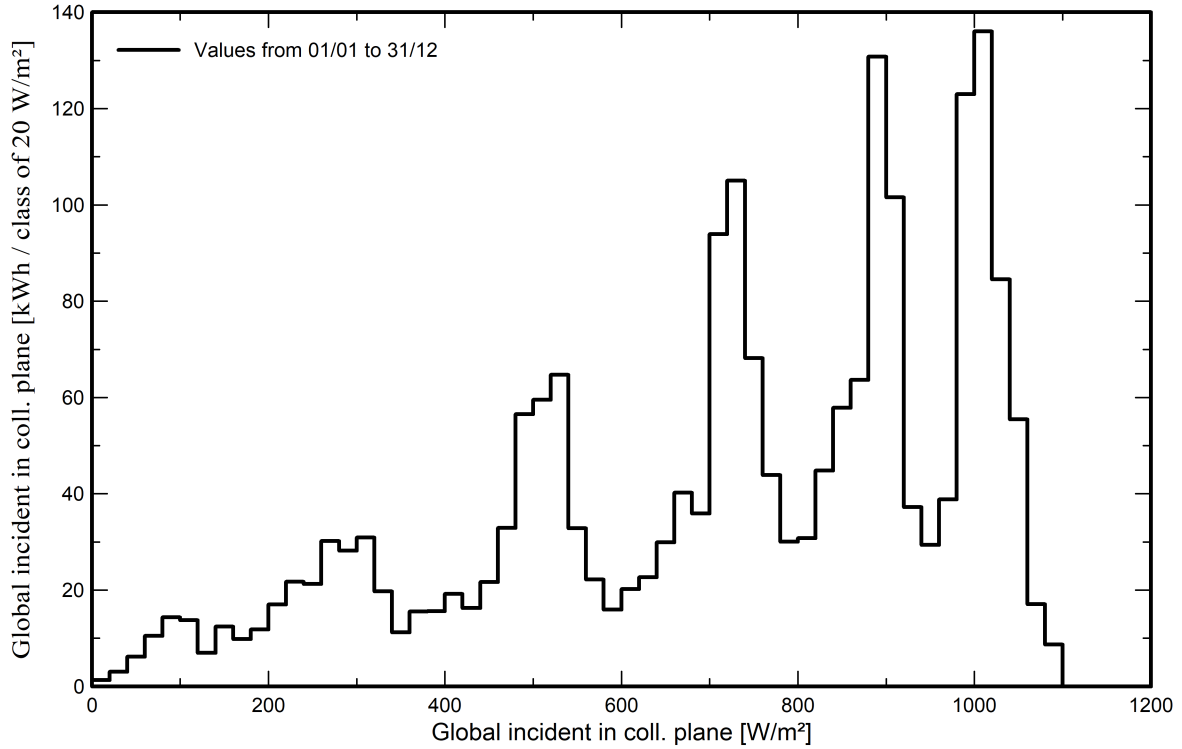


PVsyst V7.4.0

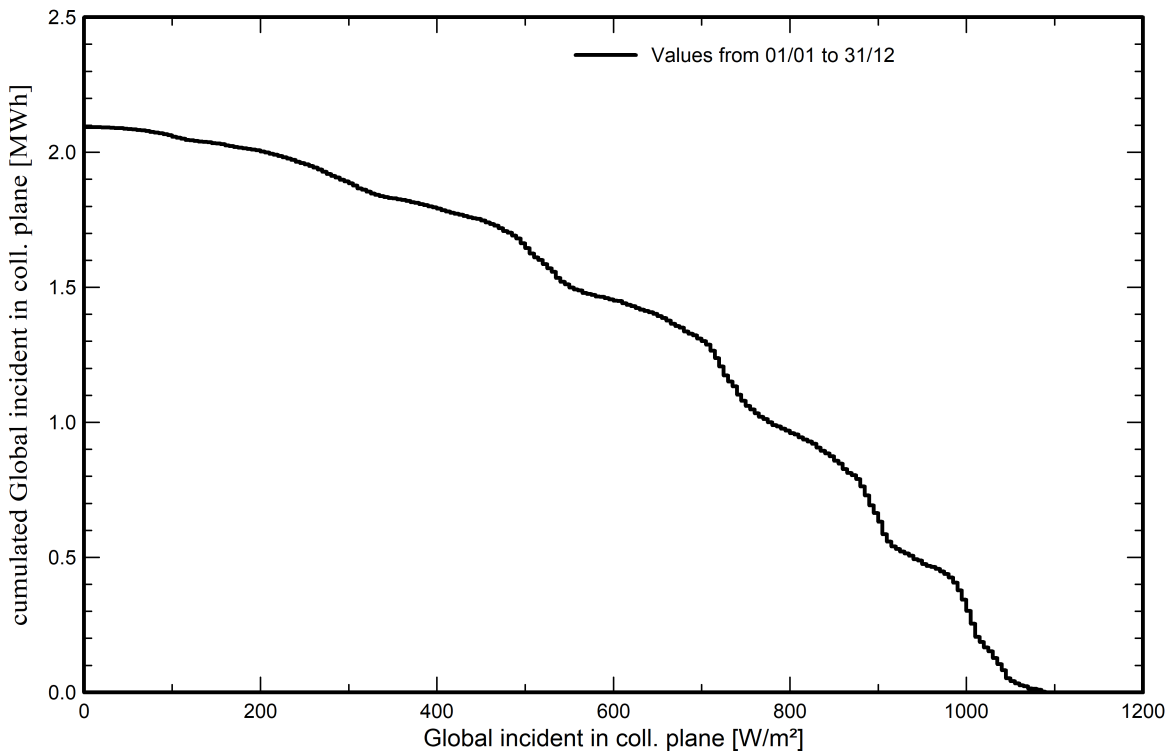
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Predef. graphs

Distribuzione irraggiamento incidente



Coda della distribuzione di irradiazione incidente





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Predef. graphs

Temperatura del campo vs. irradiazione efficace

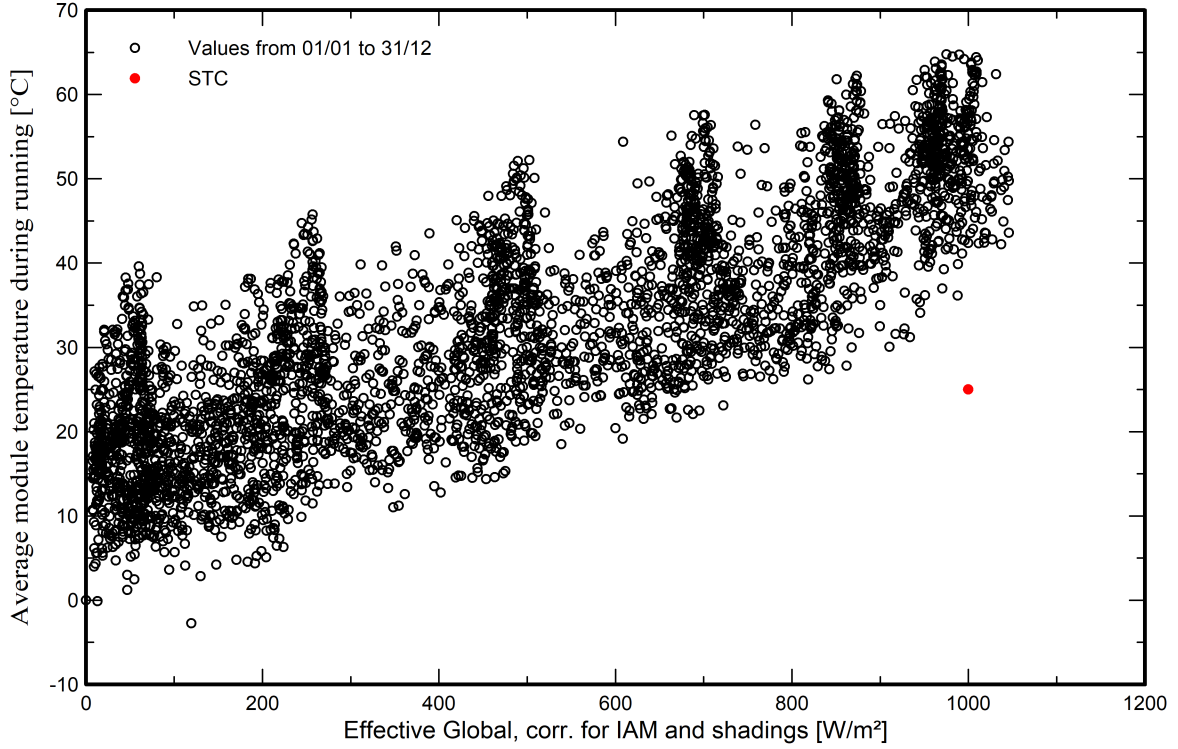
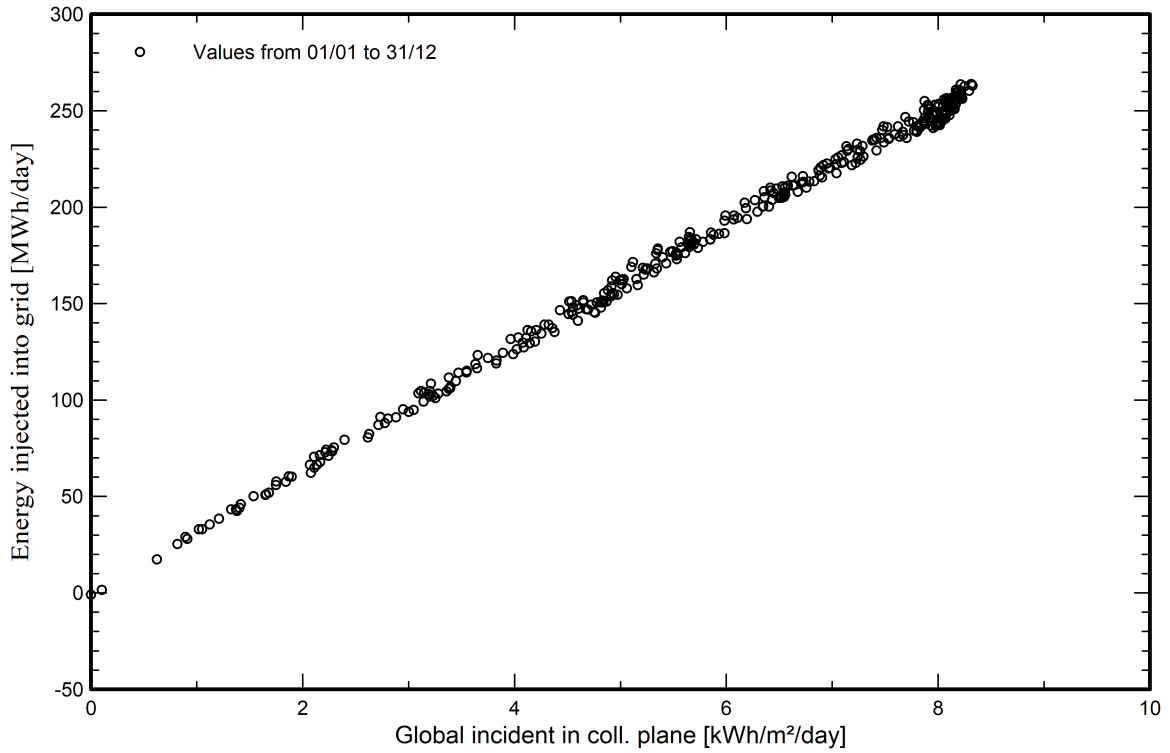


Diagramma giornaliero entrata/uscita



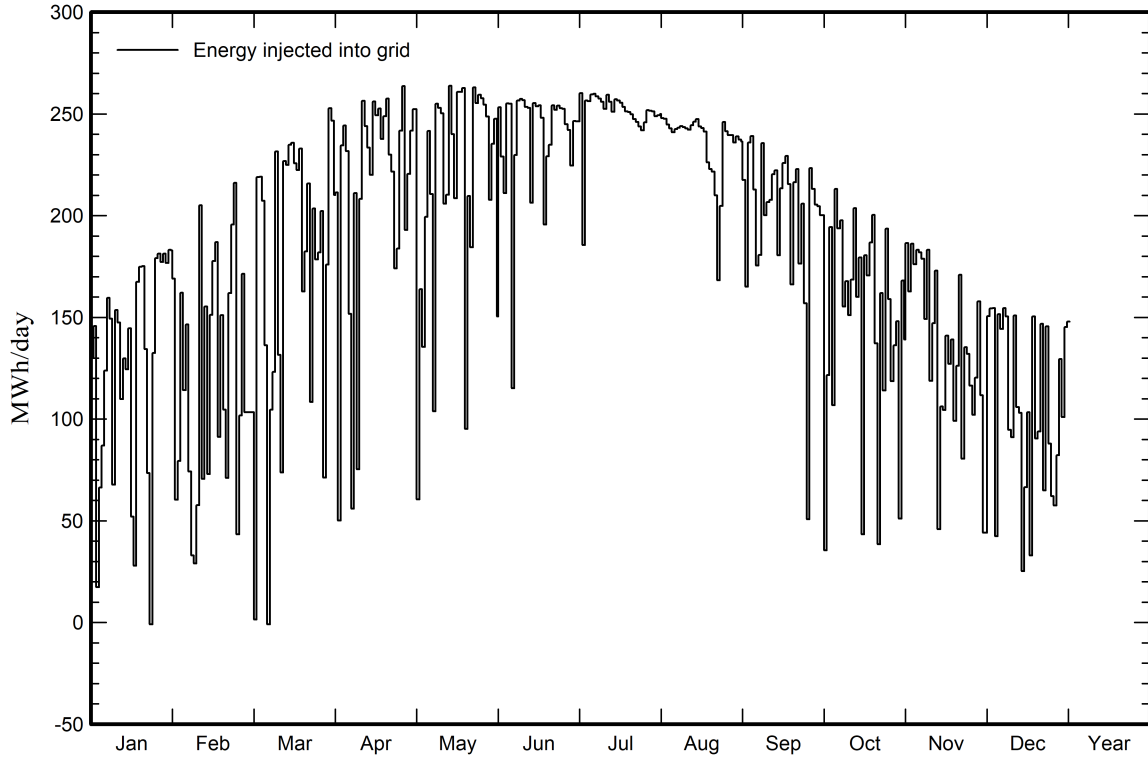


PVsyst V7.4.0

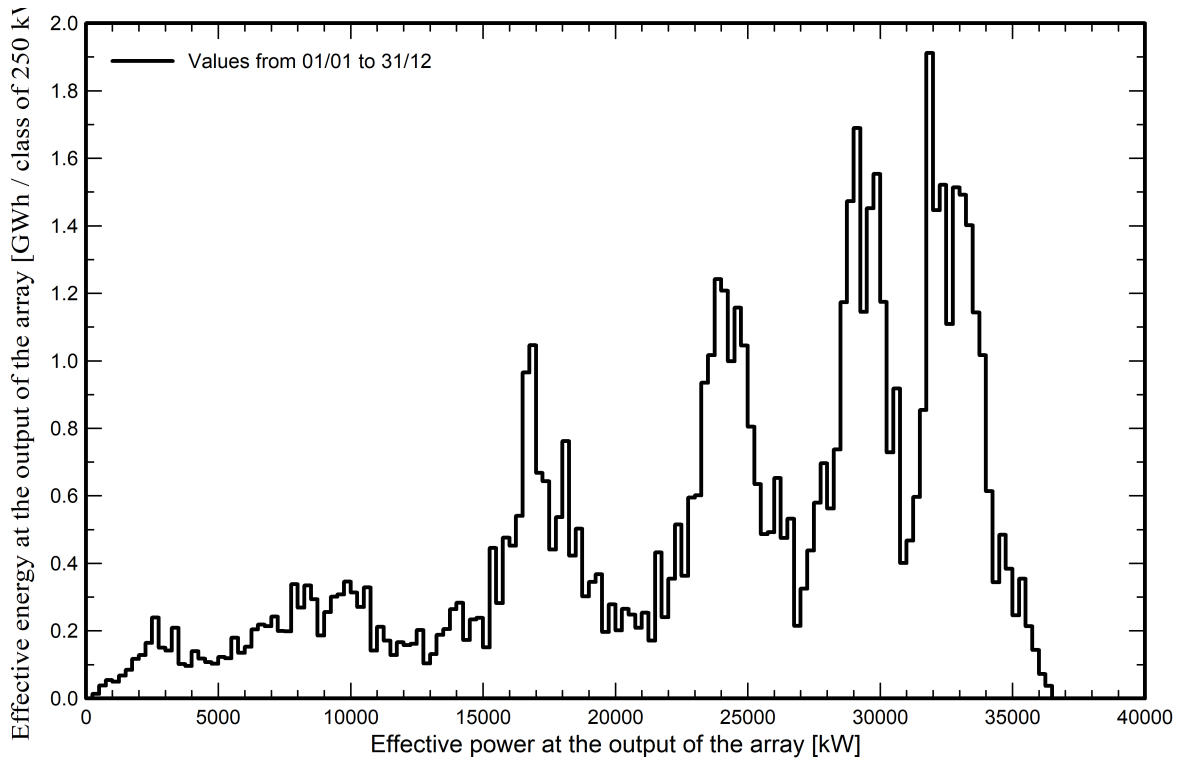
VC0, Simulation date:
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with v7.4.0

Predef. graphs

Energia giornaliera in uscita sistema



Distribuzione potenza dell'impianto



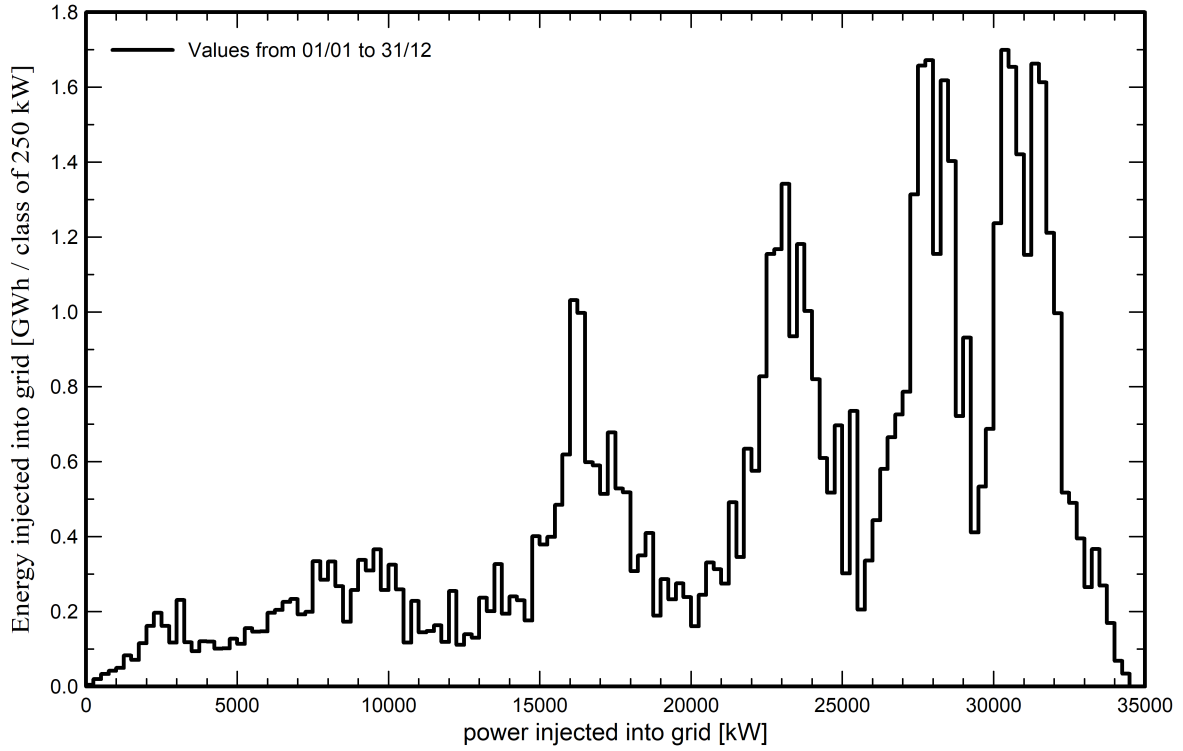


PVsyst V7.4.0

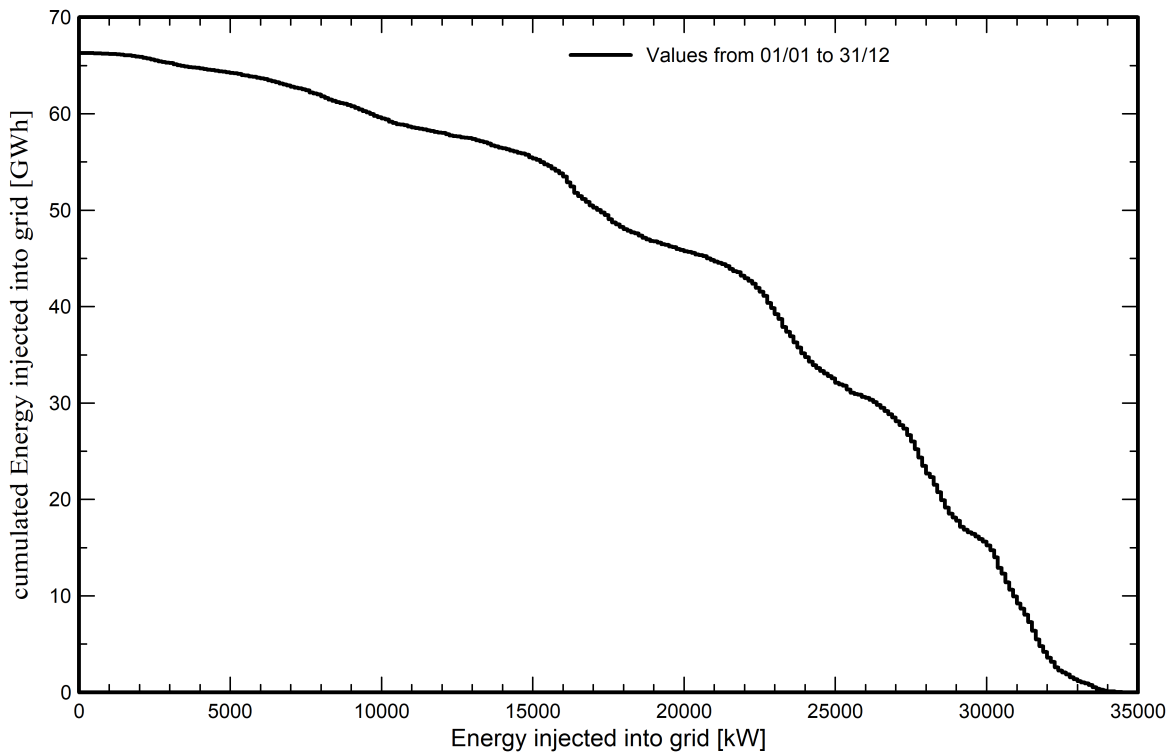
VC0, Simulation date:
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with v7.4.0

Predef. graphs

Distribuzione potenza in uscita sistema



Coda della distribuzione della potenza in uscita



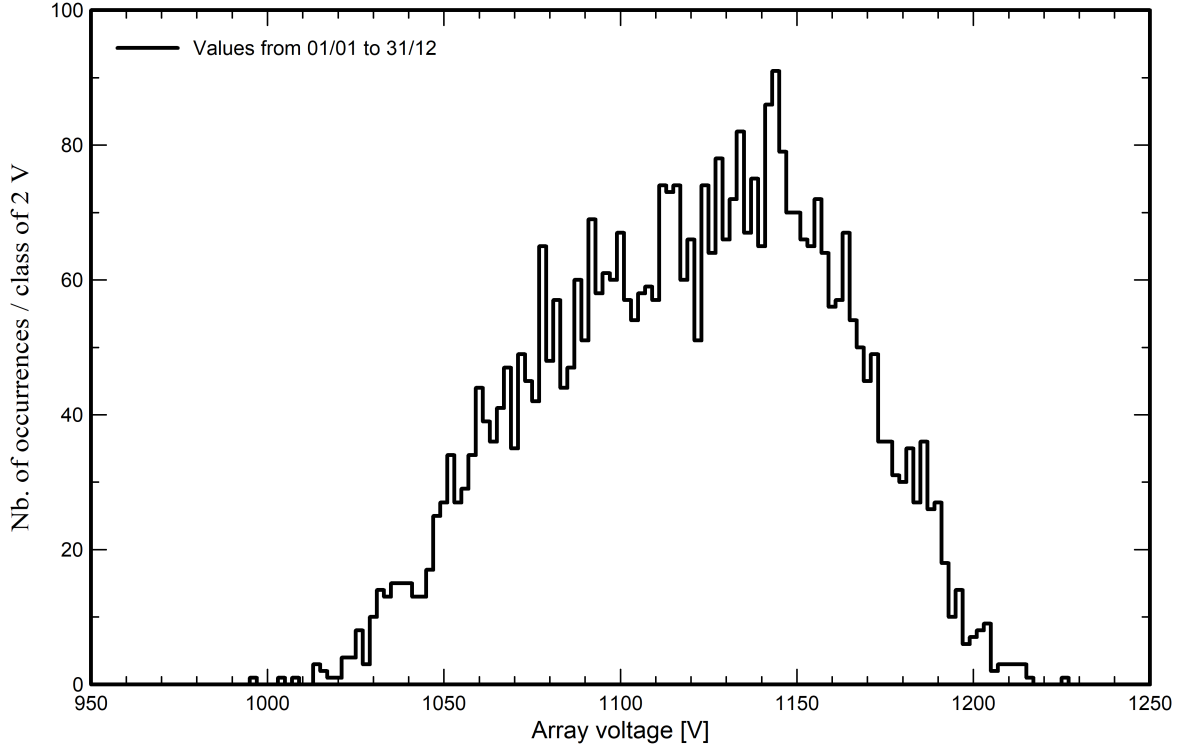


PVsyst V7.4.0

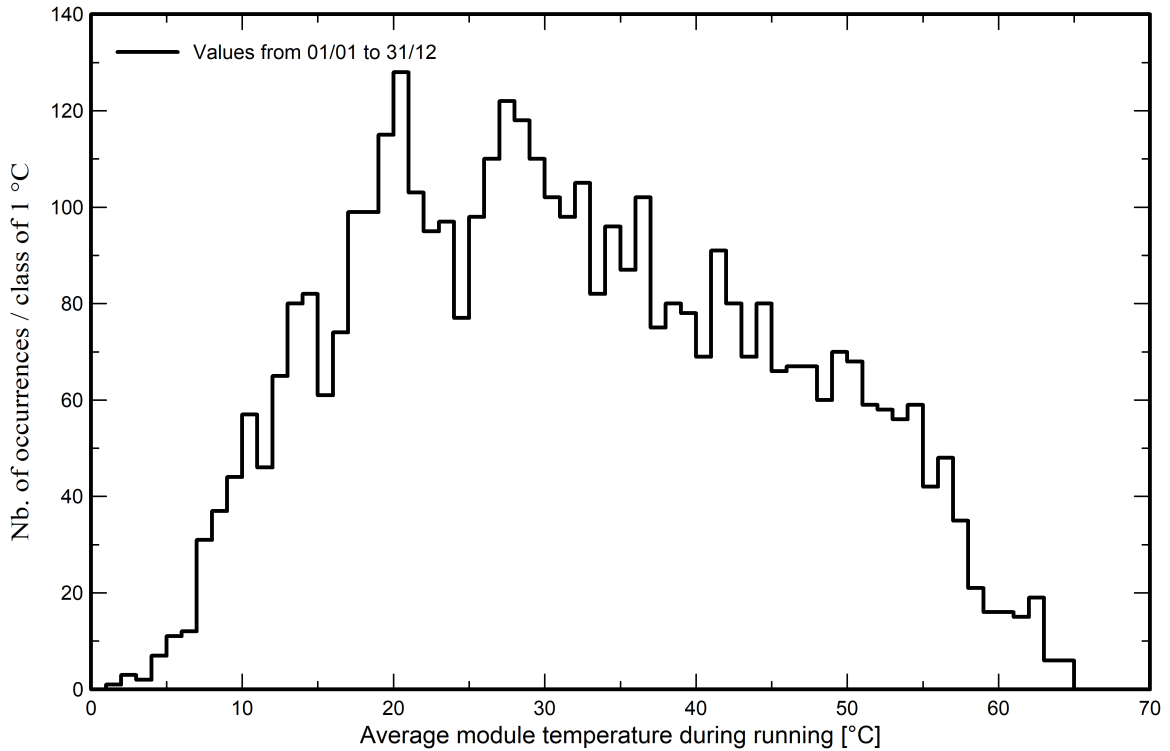
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Predef. graphs

Distribuzione tensione impianto



Distribuzione temperatura impianto





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P50 - P90 evaluation

Meteo data

Source	PVGIS api TMY
Kind	TMY, multi-year
Year-to-year variability(Variance)	2.5 %

Specified Deviation

Climate change	0.0 %
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Global variability (meteo + system)

Variability (Quadratic sum)	3.1 %
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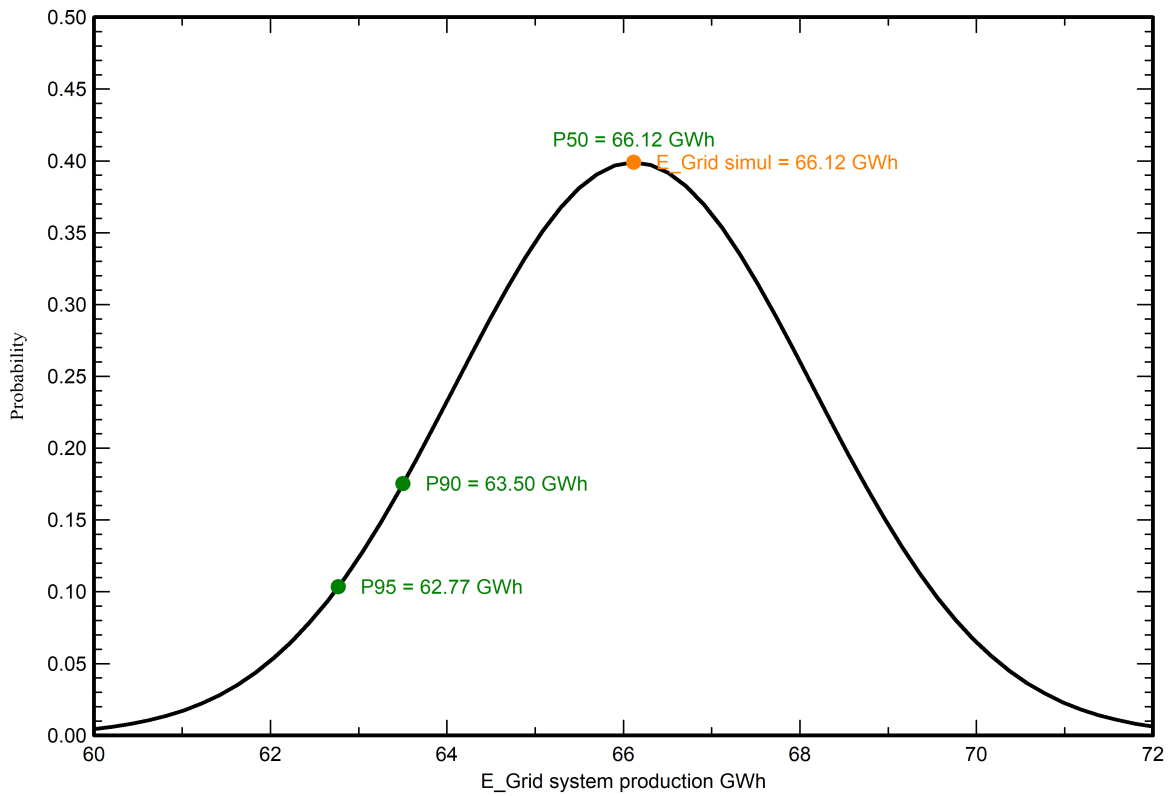
Simulation and parameters uncertainties

PV module modelling/parameters	1.0 %
Inverter efficiency uncertainty	0.5 %
Soiling and mismatch uncertainties	1.0 %
Degradation uncertainty	1.0 %

Annual production probability

Variability	2.04 GWh
P50	66.12 GWh
P90	63.50 GWh
P95	62.77 GWh

Probability distribution

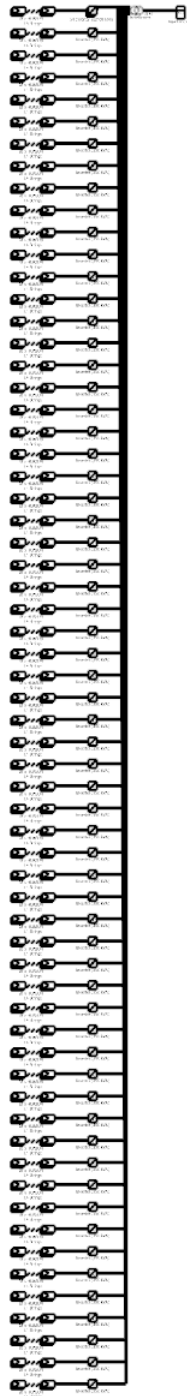




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Single-line diagram



PV module	HUASUN
Inverter	SG350-HX
String	28 x HUASUN

Ramacca 40 MW

VC0 : Variante di simulazione_Fixed

14/05/24



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CO₂ Emission Balance

Total: 662508.4 tCO₂

Generated emissions

Total: 65473.95 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 839012.8 tCO₂

System production: 66116.06 MWh/yr

Grid Lifecycle Emissions: 423 gCO₂/kWh

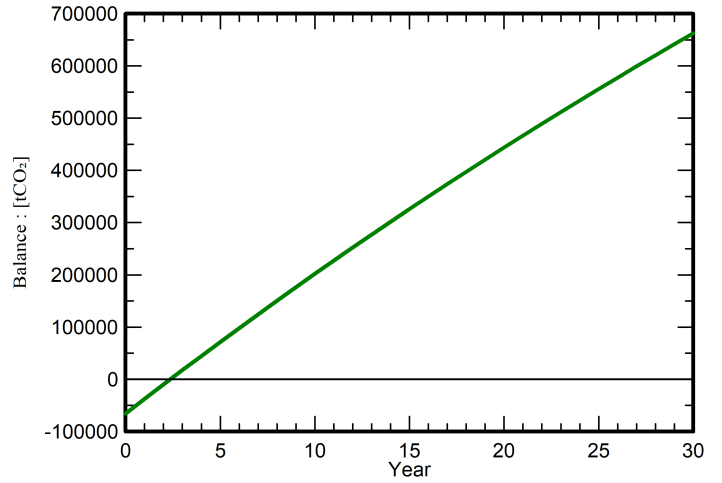
Source: IEA List

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	1713 kgCO ₂ /kWp	37364 kWp	63994618
Supports	2.82 kgCO ₂ /kg	511840 kg	1444110
Inverters	280 kgCO ₂ /units	126 units	35219

PVsyst - Simulation report

Grid-Connected System

Project: Ramacca 40 MW

Variant: Variante di simulazione_Tracker

Tracking system with backtracking

System power: 2862 kWp

Raddusa - Italia



PVsyst V7.4.0

VC1, Simulation date:
 14/05/24 11:21
 with v7.4.0

Project summary

Geographical Site Raddusa Italia	Situation Latitude 37.46 °N Longitude 14.59 °E Altitude 206 m Time zone UTC+1	Project settings Albedo 0.20
Meteo data Raddusa PVGIS api TMY		

System summary

Grid-Connected System Simulation for year no 1	Tracking system with backtracking		
PV Field Orientation Orientation Tracking plane, tilted axis Avg axis tilt 0.9 ° Avg axis azim. 3.2 °	Tracking algorithm Astronomic calculation Backtracking activated	Near Shadings According to strings Electrical effect 100 % Diffuse shading Automatic	
System information PV Array Nb. of modules 3920 units Pnom total 2862 kWp	Inverters Nb. of units 10 units Pnom total 3500 kWac Pnom ratio 0.818		
User's needs Unlimited load (grid)			

Results summary

Produced Energy 5587680 kWh/year	Specific production 1953 kWh/kWp/year	Perf. Ratio PR 80.08 %
Apparent energy 6248386 kVAh/year		

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PVsyst V7.4.0

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General parameters

Grid-Connected System		Tracking system with backtracking	
PV Field Orientation		Tracking algorithm	Backtracking array
Orientation		Astronomic calculation	Nb. of trackers 560 units
Tracking plane, tilted axis		Backtracking activated	Sizes
Avg axis tilt	0.9 °		Tracker Spacing 5.90 m
Avg axis azim.	3.2 °		Collector width 2.38 m
			Ground Cov. Ratio (GCR) 40.4 %
			Phi min / max. +/- 50.0 °
			Backtracking strategy
			Phi limits for BT +/- 66.0 °
			Backtracking pitch 5.90 m
			Backtracking width 2.38 m
Models used		Near Shadings	User's needs
Transposition	Perez	According to strings	Unlimited load (grid)
Diffuse	Imported	Electrical effect 100 %	
Circumsolar	separate	Diffuse shading Automatic	
Horizon			
Average Height	3.6 °		
Bifacial system			
Model	2D Calculation unlimited trackers		
Bifacial model geometry		Bifacial model definitions	
Tracker Spacing	5.90 m	Ground albedo	0.25
Tracker width	2.38 m	Bifaciality factor	70 %
GCR	40.4 %	Rear shading factor	15.0 %
Axis height above ground	2.10 m	Rear mismatch loss	5.0 %
		Shed transparent fraction	2.0 %
Grid injection point			
Power factor			
Cos(phi) (lagging)	0.900		

PV Array Characteristics

PV module		Inverter	
Manufacturer	HUASUN	Manufacturer	Sungrow
Model	HUASUN	Model	SG350-HX
(Custom parameters definition)		(Original PVsyst database)	
Unit Nom. Power	730 Wp	Unit Nom. Power	350 kWac
Number of PV modules	3920 units	Number of inverters	10 units
Nominal (STC)	2862 kWp	Total power	3500 kWac
Modules	140 Strings x 28 In series	Operating voltage	500-1450 V
At operating cond. (50°C)		Pnom ratio (DC:AC)	0.82
Pmpp	2651 kWp	Power sharing within this inverter	
U mpp	1116 V		
I mpp	2375 A		



PVsyst V7.4.0

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PV Array Characteristics

Total PV power		Total inverter power	
Nominal (STC)	2862 kWp	Total power	3500 kWac
Total	3920 modules	Number of inverters	10 units
Module area	12177 m ²	Pnom ratio	0.82
		PNom limit forced to active power	

Array losses

Array Soiling Losses		Thermal Loss factor		DC wiring losses				
Loss Fraction	3.0 %	Module temperature according to irradiance		Global array res.	7.6 mΩ			
		Uc (const)	29.0 W/m ² K	Loss Fraction	1.5 % at STC			
		Uv (wind)	0.0 W/m ² K/m/s					
Serie Diode Loss		LID - Light Induced Degradation		Module Quality Loss				
Voltage drop	0.7 V	Loss Fraction	2.0 %	Loss Fraction	-0.4 %			
Loss Fraction	0.1 % at STC							
Module mismatch losses		Strings Mismatch loss		Module average degradation				
Loss Fraction	2.0 % at MPP	Loss Fraction	0.2 %	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): 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

System losses

Auxiliaries loss	
Proportionnal to Power	3.0 W/kW
0.0 kW from Power thresh.	

AC wiring losses

Inv. output line up to MV transfo	
Inverter voltage	800 Vac tri
Loss Fraction	1.44 % at STC
Inverter: SG350-HX	
Wire section (10 Inv.)	Alu 10 x 3 x 300 mm ²
Average wires length	250 m
MV line up to Injection	
MV Voltage	36 kV
Wires	Alu 3 x 35 mm ²
Length	4500 m
Loss Fraction	1.09 % at STC



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AC losses in transformers

MV transfo

Medium voltage 36 kV

Transformer parameters

Nominal power at STC 2.84 MVA

Iron Loss (24/24 Connexion) 2.95 kVA

Iron loss fraction 0.10 % at STC

Copper loss 27.39 kVA

Copper loss fraction 0.96 % at STC

Coils equivalent resistance 3 x 2.18 mΩ



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Horizon definition

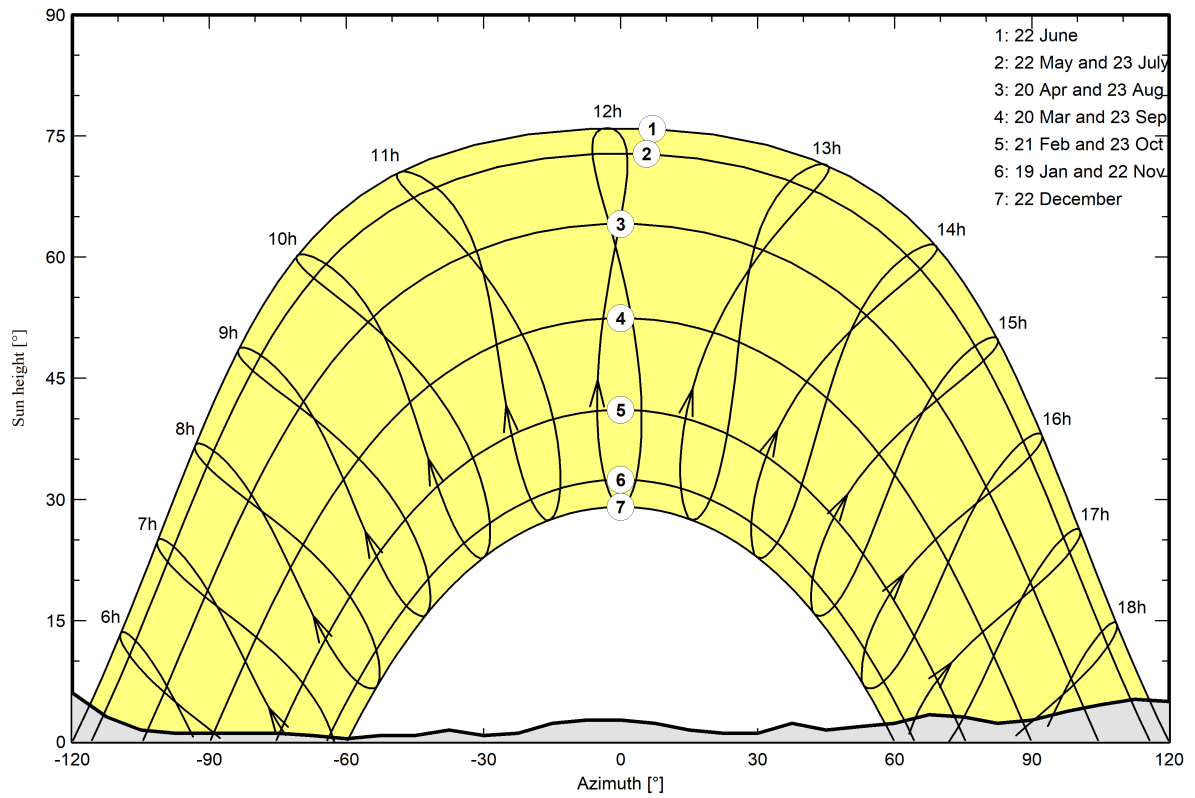
Horizon from PVGIS website API, Lat=37°27'42", Long=14°35'11", Alt=206m

Average Height 3.6 ° Albedo Factor 0.85
 Diffuse Factor 0.97 Albedo Fraction 100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-120	-113	-105	-98	-75	-68	-60	-53
Height [°]	7.3	7.6	7.6	7.3	7.3	6.1	6.1	3.1	1.5	1.1	1.1	0.8	0.4	0.8
Azimuth [°]	-45	-38	-30	-23	-15	-8	0	8	15	23	30	38	45	53
Height [°]	0.8	1.5	0.8	1.1	2.3	2.7	2.7	2.3	1.5	1.1	1.1	2.3	1.5	1.9
Azimuth [°]	60	68	75	83	90	98	105	113	120	128	135	143	180	
Height [°]	2.3	3.4	3.1	2.3	2.7	3.8	4.6	5.3	5.0	3.8	3.8	7.3	7.3	

Sun Paths (Height / Azimuth diagram)



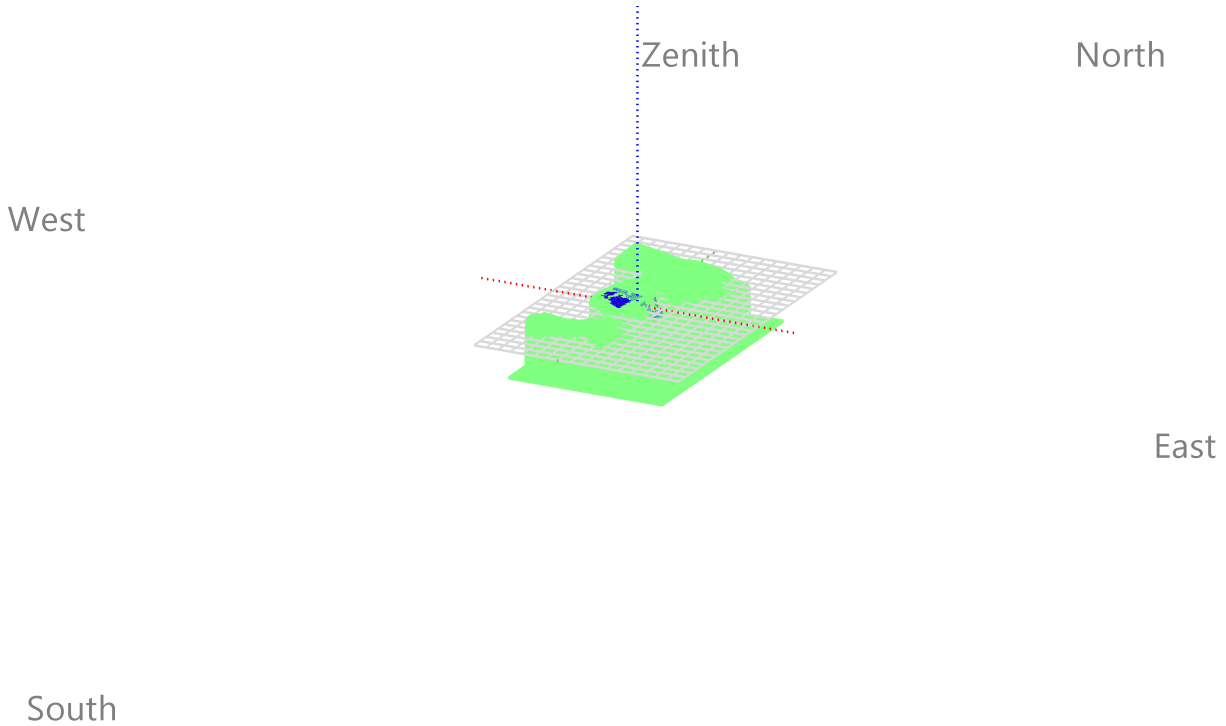


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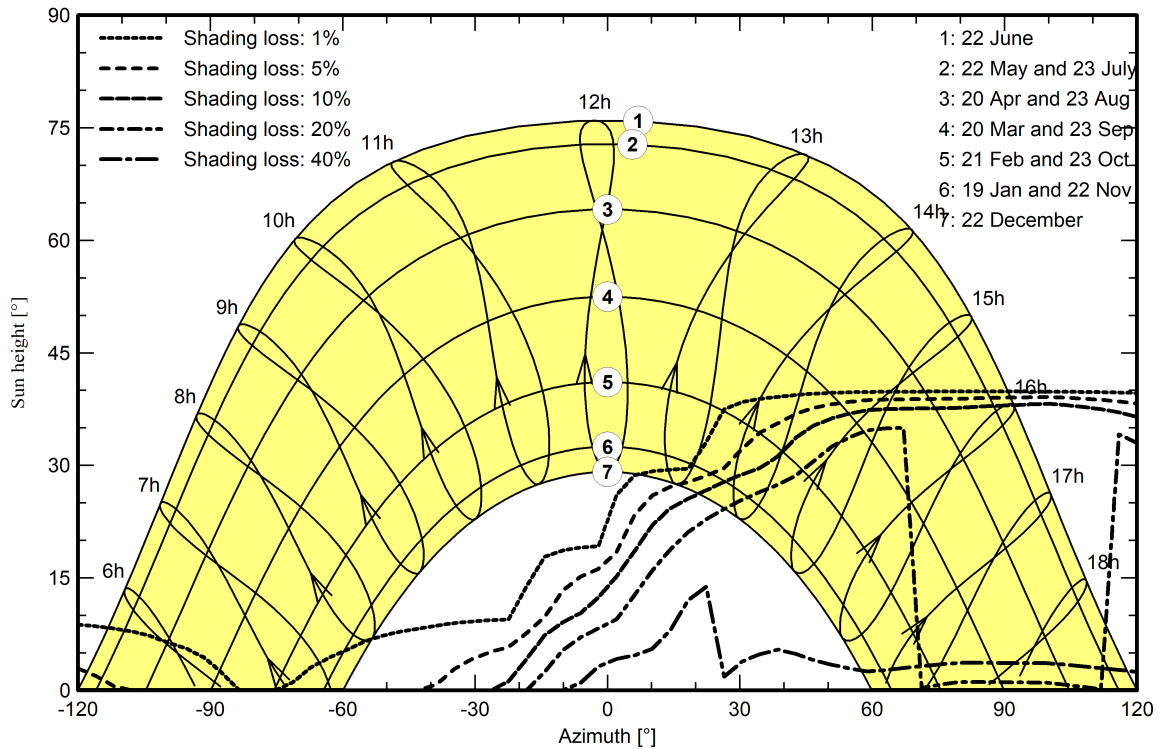
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





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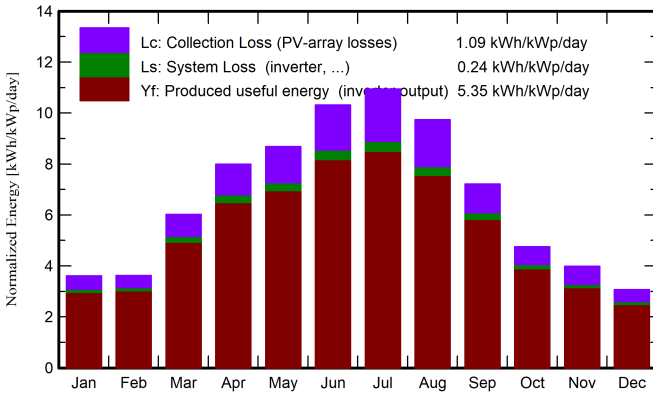
VC1, Simulation date:
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 with v7.4.0

Main results

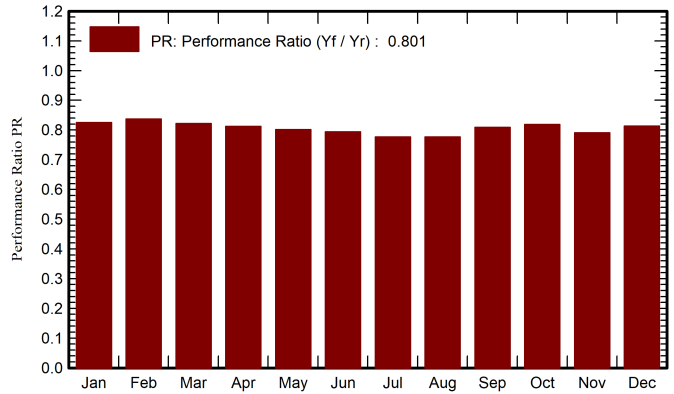
System Production

Produced Energy (P50) 5587680 kWh/year Specific production (P50) 1953 kWh/kWp/year Perf. Ratio PR 80.08 %
 Produced Energy (P90) 5206854 kWh/year Specific production (P90) 1820 kWh/kWp/year
 Produced Energy (P75) 5387459 kWh/year Specific production (P75) 1883 kWh/kWp/year
 Apparent energy 6248386 kVAh/year

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 kWh	E_Grid kWh	PR ratio
January	79.5	26.20	8.65	111.8	100.5	275197	263913	0.825
February	78.3	39.15	5.28	101.4	90.9	253409	242726	0.837
March	139.5	53.04	10.84	186.5	171.1	458023	438705	0.822
April	184.7	62.91	16.48	239.9	222.4	583479	557792	0.813
May	209.9	73.46	18.92	269.3	249.4	646170	617929	0.802
June	237.8	63.89	25.04	309.4	289.0	734692	702449	0.793
July	255.8	56.88	26.40	339.5	315.7	789392	754528	0.777
August	225.9	55.36	27.85	301.8	280.5	701063	670783	0.777
September	164.2	54.76	21.25	216.6	201.0	523275	501194	0.809
October	112.0	48.31	18.01	147.4	134.8	360200	345455	0.819
November	87.4	33.04	11.91	119.7	105.2	281952	270709	0.790
December	69.1	30.08	10.35	95.1	84.4	231094	221498	0.814
Year	1844.1	597.07	16.82	2438.3	2245.0	5837947	5587680	0.801

Legends

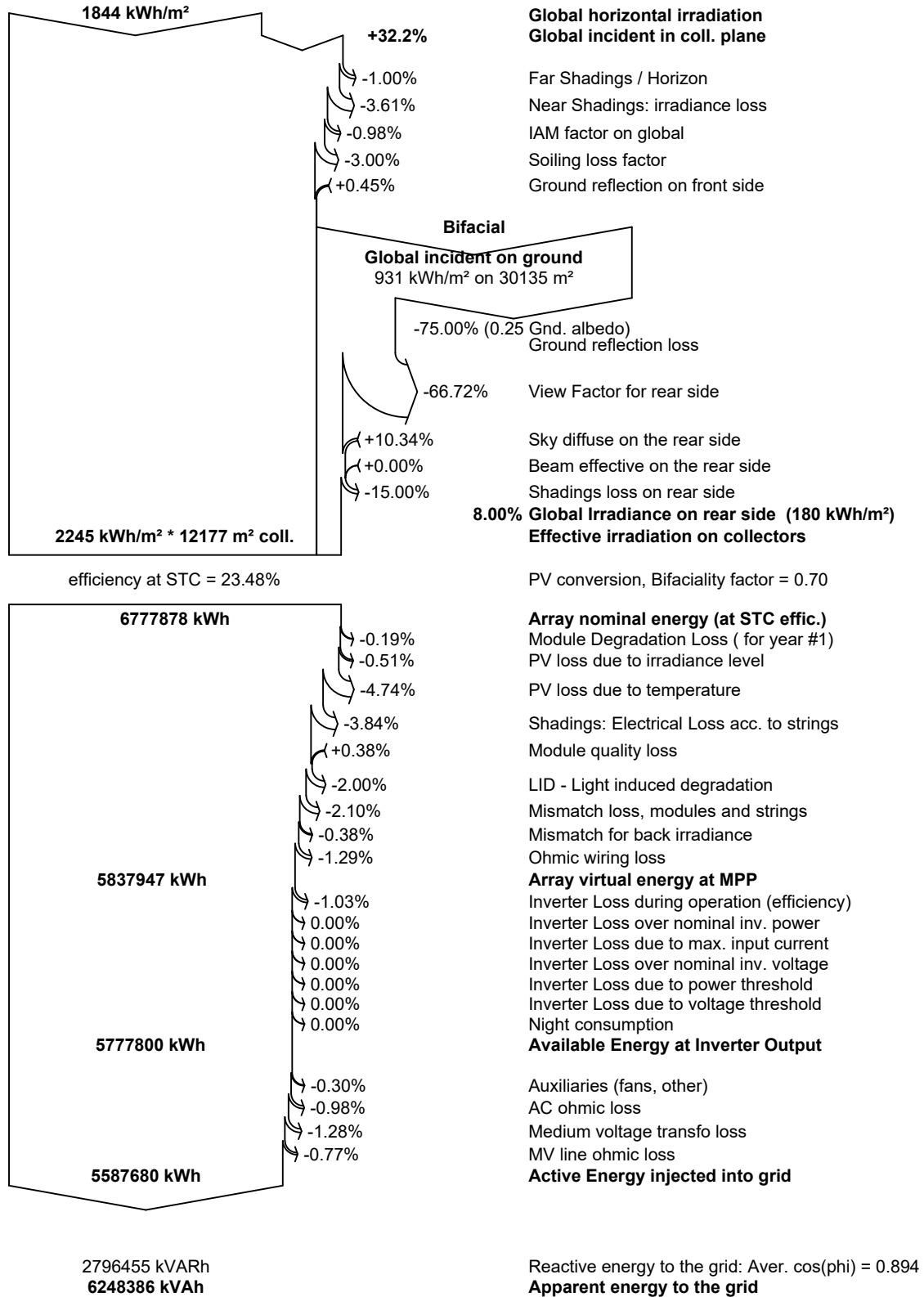
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



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Loss diagram



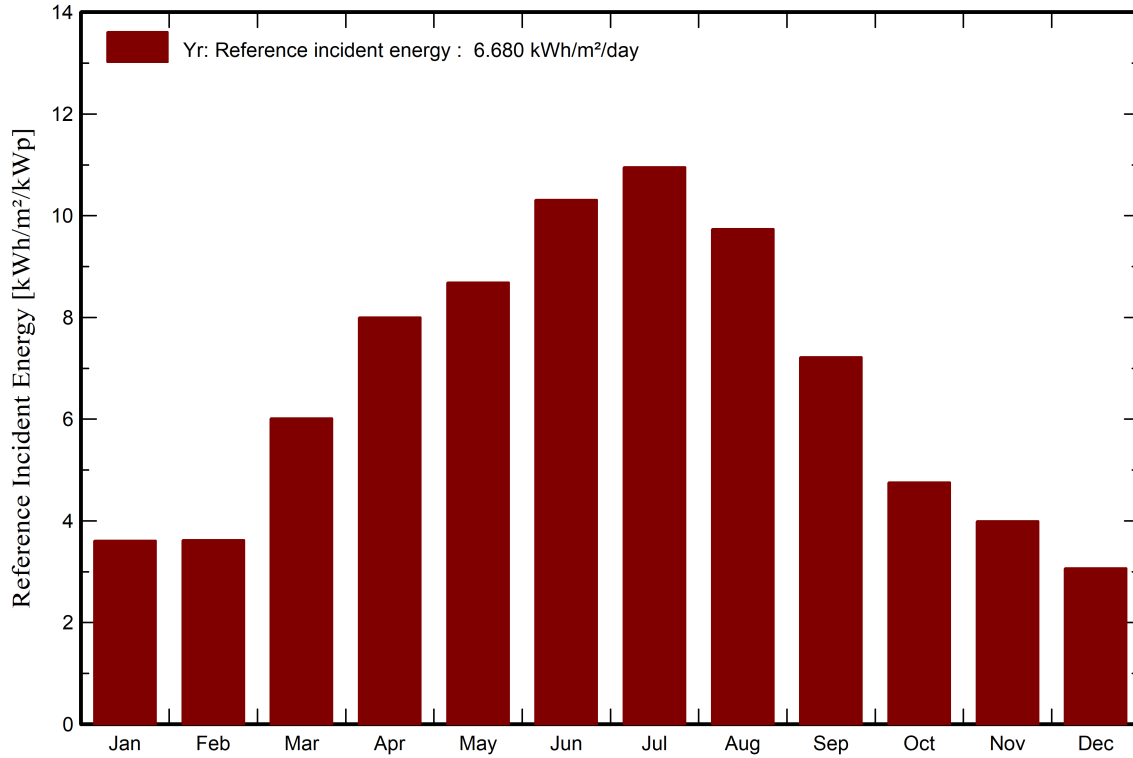


PVsyst V7.4.0

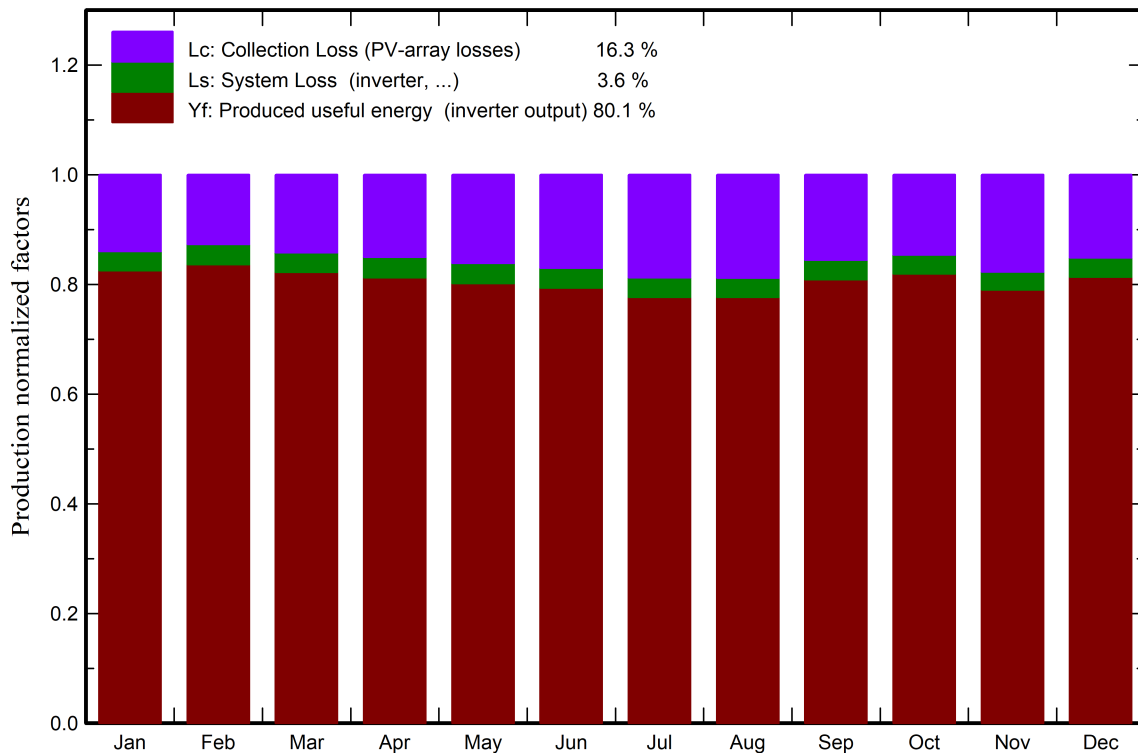
VC1, Simulation date:
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Predef. graphs

Energia incidente di riferimento su piano collettori



Fattori normalizzati di produzione e di perdita



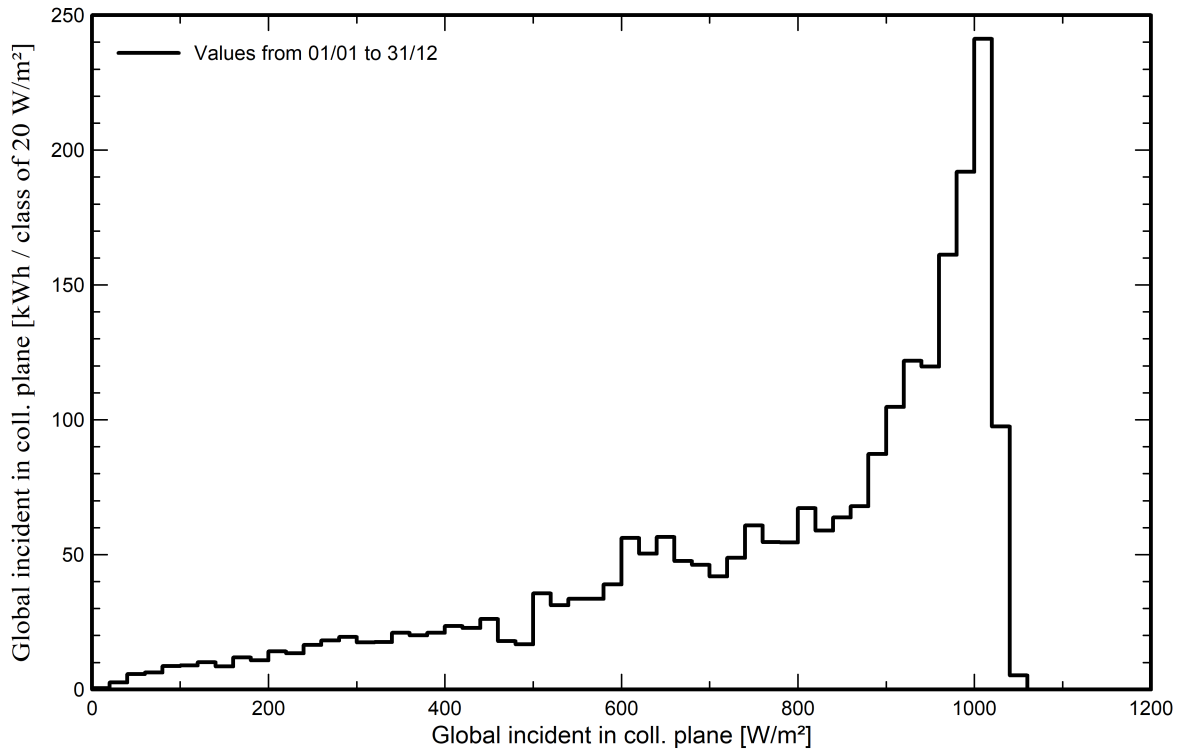


PVsyst V7.4.0

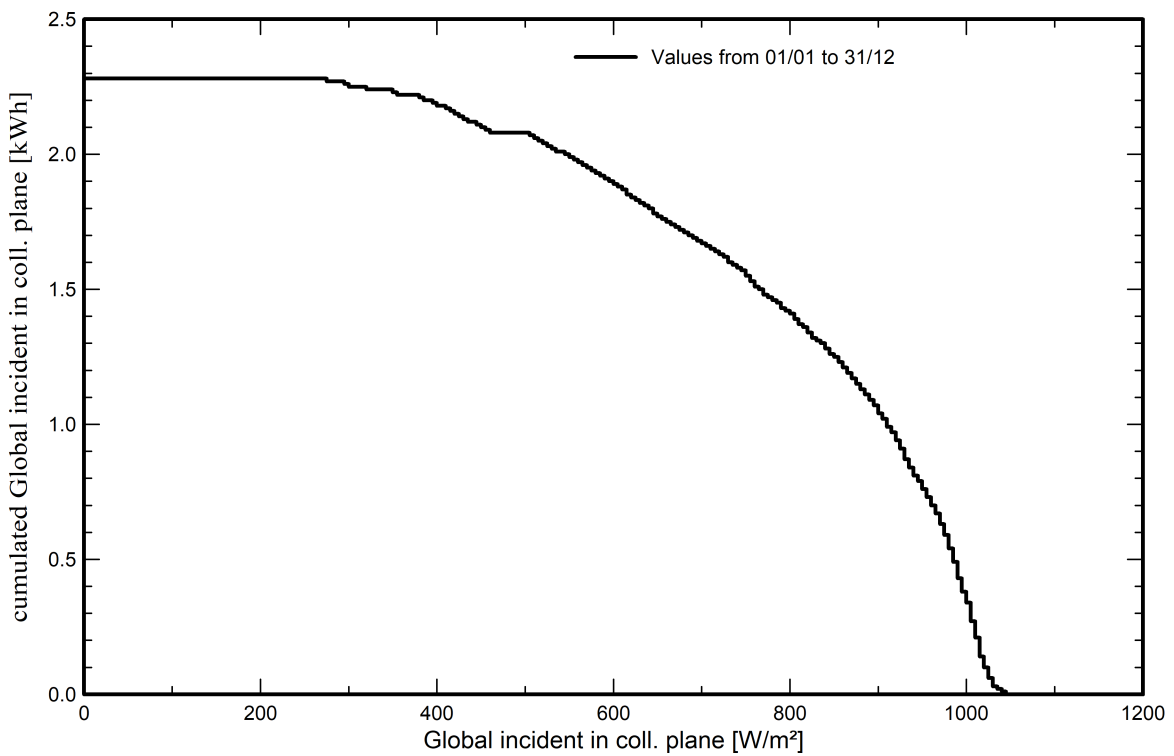
VC1, Simulation date:
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Predef. graphs

Distribuzione irraggiamento incidente



Coda della distribuzione di irradiazione incidente





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Predef. graphs

Temperatura del campo vs. irradiazione efficace

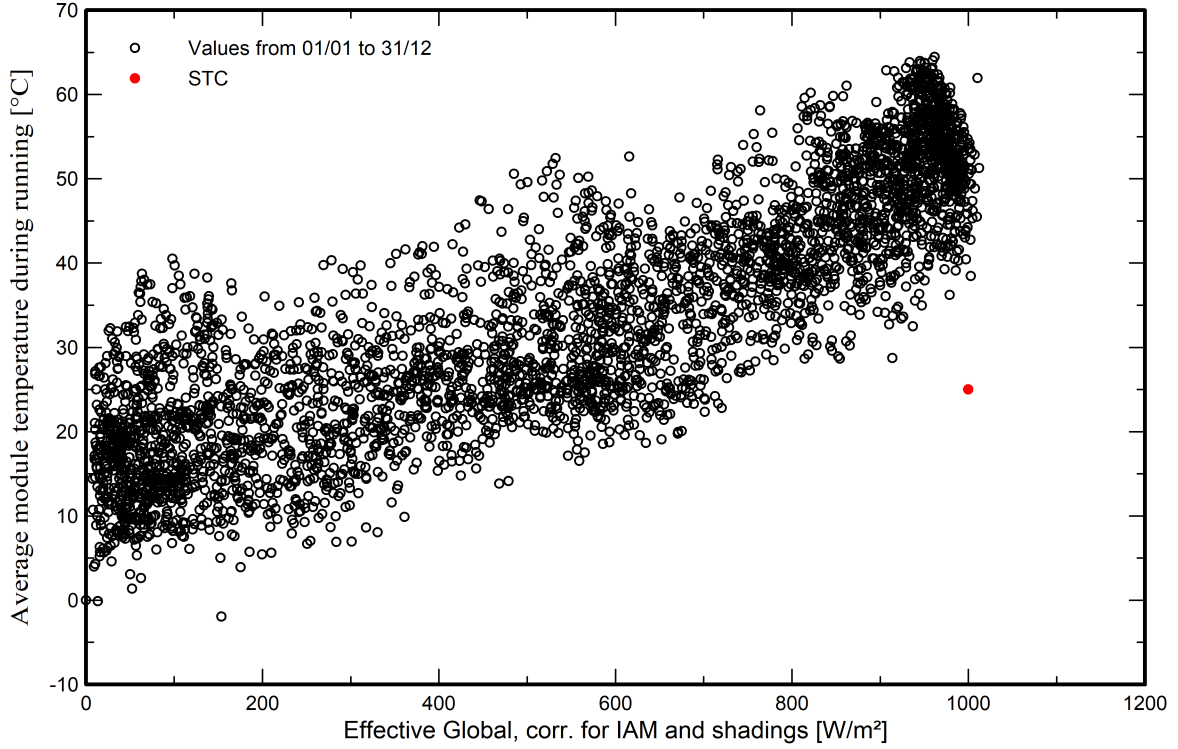
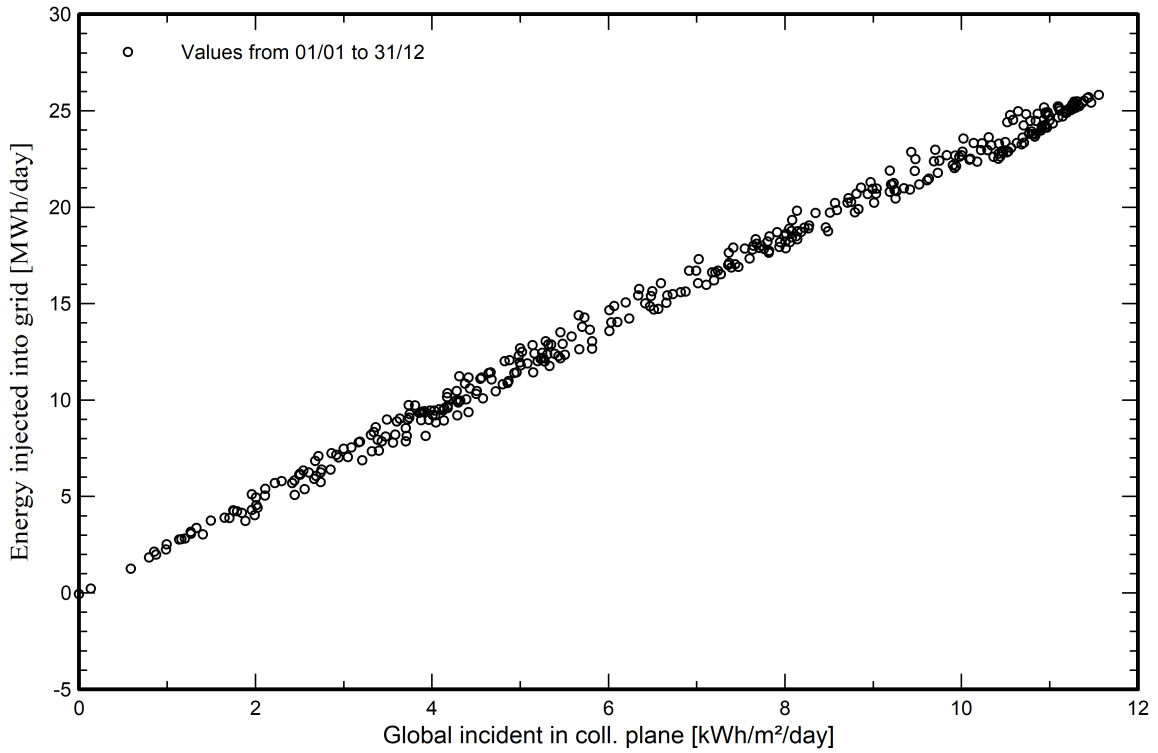


Diagramma giornaliero entrata/uscita



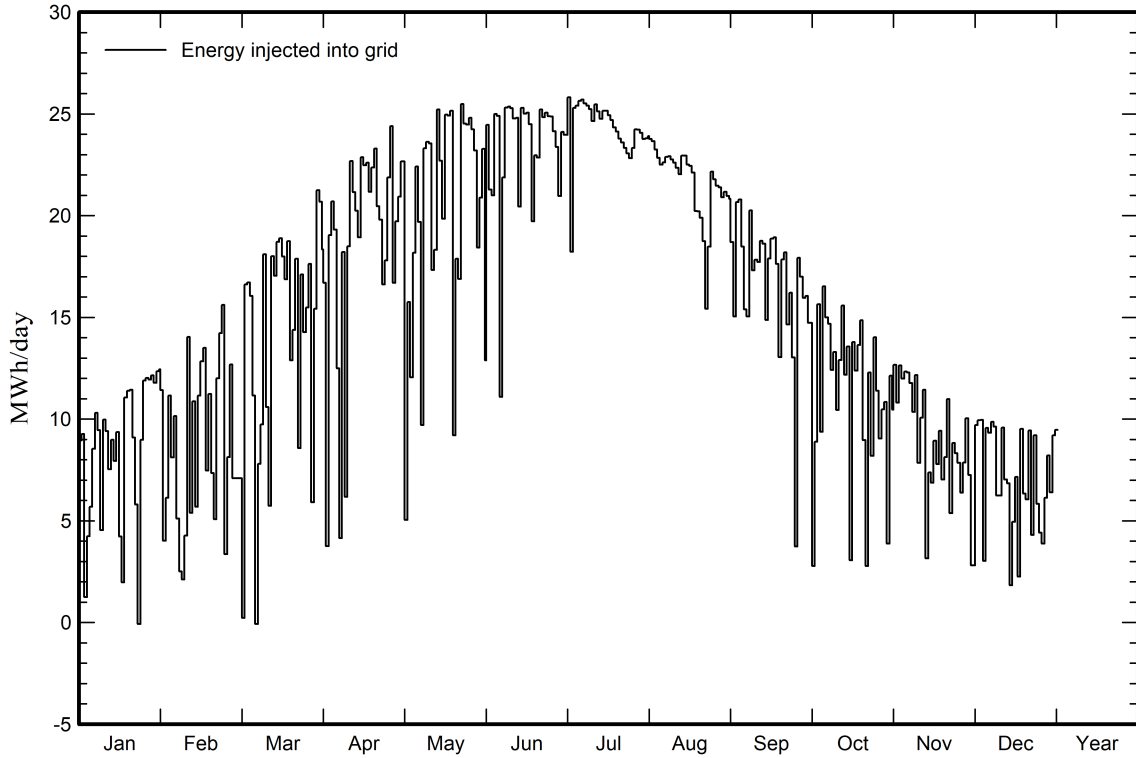


PVsyst V7.4.0

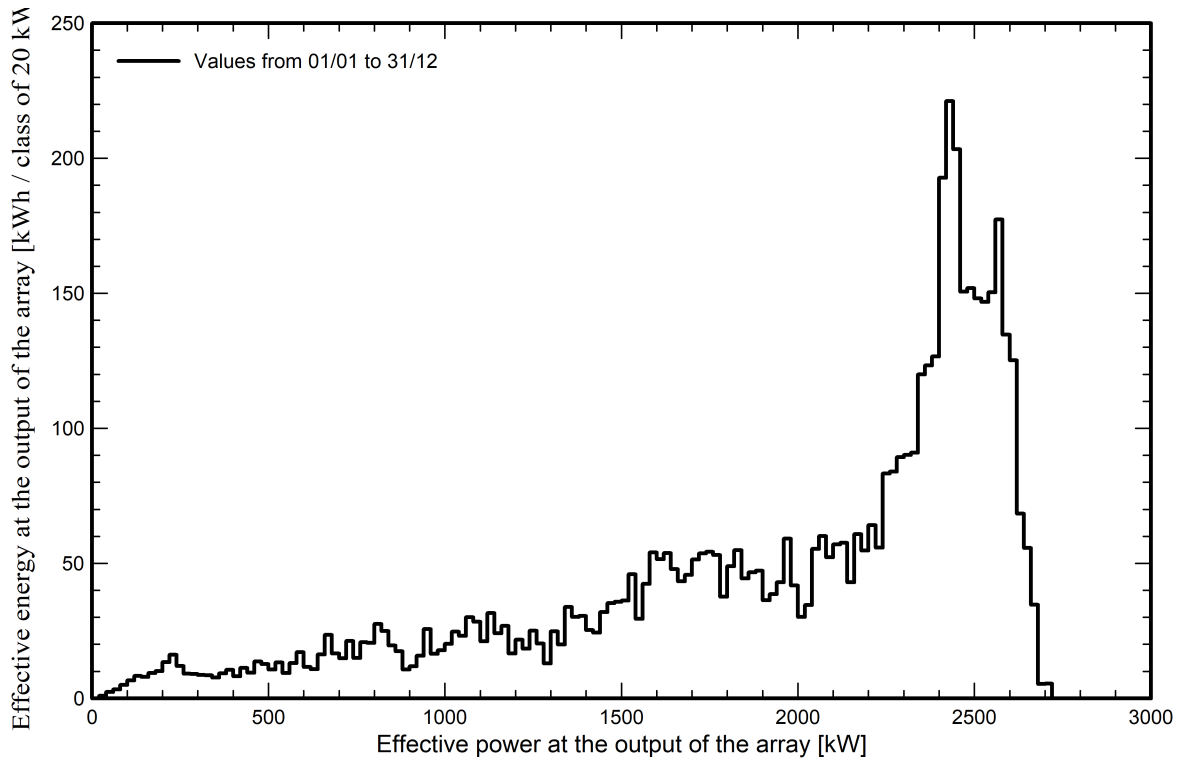
VC1, Simulation date:
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with v7.4.0

Predef. graphs

Energia giornaliera in uscita sistema



Distribuzione potenza dell'impianto



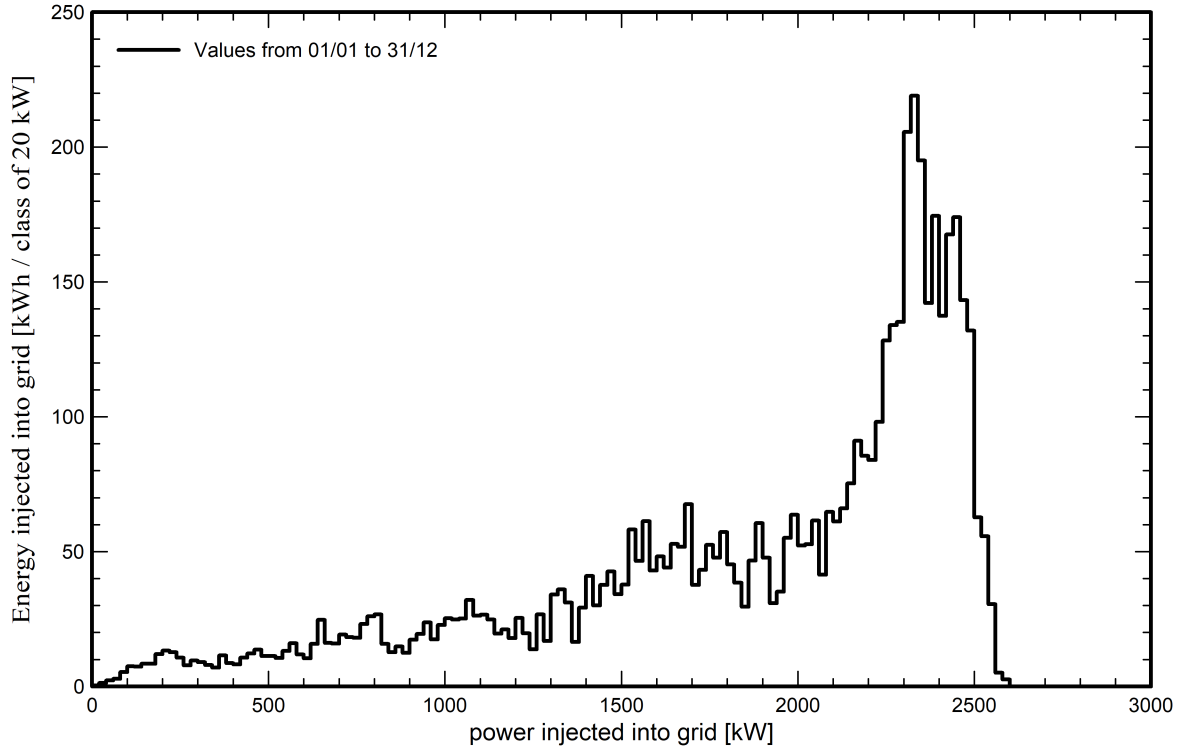


PVsyst V7.4.0

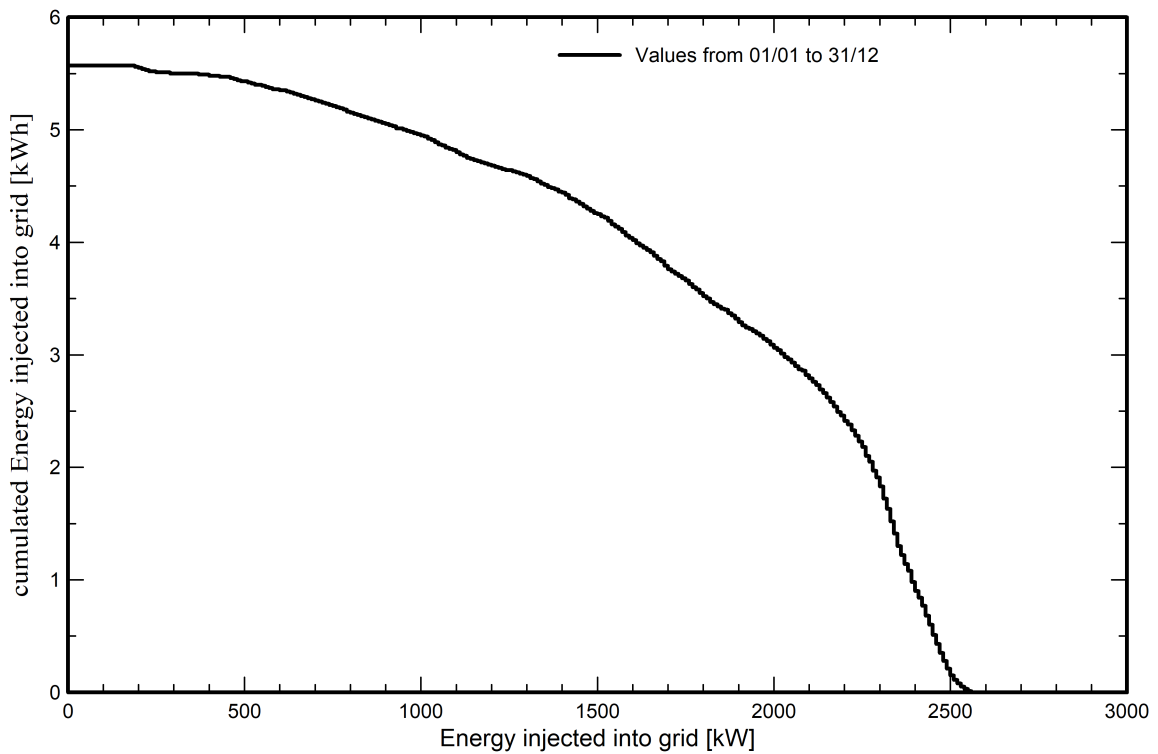
VC1, Simulation date:
14/05/24 11:21
with v7.4.0

Predef. graphs

Distribuzione potenza in uscita sistema



Coda della distribuzione della potenza in uscita



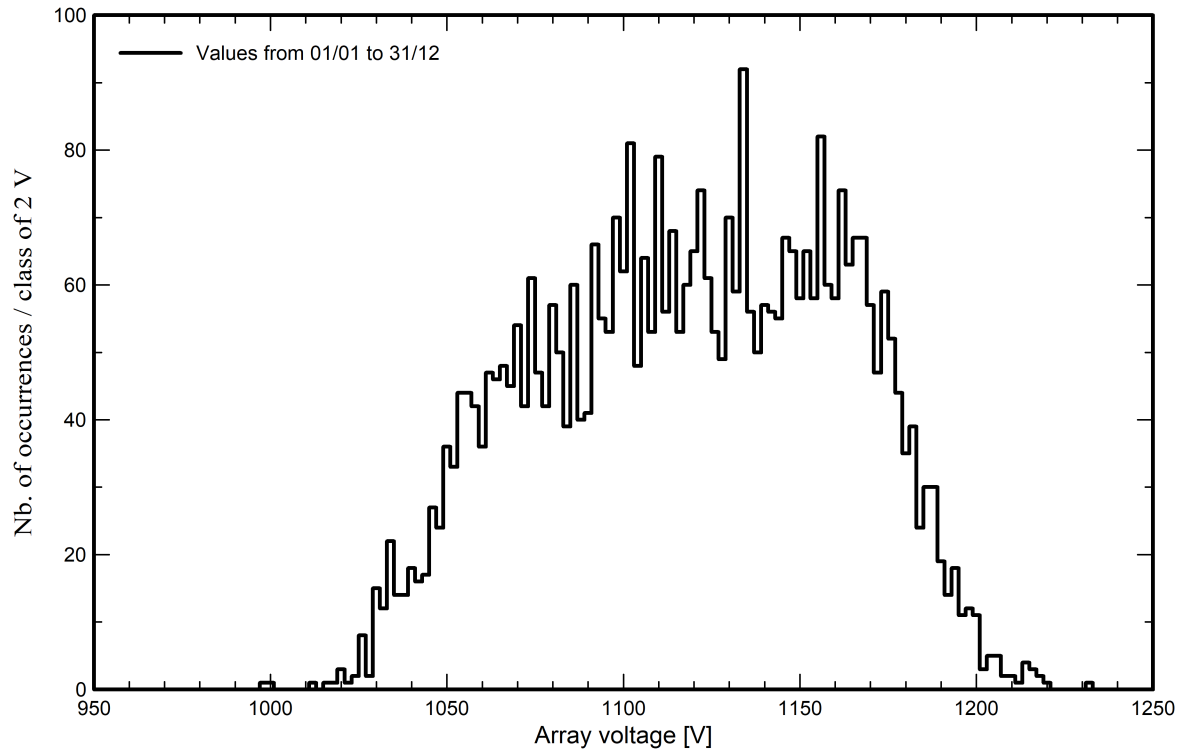


PVsyst V7.4.0

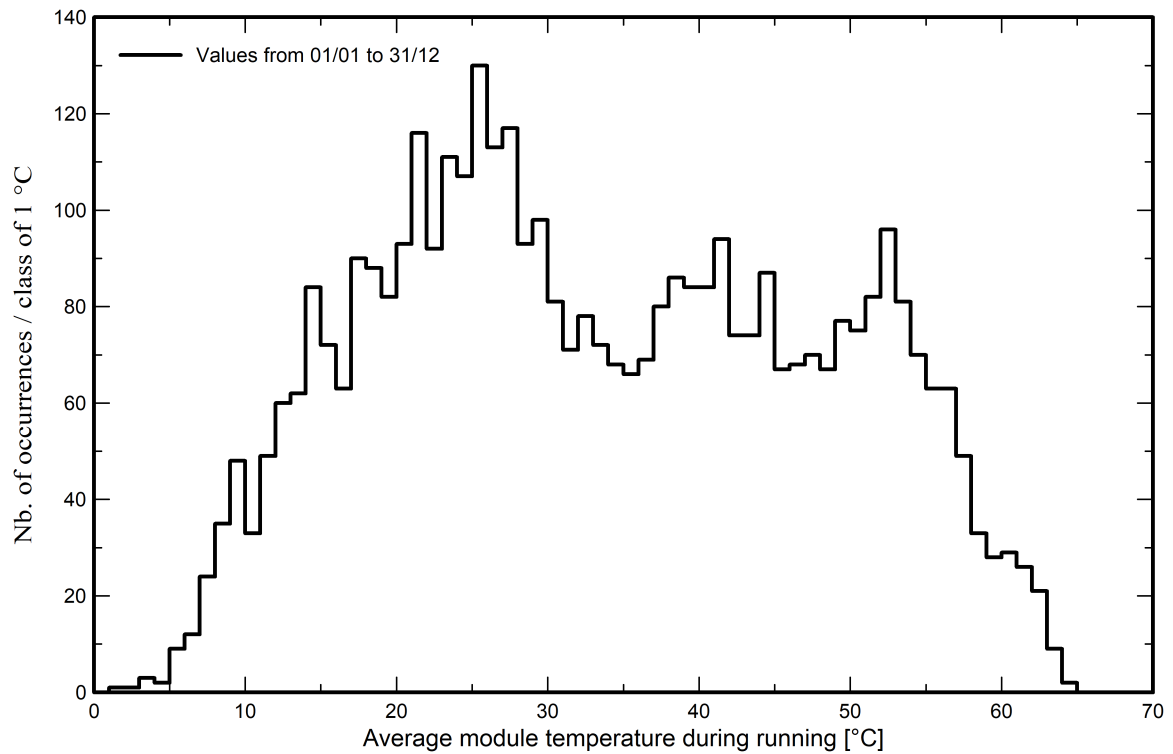
VC1, Simulation date:
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Predef. graphs

Distribuzione tensione impianto



Distribuzione temperatura impianto





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P50 - P90 evaluation

Meteo data

Source	PVGIS api TMY
Kind	Specific year
Year	TMY
Year-to-year variability(Variance)	5.0 %

Specified Deviation

Year deviation from average	0.0 %
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Global variability (meteo + system)

Variability (Quadratic sum)	5.3 %
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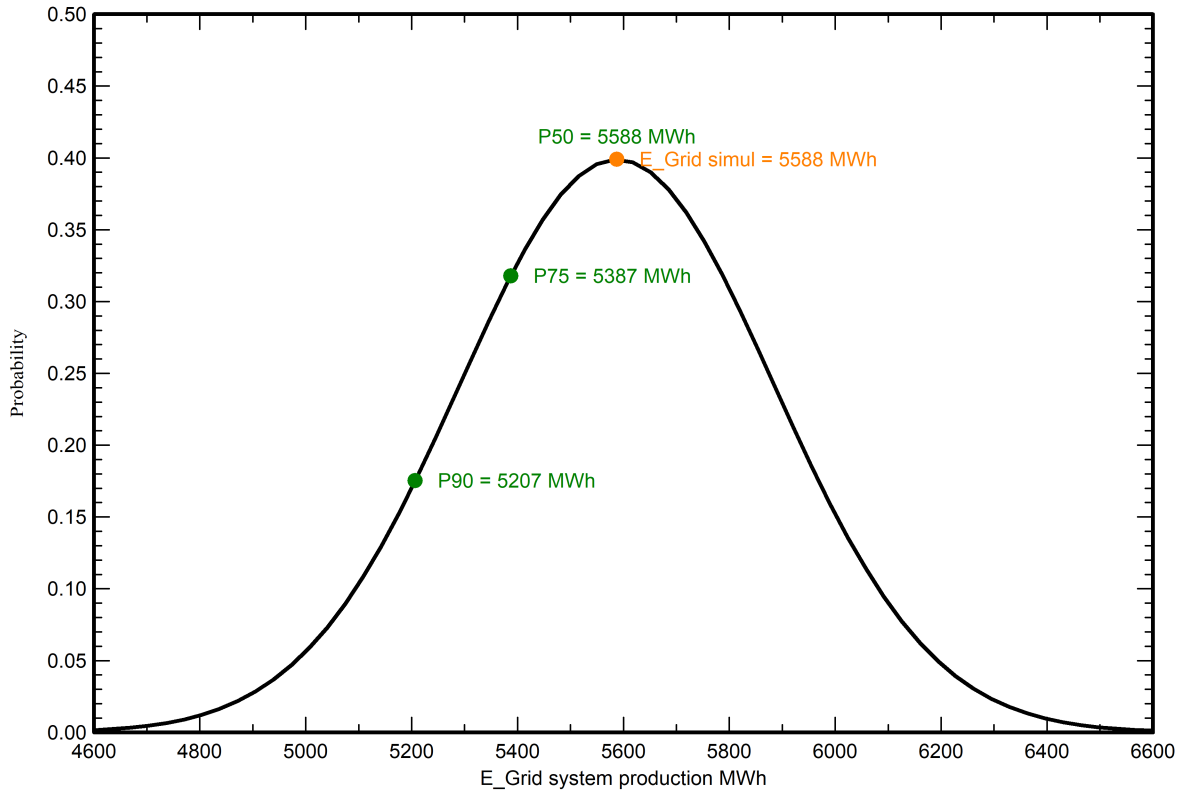
Simulation and parameters uncertainties

PV module modelling/parameters	1.0 %
Inverter efficiency uncertainty	0.5 %
Soiling and mismatch uncertainties	1.0 %
Degradation uncertainty	1.0 %

Annual production probability

Variability	297 MWh
P50	5588 MWh
P90	5207 MWh
P75	5387 MWh

Probability distribution

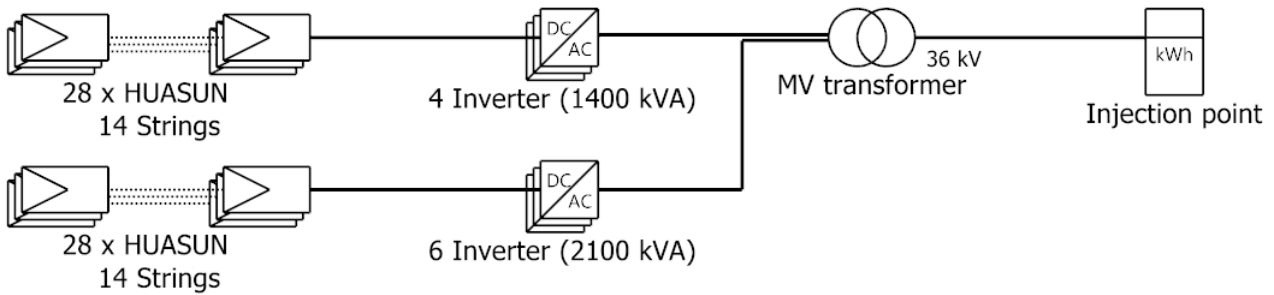




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Single-line diagram



PV module	HUASUN
Inverter	SG350-HX
String	28 x HUASUN

Ramacca 40 MW

VC1 : Variante di simulazione_Tracker

14/05/24



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Cost of the system

Installation costs

Item	Quantity units	Cost EUR	Total EUR
		Total	0.00
		Depreciable asset	0.00

Operating costs

Item	Total EUR/year
Total (OPEX)	0.00

System summary

Total installation cost	0.00 EUR
Operating costs	0.00 EUR/year
Produced Energy	5602 MWh/year
Cost of produced energy (LCOE)	0.000 EUR/kWh



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CO₂ Emission Balance

Total: 56619.8 tCO₂

Generated emissions

Total: 4904.30 tCO₂

Source: Detailed calculation from table below

Replaced Emissions

Total: 70907.7 tCO₂

System production: 5587.68 MWh/yr

Grid Lifecycle Emissions: 423 gCO₂/kWh

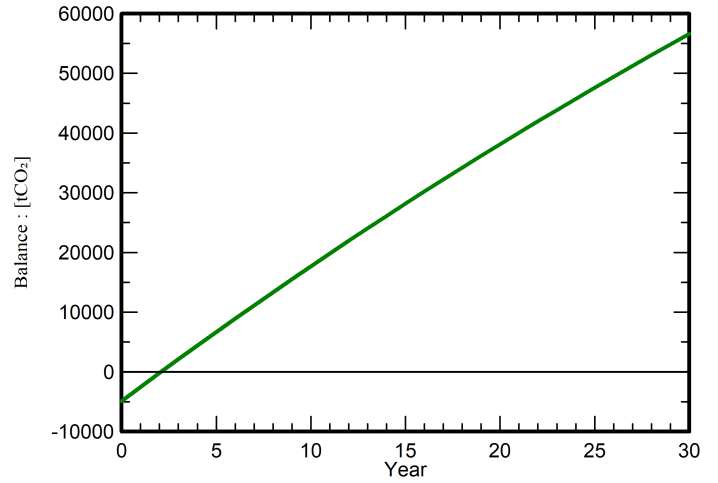
Source: IEA List

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	1250 kgCO ₂ /modules	3920 modules	4900996
Supports	2.82 kgCO ₂ /units	179 units	505
Inverters	280 kgCO ₂ /units	10.00 units	2795