



PROVINCIA
DI VITERBO



REGIONE
LAZIO



COMUNE DI
VITERBO

REALIZZAZIONE DI UN IMPIANTO AGRO-FOTOVOLTAICO AVANZATO CONNESSO ALLA R.T.N. TERNA DELLA POTENZA DI PICCO 65,292 MWp

Denominazione Impianto: IMPIANTO FOTOVOLTAICO "VITERBO 2"

Ubicazione: Comune di Viterbo

ELABORATO
02.VT2.DC.05

DOC.01.01.A

VALUTAZIONE PRESTAZIONI IMPIANTO



CLEAN ENERGY NATURALLY

Project - Commissioning - Consulting
CEN SRL
STRADA DI GUINZA GRANDE
1 INT. 2 CAP 01014
MONTALTO DI CASTRO (VT)

Scala:

Data:

12/06/23

PROGETTO

PRELIMINARE



DEFINITIVO



ESECUTIVO



Il Richiedente:

CCEN Viterbo 2 S.r.l.
PIAZZA WALTHER VON VOGELWEIDE 8
39100 BOLZANO
KANZLEI ROEDL & PARTNER
P IVA 03210110213

Tecnici:

Ing. Mauro Marchino - Albo Ingegneri Viterbo n° A666

Revisione	Data	Descrizione	Redatto	Approvato	Autorizzato
01	23/04/2024	Emissione	MARCHINO	MARCHINO	MARCHINO
02					
03					
04					

Firma Produttore

Firme

PVsyst - Simulation report

Grid-Connected System

Project: viterbo 2 sc1

Variant: Nuova variante di simulazione

Tracking system with backtracking

System power: 5506 kWp

Norchia - Italy

Author

Mauro Marchino (italy)



PVsyst V7.4.5

VCO, Simulation date:
 25/02/24 18:11
 with v7.4.5

Mauro Marchino (italy)

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italy		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		Tracking system with backtracking			
PV Field Orientation		Tracking algorithm		Near Shadings	
Orientation		Astronomic calculation		Linear shadings : Fast (table)	
Tracking plane, tilted axis		Backtracking activated		Diffuse shading Automatic	
Avg axis tilt	-0.3 °				
Avg axis azim.	-36.6 °				
System information					
PV Array					
Nb. of modules	8280 units	Inverters		Nb. of units 19 units	
Pnom total	5506 kWp	Pnom total		5700 kWac	
		Pnom ratio		0.966	
User's needs					
Unlimited load (grid)					

Results summary

Produced Energy	10333452 kWh/year	Specific production	1877 kWh/kWp/year	Perf. Ratio PR	94.27 %
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Near shading definition - Iso-shadings diagram	6
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Single-line diagram	10

**PVsyst V7.4.5**

VCO, Simulation date:
25/02/24 18:11
with v7.4.5

Mauro Marchino (italy)

General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Tracking plane, tilted axis
Avg axis tilt -0.3 °
Avg axis azim. -36.6 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 1.1 °

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 8.99 m
Tracker width 2.74 m
GCR 30.5 %
Axis height above ground 2.10 m

Tracking system with backtracking**Tracking algorithm**

Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings : Fast (table)
Diffuse shading Automatic

Backtracking array

Nb. of trackers 405 units
Identical arrays

Sizes

Tracker Spacing 8.99 m
Collector width 2.74 m
Ground Cov. Ratio (GCR) 30.5 %
Phi min / max. -/+ 60.0 °

Backtracking strategy

Phi limits for BT -/+ 72.1 °
Backtracking pitch 8.99 m
Backtracking width 2.74 m
Mode Automatic

User's needs

Unlimited load (grid)

Bifacial model definitions

Ground albedo 0.30
Bifaciality factor 72 %
Rear shading factor 5.0 %
Rear mismatch loss 10.0 %
Shed transparent fraction 0.0 %

PV Array Characteristics**PV module**

Manufacturer Trina Solar
Model TSM-DEG21C-20-665Wp Vertex
(Original PVsyst database)

Unit Nom. Power 665 Wp
Number of PV modules 8280 units
Nominal (STC) 5506 kWp
Modules 345 string x 24 In series

At operating cond. (50°C)

Pmpp 5045 kWp
U mpp 834 V
I mpp 6051 A

Total PV power

Nominal (STC) 5506 kWp
Total 8280 modules
Module area 25721 m²

Inverter

Manufacturer Huawei Technologies
Model SUN2000-330KTL-H1-Preliminary V0.1
(Custom parameters definition)

Unit Nom. Power 300 kWac
Number of inverters 19 units
Total power 5700 kWac
Operating voltage 500-1500 V
Max. power (=>30°C) 330 kWac
Pnom ratio (DC:AC) 0.97
Power sharing within this inverter

Total inverter power

Total power 5700 kWac
Max. power 6270 kWac
Number of inverters 19 units
Pnom ratio 0.97



PVsyst V7.4.5

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with v7.4.5

Array losses

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. 2.3 mΩ
Loss Fraction 1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 0.3 % 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



Horizon definition

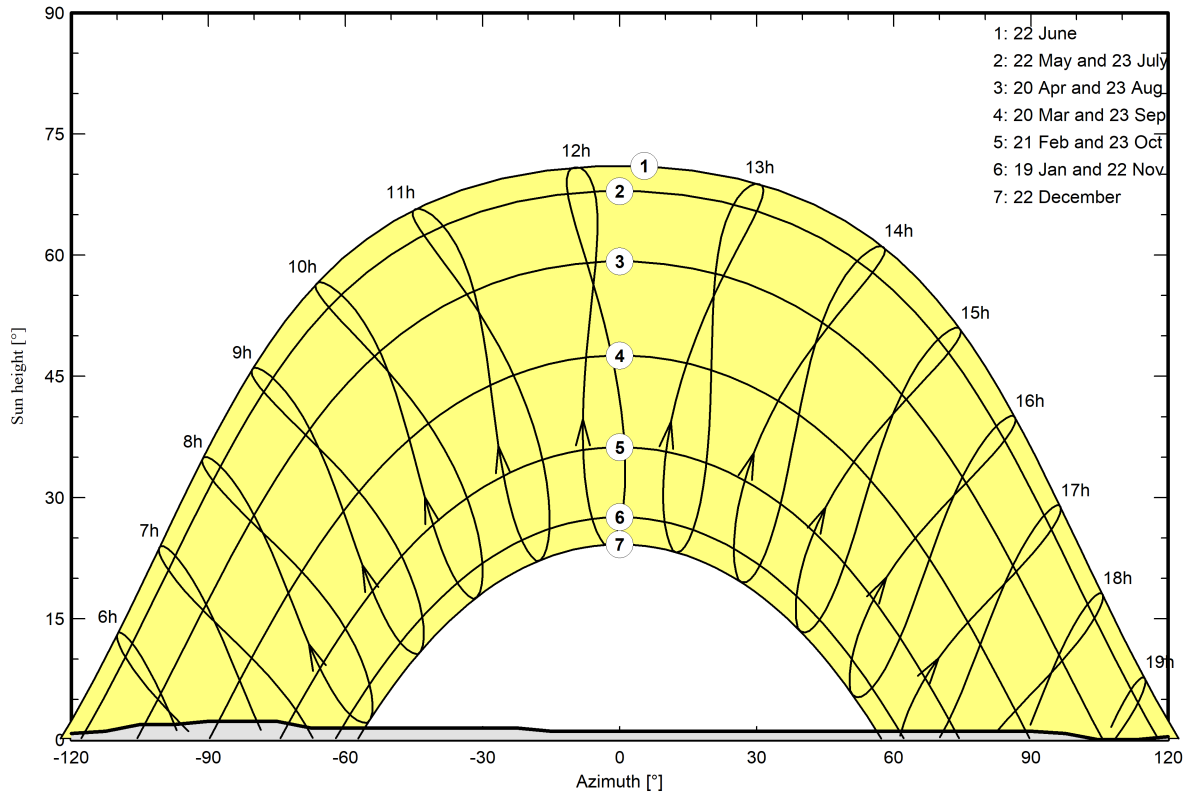
Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

Average Height	1.1 °	Albedo Factor	0.95
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

Sun Paths (Height / Azimuth diagram)

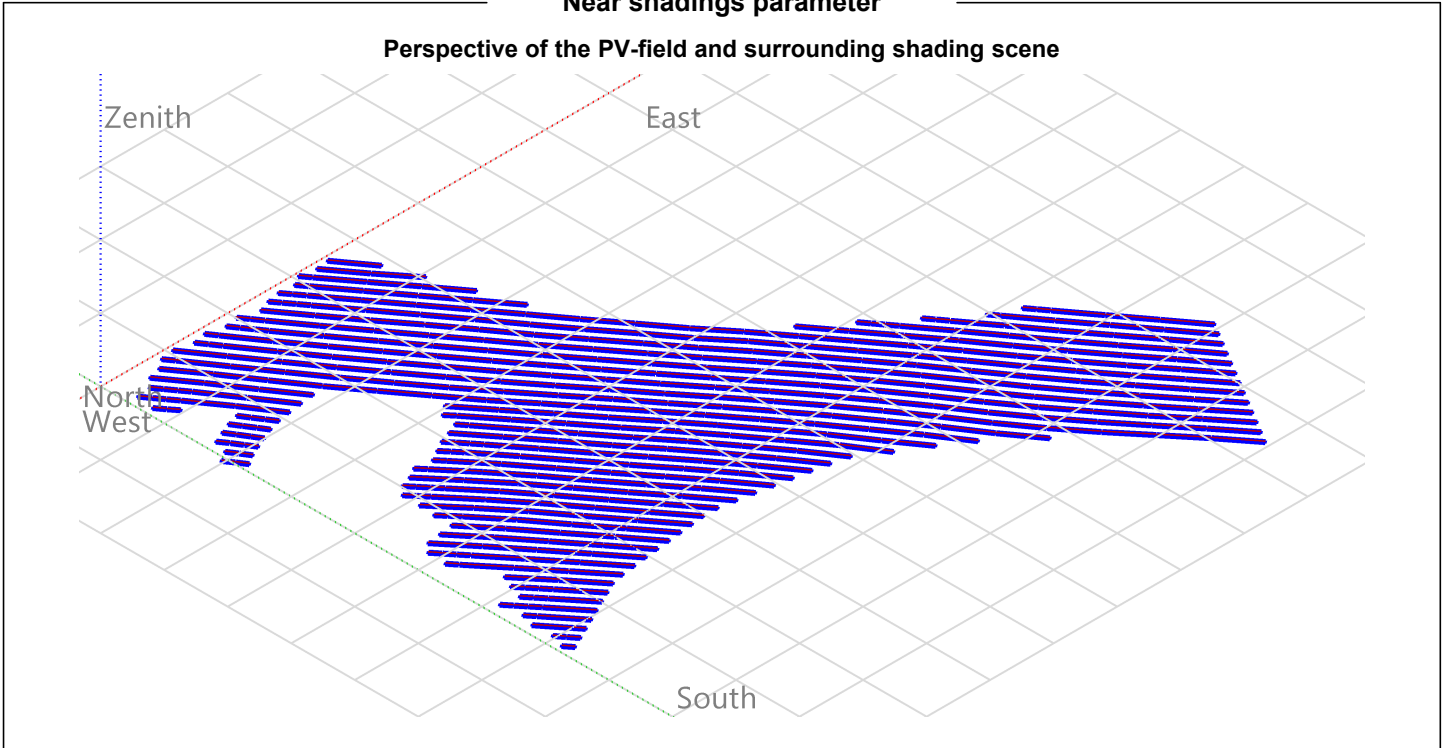




PVsyst V7.4.5

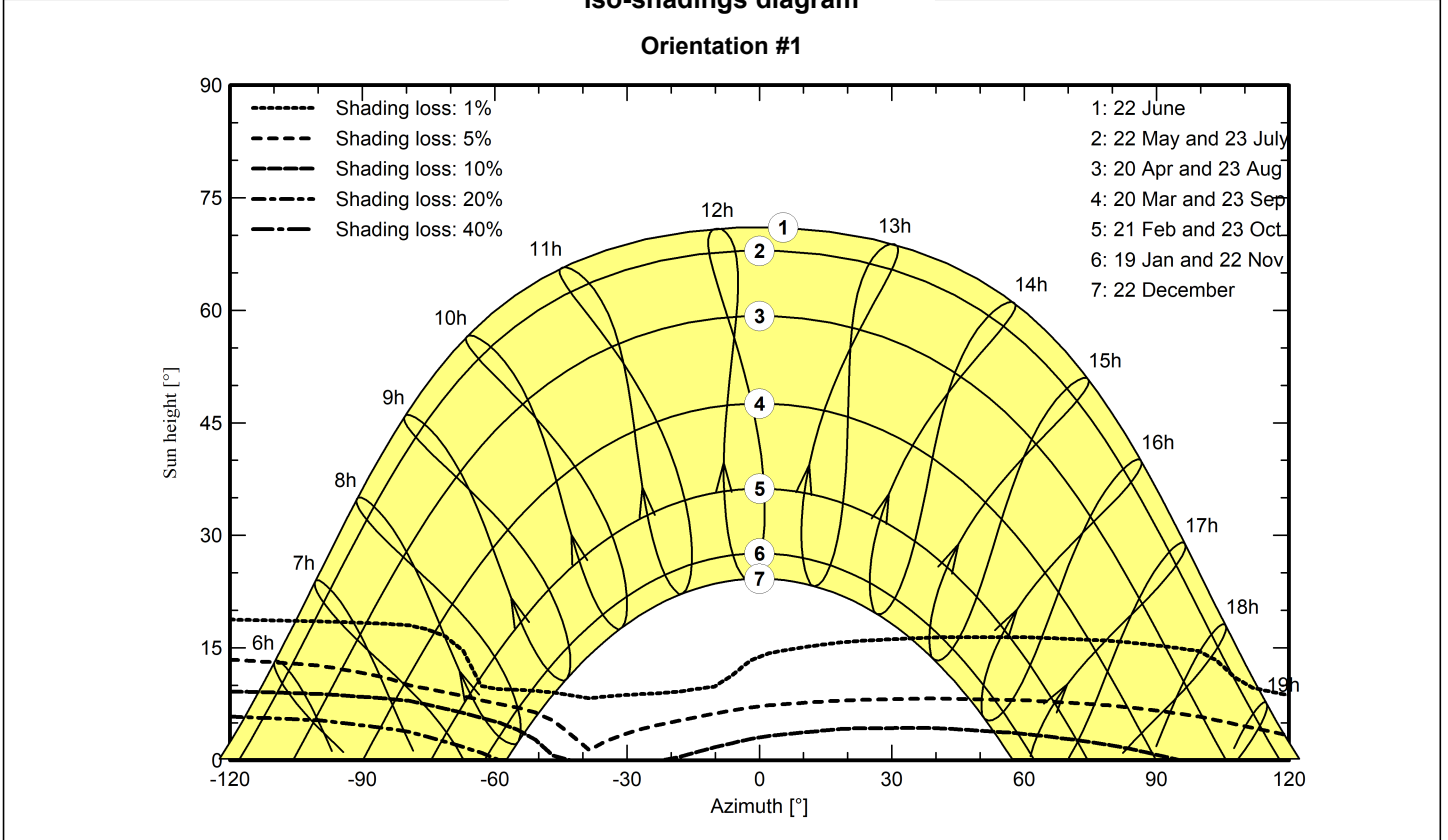
VC0, Simulation date:
25/02/24 18:11
with v7.4.5

Near shadings parameter



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy 10333452 kWh/year

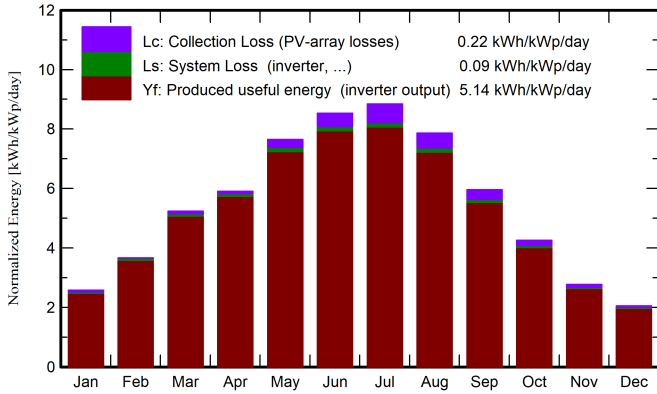
Specific production

1877 kWh/kWp/year

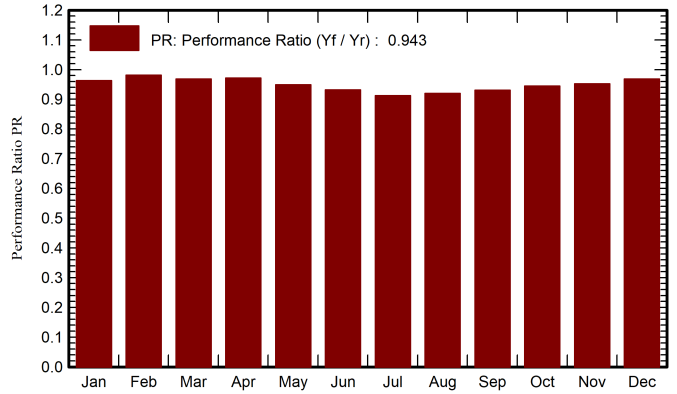
Perf. Ratio PR

94.27 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

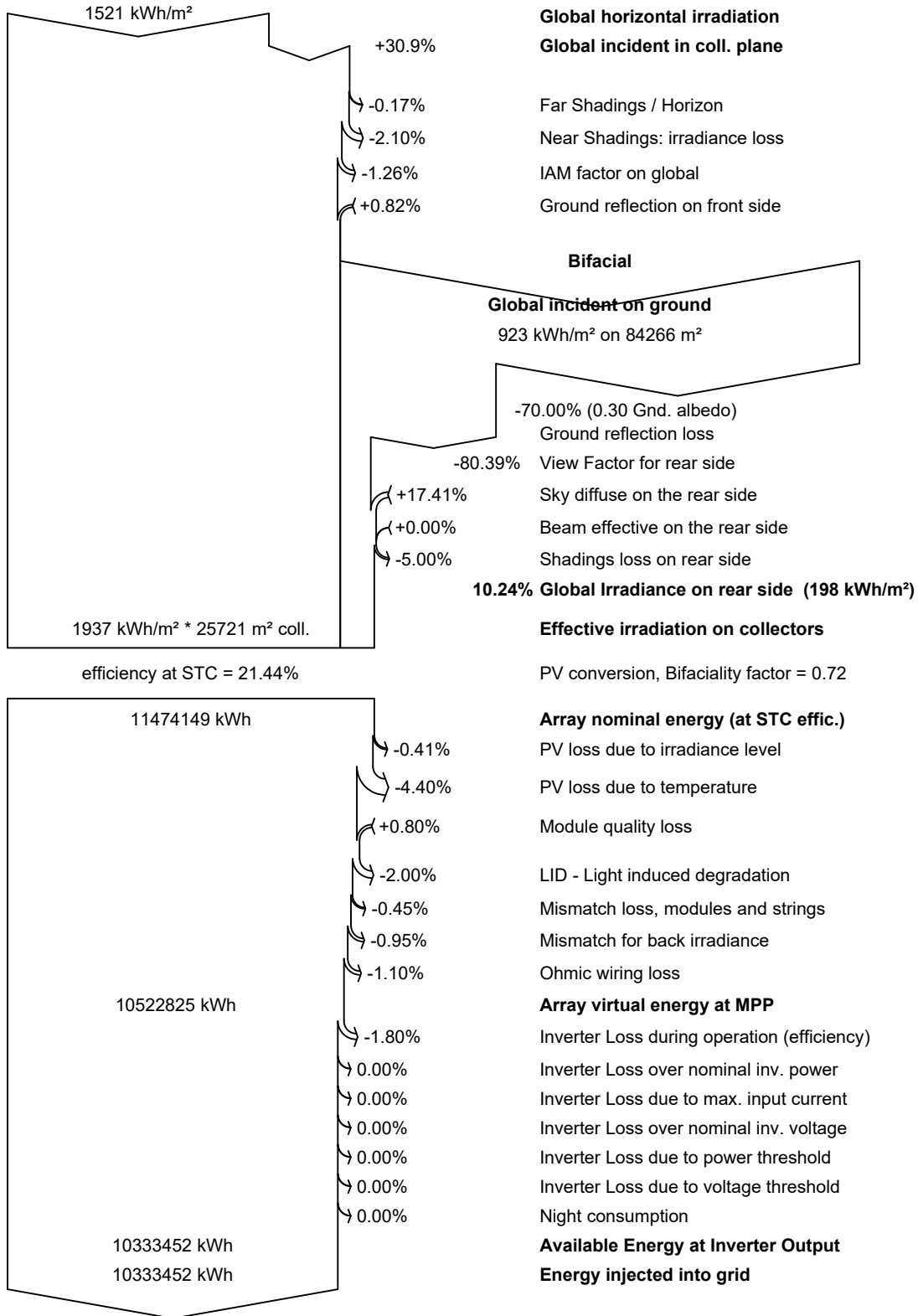
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_Grid kWh	PR ratio
January	53.2	23.51	7.29	79.9	75.8	431518	423437	0.963
February	73.1	35.29	8.18	102.6	99.0	564353	554245	0.981
March	121.1	50.30	11.12	162.4	157.8	881946	866145	0.969
April	145.0	72.00	14.38	177.2	172.4	965144	947840	0.972
May	190.6	81.52	18.64	237.1	231.6	1260994	1238430	0.949
June	206.0	80.87	23.28	256.1	251.0	1337221	1313294	0.931
July	214.9	68.32	26.40	274.3	269.1	1403710	1378517	0.913
August	188.9	72.65	26.14	243.9	238.8	1256902	1234687	0.919
September	134.3	51.32	21.17	178.6	173.8	932464	915711	0.931
October	93.8	41.79	17.33	132.1	127.9	699589	686976	0.944
November	56.2	26.25	12.27	83.2	79.7	444468	436162	0.952
December	44.0	24.75	8.54	63.4	59.9	344517	338007	0.968
Year	1521.1	628.56	16.28	1990.7	1936.9	10522825	10333452	0.943

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		



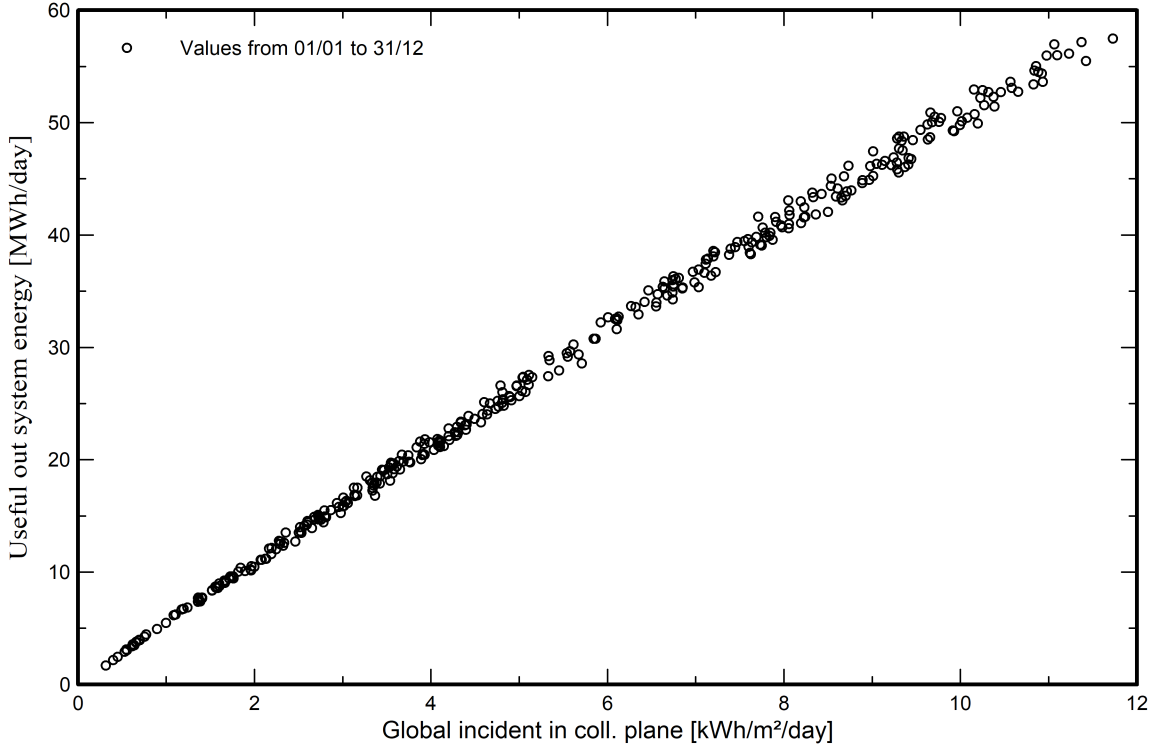
Loss diagram



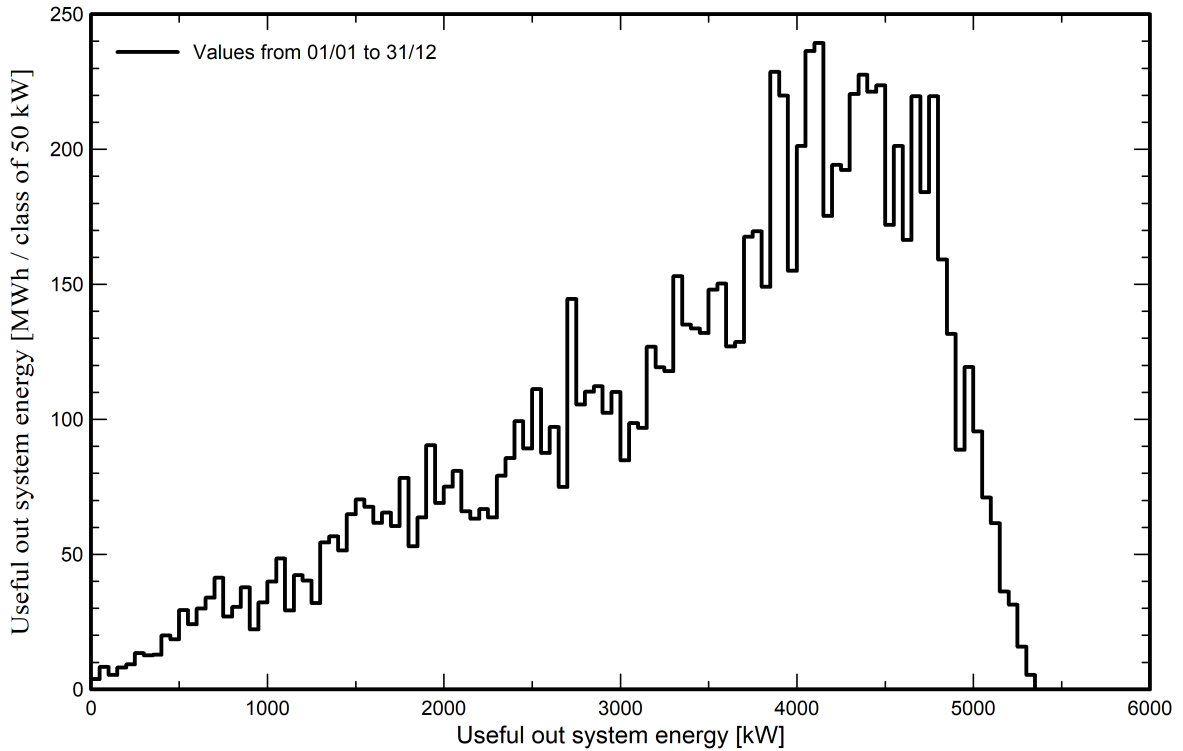


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

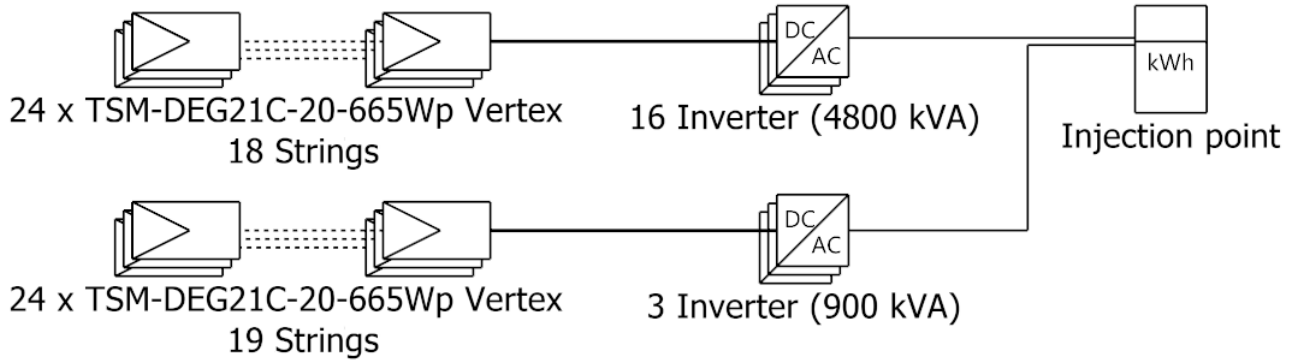




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VC0, Simulation date:
25/02/24 18:11
with v7.4.5

Single-line diagram



PV module	TSM-DEG21C-20-665Wp Vertex
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	24 x TSM-DEG21C-20-665Wp Vertex

viterbo 2 sc1

Mauro Marchino (it aly)

VC0 : Nuova variante di simulazione

25/02/24

PVsyst - Simulation report

Grid-Connected System

Project: Viterbo 2 sc2

Variant: Nuova variante di simulazione

Tracking system with backtracking

System power: 14.14 MWp

Norchia - Italy

Author

Mauro Marchino (italy)



Project: Viterbo 2 sc2

Variant: Nuova variante di simulazione

Mauro Marchino (italy)

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 18:09
with v7.4.5

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italy		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		Tracking system with backtracking			
PV Field Orientation		Tracking algorithm		Near Shadings	
Orientation		Astronomic calculation		Linear shadings : Fast (table)	
Tracking plane, tilted axis		Backtracking activated		Diffuse shading Automatic	
Avg axis tilt	-0.9 °				
Avg axis azim.	0 °				
System information					
PV Array					
Nb. of modules	21264 units	Inverters		Nb. of units 45 units	
Pnom total	14.14 MWp	Pnom total		13.50 MWac	
		Pnom ratio		1.047	
User's needs					
Unlimited load (grid)					

Results summary

Produced Energy	25484796 kWh/year	Specific production	1802 kWh/kWp/year	Perf. Ratio PR	91.05 %
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PVsyst V7.4.5

VCO, Simulation date:
25/02/24 18:09
with v7.4.5

Mauro Marchino (italy)

General parameters

Grid-Connected System

PV Field Orientation

Orientation

Tracking plane, tilted axis
Avg axis tilt -0.9 °
Avg axis azim. 0 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 1.1 °

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 12.00 m
Tracker width 4.79 m
GCR 39.9 %
Axis height above ground 2.10 m

Tracking system with backtracking

Tracking algorithm

Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings : Fast (table)
Diffuse shading Automatic

Backtracking array

Nb. of trackers 886 units

Sizes

Tracker Spacing 12.0 m
Collector width 4.79 m
Ground Cov. Ratio (GCR) 39.9 %
Phi min / max. +/- 60.0 °

Backtracking strategy

Phi limits for BT +/- 66.4 °
Backtracking pitch 12.0 m
Backtracking width 4.79 m
Mode Automatic

User's needs

Unlimited load (grid)

Bifacial model definitions

Ground albedo 0.30
Bifaciality factor 72 %
Rear shading factor 5.0 %
Rear mismatch loss 10.0 %
Shed transparent fraction 0.0 %

PV Array Characteristics

PV module

Manufacturer Trina Solar
Model TSM-DEG21C-20-665Wp Vertex
(Original PVsyst database)

Unit Nom. Power 665 Wp
Number of PV modules 21264 units
Nominal (STC) 14.14 MWp
Modules 886 string x 24 In series

At operating cond. (50°C)

Pmpp 12.96 MWp
U mpp 834 V
I mpp 15540 A

Total PV power

Nominal (STC) 14141 kWp
Total 21264 modules
Module area 66053 m²

Inverter

Manufacturer Huawei Technologies
Model SUN2000-330KTL-H1-Preliminary V0.1
(Custom parameters definition)

Unit Nom. Power 300 kWac
Number of inverters 45 units
Total power 13500 kWac
Operating voltage 500-1500 V
Max. power (=>30°C) 330 kWac
Pnom ratio (DC:AC) 1.05
Power sharing within this inverter

Total inverter power

Total power 13500 kWac
Max. power 14850 kWac
Number of inverters 45 units
Pnom ratio 1.05



PVsyst V7.4.5

VC0, Simulation date:
25/02/24 18:09
with v7.4.5

Array losses

Array Soiling Losses

Loss Fraction 0.5 %

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. 0.88 mΩ

Loss Fraction 1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 0.3 % 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



Project: Viterbo 2 sc2

Variant: Nuova variante di simulazione

Mauro Marchino (italy)

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 18:09
with v7.4.5

Horizon definition

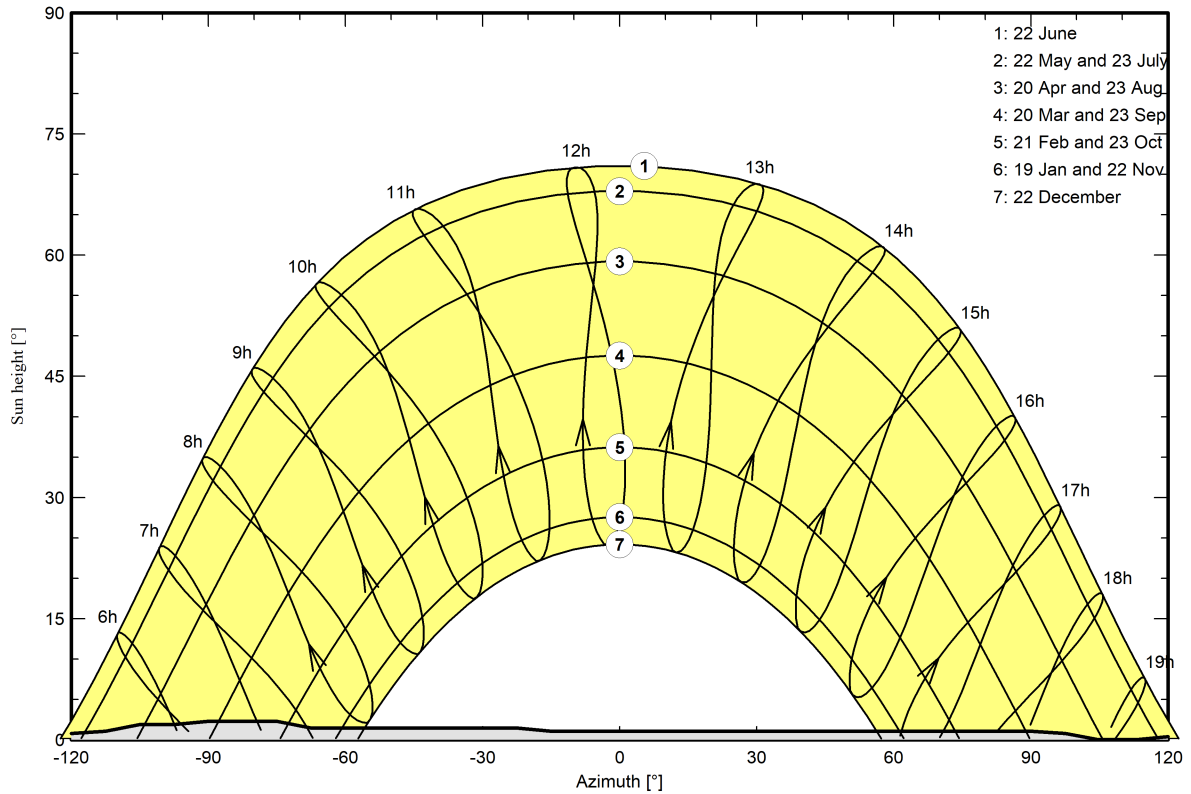
Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

Average Height	1.1 °	Albedo Factor	0.96
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

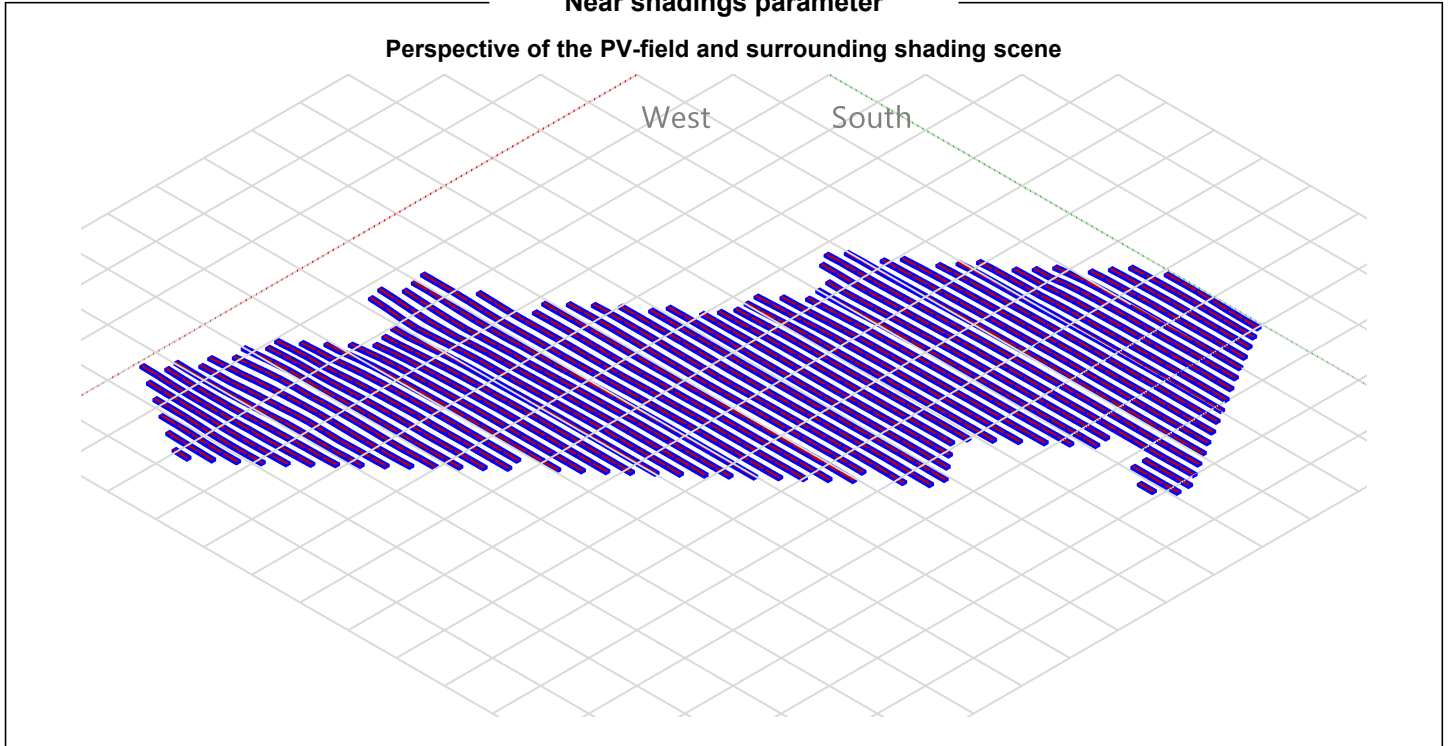
Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

Sun Paths (Height / Azimuth diagram)



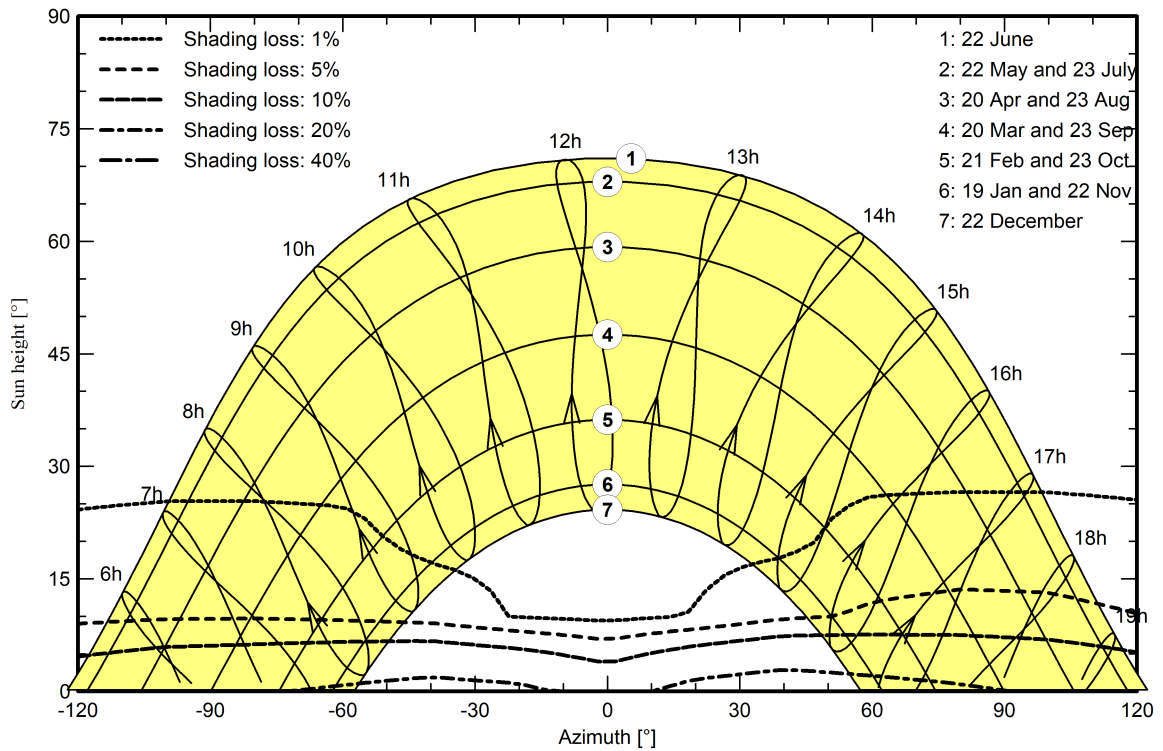


Near shadings parameter



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy 25484796 kWh/year

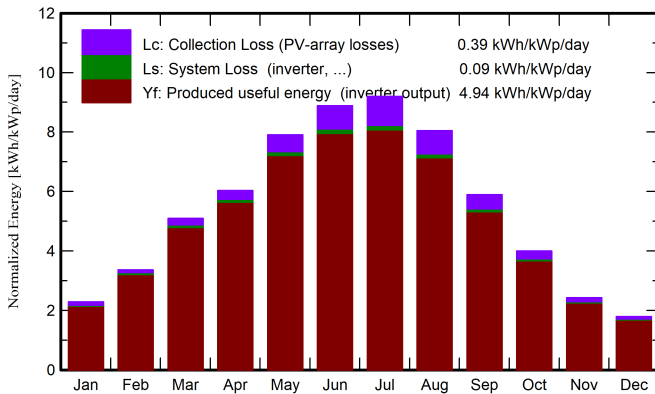
Specific production

1802 kWh/kWp/year

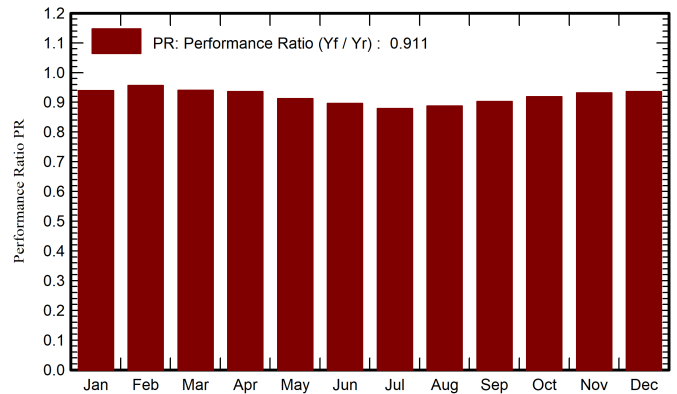
Perf. Ratio PR

91.05 %

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	53.2	23.51	7.29	70.8	65.9	957199	939554	0.939
February	73.1	35.29	8.18	94.2	89.4	1297026	1274060	0.957
March	121.1	50.30	11.12	158.0	151.4	2141037	2102663	0.941
April	145.0	72.00	14.38	180.9	174.0	2437897	2393759	0.936
May	190.6	81.52	18.64	245.1	236.9	3220618	3162130	0.912
June	206.0	80.87	23.28	266.6	258.6	3440877	3378406	0.896
July	214.9	68.32	26.40	285.1	276.9	3607821	3541948	0.879
August	188.9	72.65	26.14	249.5	241.7	3187735	3130704	0.887
September	134.3	51.32	21.17	176.9	170.0	2297861	2256417	0.902
October	93.8	41.79	17.33	123.9	117.9	1639183	1609774	0.919
November	56.2	26.25	12.27	72.7	68.3	976312	958334	0.932
December	44.0	24.75	8.54	55.7	51.3	751239	737047	0.936
Year	1521.1	628.56	16.28	1979.3	1902.4	25954805	25484796	0.911

Legends

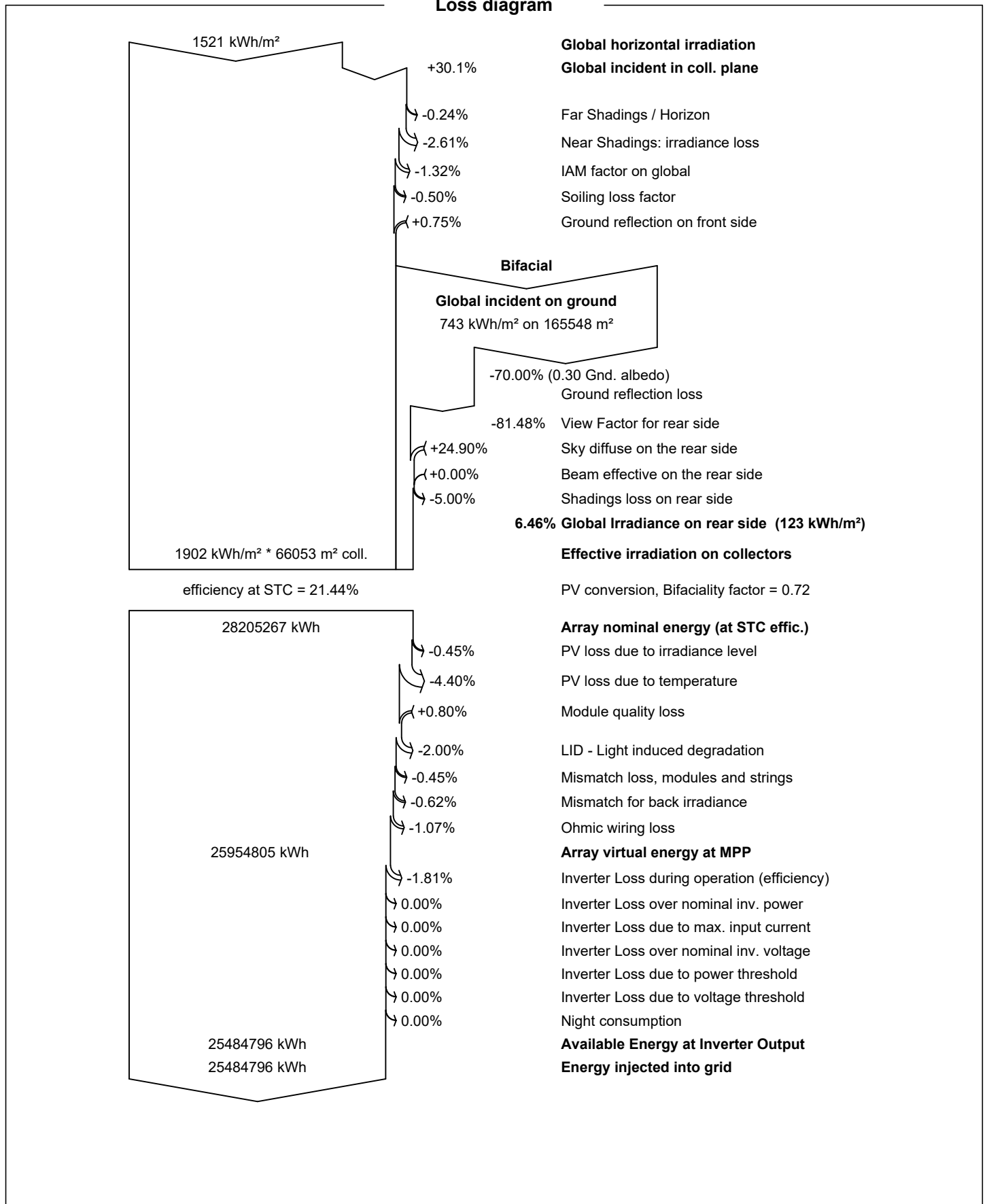
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



PVsyst V7.4.5

VC0, Simulation date:
25/02/24 18:09
with v7.4.5

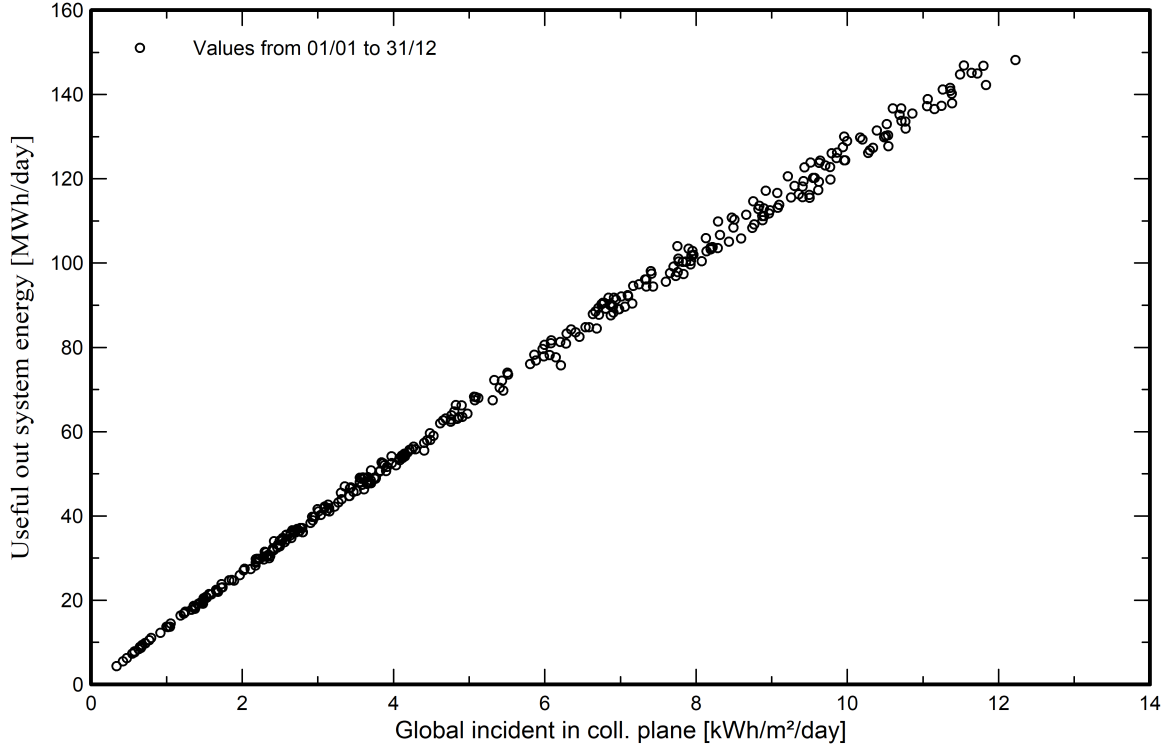
Loss diagram



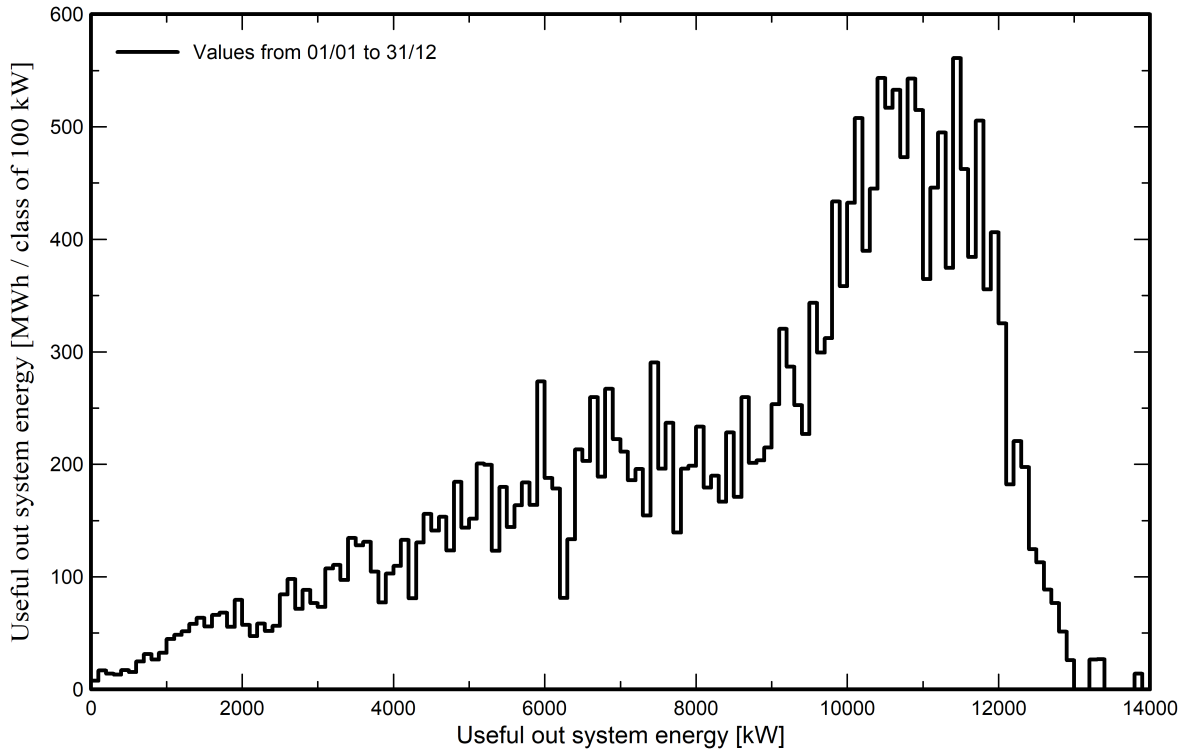


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

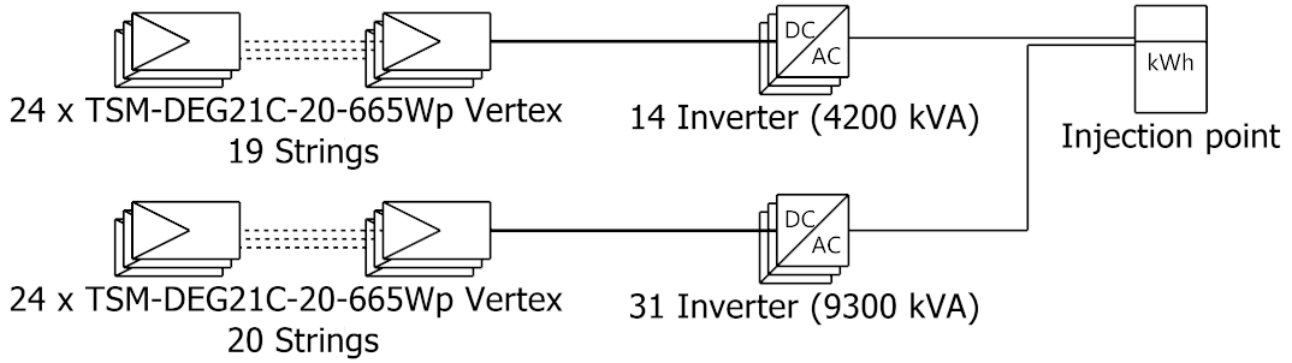




PVsyst V7.4.5

VC0, Simulation date:
25/02/24 18:09
with v7.4.5

Single-line diagram



PV module	TSM-DEG21C-20-665Wp Vertex
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	24 x TSM-DEG21C-20-665Wp Vertex

Viterbo 2 sc2

Mauro Marchino (italy)

VC0 : Nuova variante di simulazione

25/02/24

PVsyst - Simulation report

Grid-Connected System

Project: viterbo 2 - sc3

Variant: Nuova variante di simulazione

No 3D scene defined, no shadings

System power: 8459 kWp

Norchia - Italia

Author

Mauro Marchino (italy)



Project: viterbo 2 - sc3

Variant: Nuova variante di simulazione

Mauro Marchino (italy)

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 11:50
with v7.4.5

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italia		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		No 3D scene defined, no shadings			
PV Field Orientation		Near Shadings		User's needs	
Fixed plane		No Shadings		Unlimited load (grid)	
Tilt/Azimuth	15 / -23 °				
System information					
PV Array					
Nb. of modules	12720 units	Inverters		27 units	
Pnom total	8459 kWp	Nb. of units		8100 kWac	
		Pnom total		1.044	
		Pnom ratio			

Results summary

Produced Energy	12549777 kWh/year	Specific production	1484 kWh/kWp/year	Perf. Ratio PR	88.81 %
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**PVsyst V7.4.5**

VC0, Simulation date:
25/02/24 11:50
with v7.4.5

Mauro Marchino (italy)

General parameters**Grid-Connected System****No 3D scene defined, no shadings****PV Field Orientation****Orientation**

Fixed plane

Tilt/Azimuth 15 / -23 °

Sheds configuration

No 3D scene defined

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Average Height 1.1 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer

Trina Solar

Model

TSM-DEG21C-20-665Wp Vertex

(Original PVsyst database)

Unit Nom. Power

665 Wp

Number of PV modules

12720 units

Nominal (STC)

8459 kWp

Modules

530 string x 24 In series

At operating cond. (50°C)

Pmpp

7751 kWp

U mpp

834 V

I mpp

9296 A

Total PV power

Nominal (STC)

8459 kWp

Total

12720 modules

Module area

39513 m²**Inverter**

Manufacturer

Huawei Technologies

Model

SUN2000-330KTL-H1-Preliminary V0.1

(Custom parameters definition)

Unit Nom. Power

300 kWac

Number of inverters

27 units

Total power

8100 kWac

Operating voltage

500-1500 V

Max. power (=>30°C)

330 kWac

Pnom ratio (DC:AC)

1.04

Power sharing within this inverter

Total inverter power

Total power

8100 kWac

Max. power

8910 kWac

Number of inverters

27 units

Pnom ratio

1.04

Array losses**Thermal Loss factor**

Module temperature according to irradiance

Uc (const) 29.0 W/m²KUv (wind) 0.0 W/m²K/m/s**DC wiring losses**

Global array res.

1.5 mΩ

Loss Fraction

1.5 % at STC

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



PVsyst V7.4.5

VCO, Simulation date: 25/02/24 11:50 with v7.4.5

Mauro Marchino (italy)

Horizon definition

Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

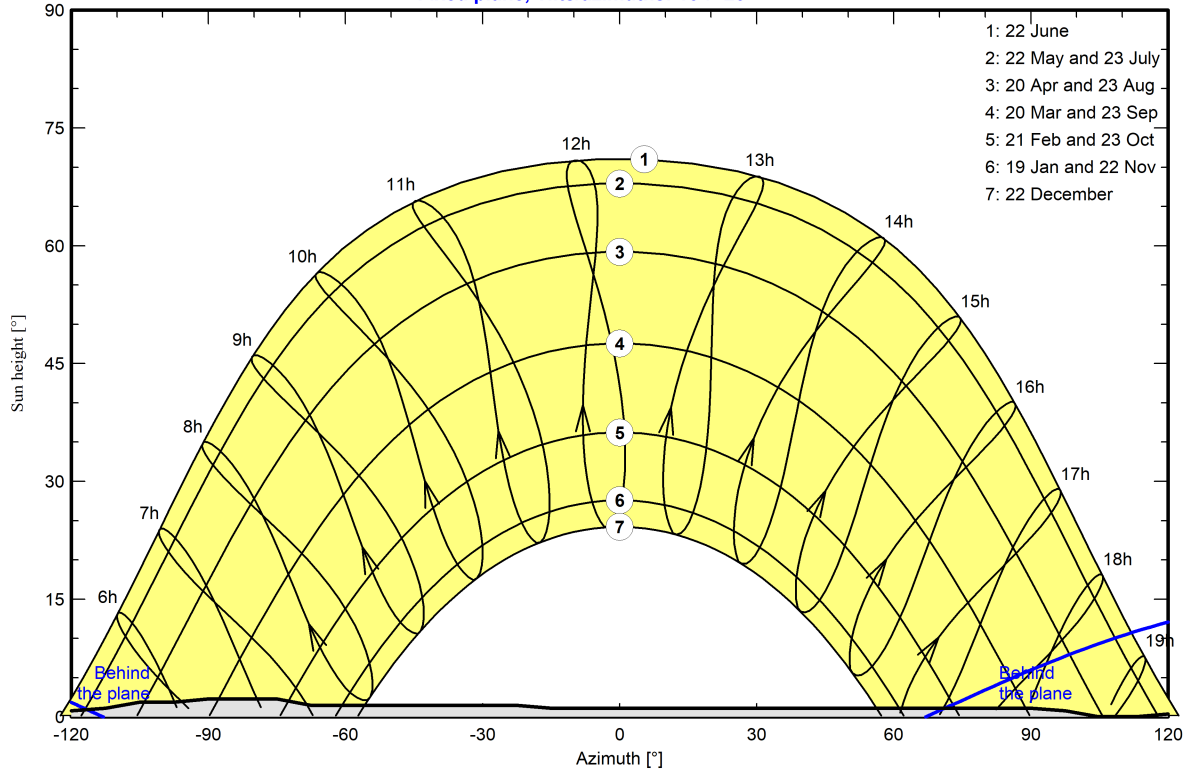
Average Height	1.1 °	Albedo Factor	0.93
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

Sun Paths (Height / Azimuth diagram)

Fixed plane, Tilts/azimuths: 15°/-23°





Main results

System Production

Produced Energy 12549777 kWh/year

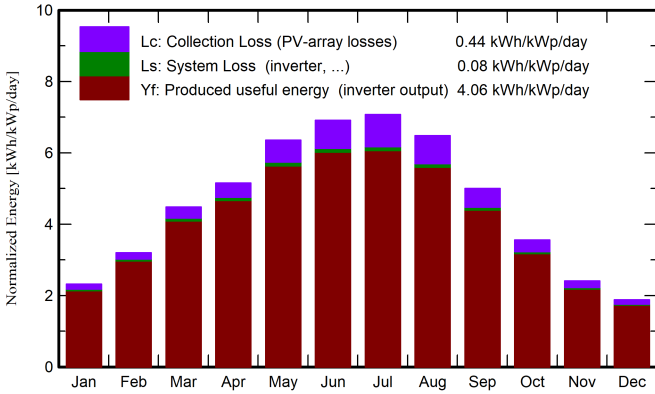
Specific production

1484 kWh/kWp/year

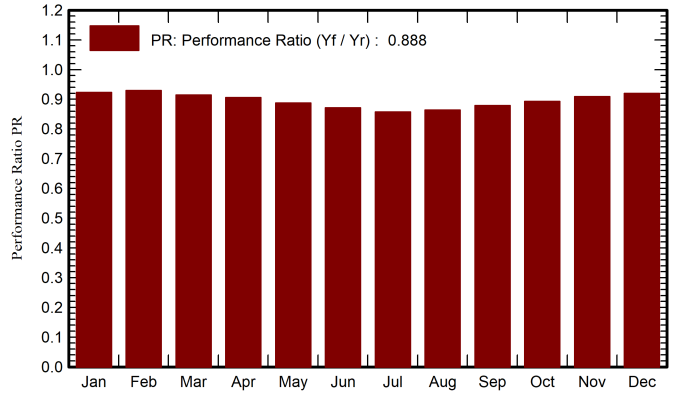
Perf. Ratio PR

88.81 %

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	53.2	23.51	7.29	71.9	69.0	572462	561785	0.924
February	73.1	35.29	8.18	89.5	86.7	716430	703592	0.929
March	121.1	50.30	11.12	138.9	135.0	1094143	1074365	0.915
April	145.0	72.00	14.38	154.7	150.7	1206961	1185070	0.906
May	190.6	81.52	18.64	197.0	192.1	1506124	1478832	0.887
June	206.0	80.87	23.28	207.4	202.3	1556234	1527988	0.871
July	214.9	68.32	26.40	219.3	214.1	1620300	1590782	0.858
August	188.9	72.65	26.14	200.9	196.1	1495270	1468509	0.864
September	134.3	51.32	21.17	150.2	146.0	1136522	1115918	0.879
October	93.8	41.79	17.33	110.3	106.7	848967	833512	0.893
November	56.2	26.25	12.27	72.2	69.5	565683	555139	0.909
December	44.0	24.75	8.54	58.3	55.9	463008	454286	0.920
Year	1521.1	628.56	16.28	1670.6	1624.1	12782104	12549777	0.888

Legends

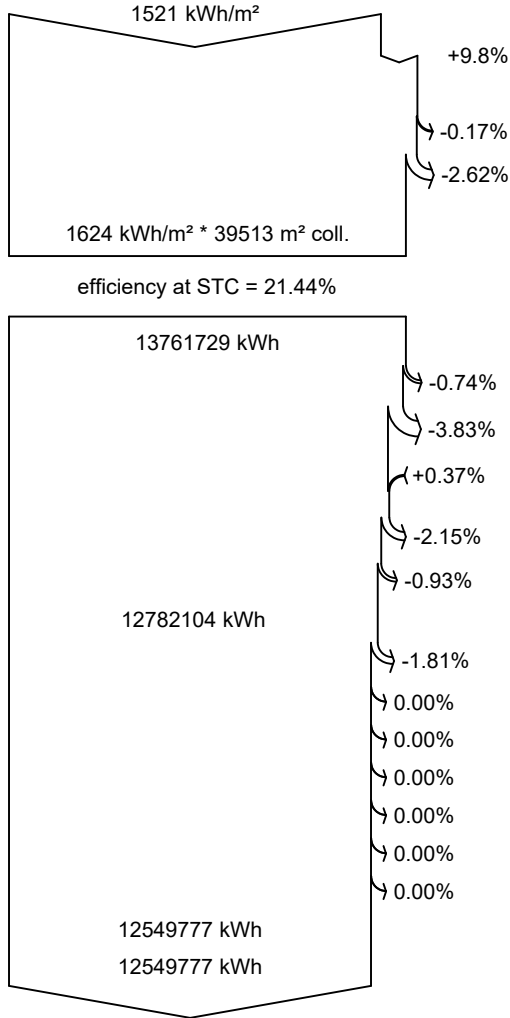
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
- GlobEff Effective Global, corr. for IAM and shadings
- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



PVsyst V7.4.5

VCO, Simulation date:
25/02/24 11:50
with v7.4.5

Loss diagram

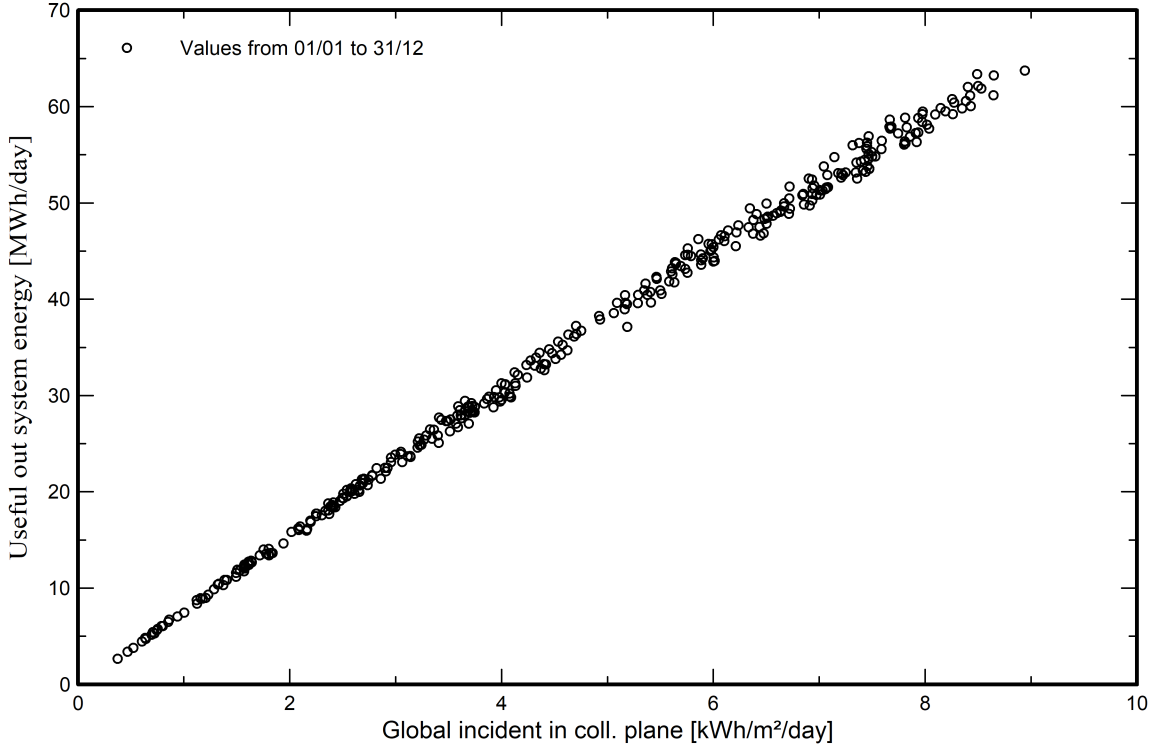


- Global horizontal irradiation**
- Global incident in coll. plane**
- Far Shadings / Horizon
- IAM factor on global
- Effective irradiation on collectors**
- PV conversion
- Array nominal energy (at STC effic.)**
- PV loss due to irradiance level
- PV loss due to temperature
- Module quality loss
- 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**
- Energy injected into grid**

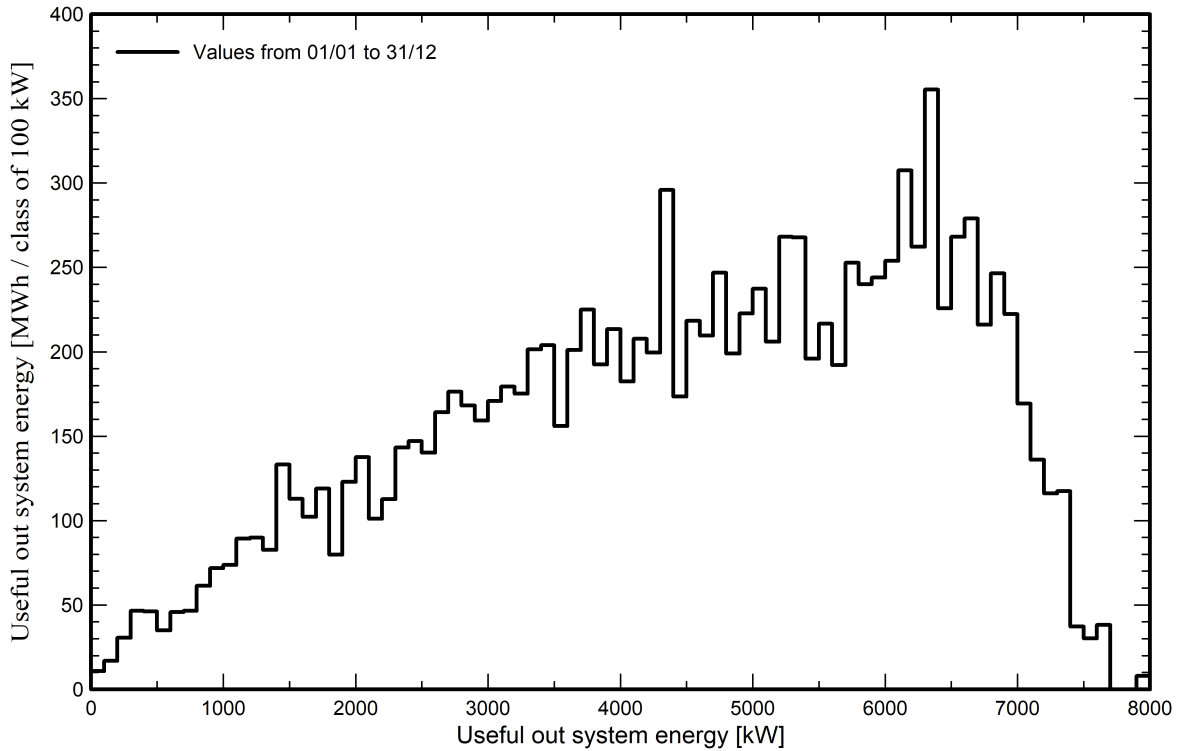


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

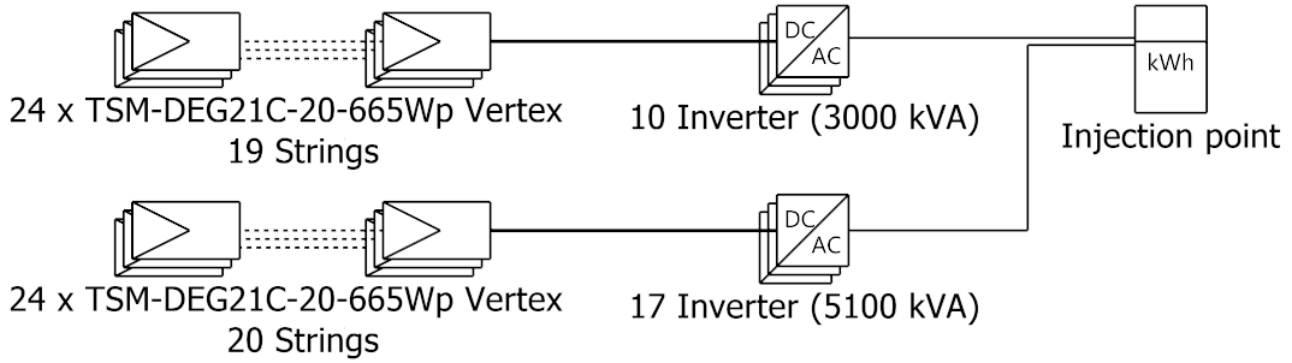




PVsyst V7.4.5

VC0, Simulation date:
25/02/24 11:50
with v7.4.5

Single-line diagram



PV module	TSM-DEG21C-20-665Wp Vertex
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	24 x TSM-DEG21C-20-665Wp Vertex

viterbo 2 - sc3

Mauro Marchino (it
aly)

VC0 : Nuova variante di simulazione

25/02/24

PVsyst - Simulation report

Grid-Connected System

Project: viterbo 2 - sc4 SC5

Variant: Nuova variante di simulazione

No 3D scene defined, no shadings

System power: 5171 kWp

Norchia - Italy

Author

Mauro Marchino (italy)



Project: viterbo 2 - sc4 SC5

Variant: Nuova variante di simulazione

Mauro Marchino (italy)

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 11:57
with v7.4.5

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italy		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		No 3D scene defined, no shadings			
PV Field Orientation		Near Shadings		User's needs	
Fixed plane		No Shadings		Unlimited load (grid)	
Tilt/Azimuth	15 / -23 °				
System information					
PV Array					
Nb. of modules	7776 units	Inverters		16 units	
Pnom total	5171 kWp	Nb. of units		4800 kWac	
		Pnom total		1.077	
		Pnom ratio			

Results summary

Produced Energy	7481447 kWh/year	Specific production	1447 kWh/kWp/year	Perf. Ratio PR	86.60 %
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**PVsyst V7.4.5**

VC0, Simulation date:
25/02/24 11:57
with v7.4.5

Mauro Marchino (italy)

General parameters**Grid-Connected System****No 3D scene defined, no shadings****PV Field Orientation****Orientation**

Fixed plane

Tilt/Azimuth 15 / -23 °

Sheds configuration

No 3D scene defined

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Average Height 1.1 °

Near Shadings

No Shadings

User's needs

Unlimited load (grid)

PV Array Characteristics**PV module**

Manufacturer

Trina Solar

Model

TSM-DEG21C-20-665Wp Vertex

(Original PVsyst database)

Unit Nom. Power

665 Wp

Number of PV modules

7776 units

Nominal (STC)

5171 kWp

Modules

324 string x 24 In series

At operating cond. (50°C)

Pmpp

4738 kWp

U mpp

834 V

I mpp

5683 A

Total PV power

Nominal (STC)

5171 kWp

Total

7776 modules

Module area

24155 m²**Inverter**

Manufacturer

Huawei Technologies

Model

SUN2000-330KTL-H1-Preliminary V0.1

(Custom parameters definition)

Unit Nom. Power

300 kWac

Number of inverters

16 units

Total power

4800 kWac

Operating voltage

500-1500 V

Max. power (=>30°C)

330 kWac

Pnom ratio (DC:AC)

1.08

Power sharing within this inverter

Total inverter power

Total power

4800 kWac

Max. power

5280 kWac

Number of inverters

16 units

Pnom ratio

1.08

Array losses**Thermal Loss factor**

Module temperature according to irradiance

Uc (const) 20.0 W/m²KUv (wind) 0.0 W/m²K/m/s**DC wiring losses**

Global array res.

2.4 mΩ

Loss Fraction

1.5 % at STC

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



PVsyst V7.4.5

VCO, Simulation date:
25/02/24 11:57
with v7.4.5

Mauro Marchino (italy)

Horizon definition

Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

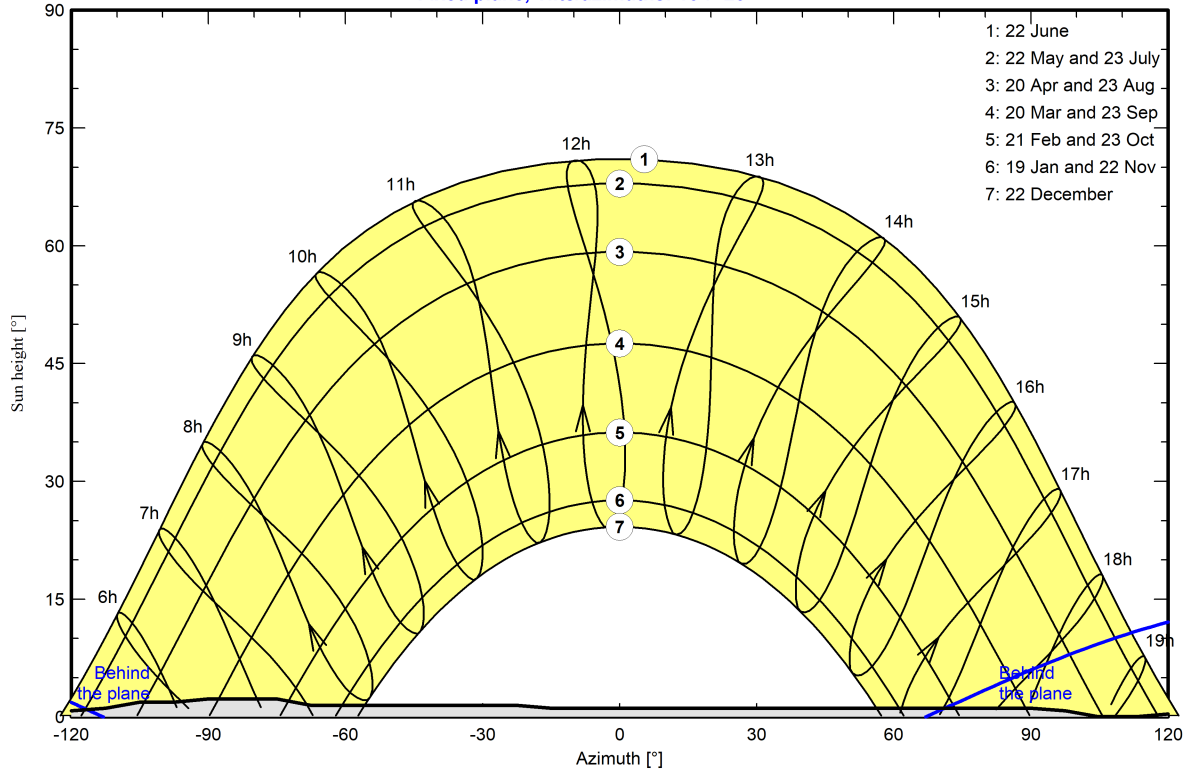
Average Height	1.1 °	Albedo Factor	0.93
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

Sun Paths (Height / Azimuth diagram)

Fixed plane, Tilts/azimuths: 15° / -23°





PVsyst V7.4.5

VC0, Simulation date:
 25/02/24 11:57
 with v7.4.5

Mauro Marchino (italy)

Main results

System Production

Produced Energy 7481447 kWh/year

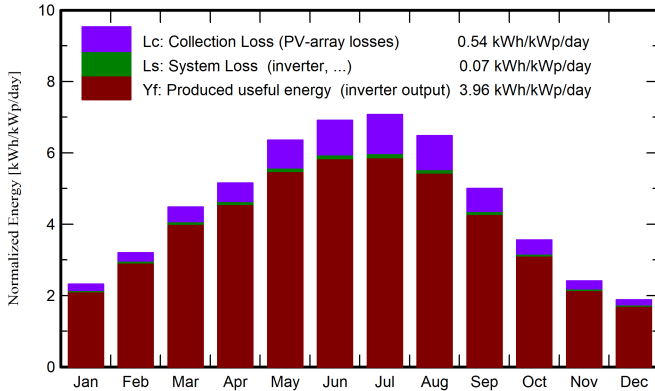
Specific production

1447 kWh/kWp/year

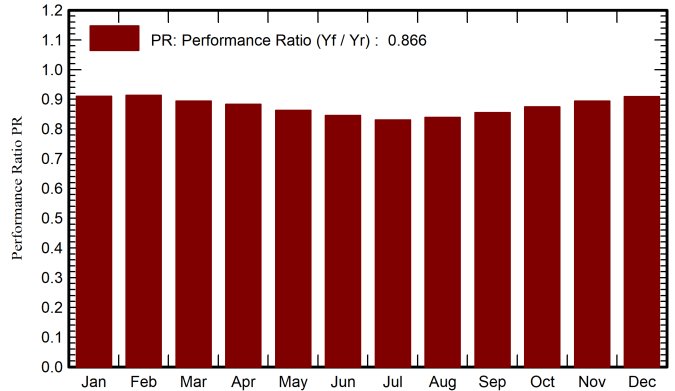
Perf. Ratio PR

86.60 %

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	53.2	23.51	7.29	71.9	69.0	344691	338270	0.910
February	73.1	35.29	8.18	89.5	86.7	430346	422637	0.913
March	121.1	50.30	11.12	138.9	135.0	653731	641929	0.894
April	145.0	72.00	14.38	154.7	150.7	720056	707018	0.884
May	190.6	81.52	18.64	197.0	192.1	895563	879363	0.863
June	206.0	80.87	23.28	207.4	202.3	923490	906756	0.845
July	214.9	68.32	26.40	219.3	214.1	959229	941788	0.830
August	188.9	72.65	26.14	200.9	196.1	887747	871882	0.839
September	134.3	51.32	21.17	150.2	146.0	676721	664474	0.856
October	93.8	41.79	17.33	110.3	106.7	508408	499169	0.875
November	56.2	26.25	12.27	72.2	69.5	340214	333886	0.894
December	44.0	24.75	8.54	58.3	55.9	279525	274274	0.909
Year	1521.1	628.56	16.28	1670.6	1624.1	7619720	7481447	0.866

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 | | |

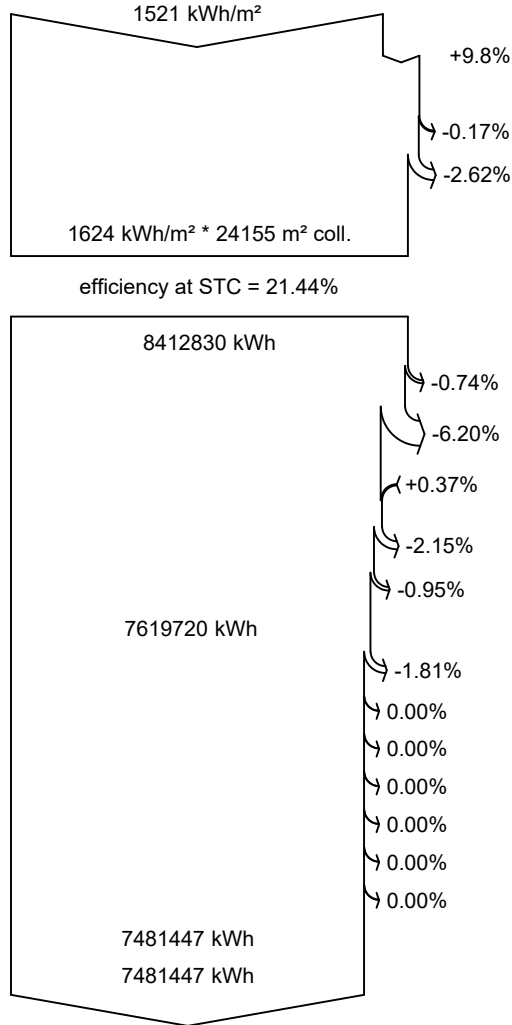


PVsyst V7.4.5

VCO, Simulation date:
25/02/24 11:57
with v7.4.5

Mauro Marchino (italy)

Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

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

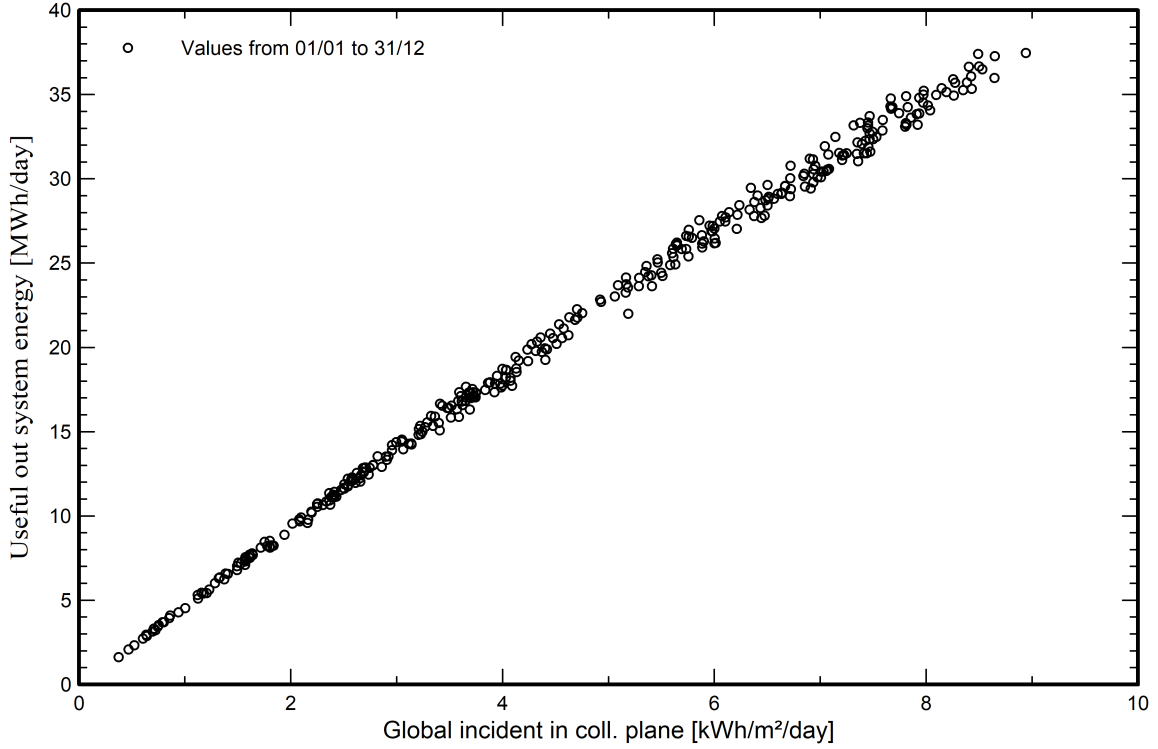
Available Energy at Inverter Output

Energy injected into grid

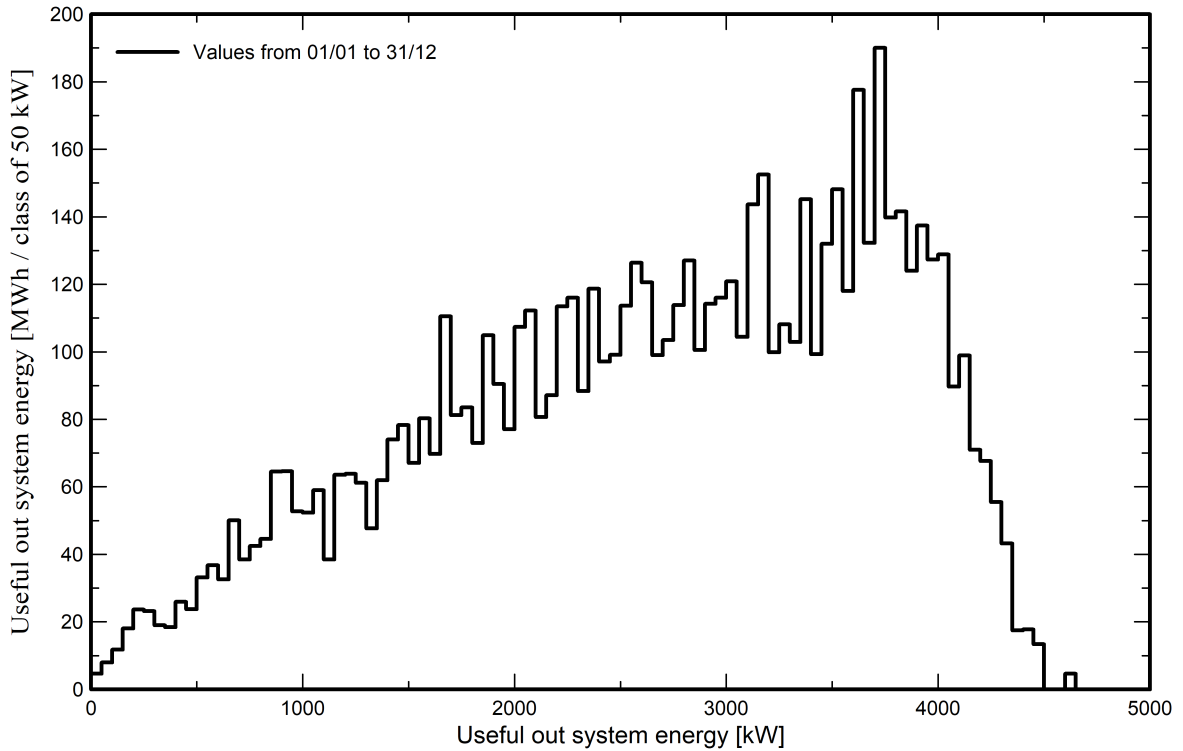


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

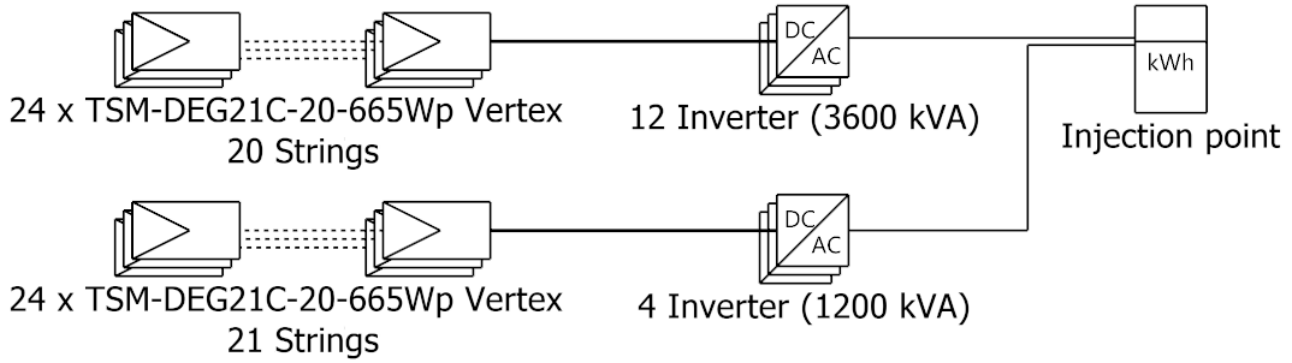




PVsyst V7.4.5

VC0, Simulation date:
25/02/24 11:57
with v7.4.5

Single-line diagram



PV module	TSM-DEG21C-20-665Wp Vertex
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	24 x TSM-DEG21C-20-665Wp Vertex

viterbo 2 - sc4 SC5

Mauro Marchino (it
aly)

VC0 : Nuova variante di simulazione

25/02/24

PVsyst - Simulation report

Grid-Connected System

Project: Viterbo 2 sc6

Variant: Nuova variante di simulazione

Tracking system with backtracking

System power: 23.41 MWp

Norchia - Italy

Author

Mauro Marchino (italy)



PVsyst V7.4.5

VCO, Simulation date:
26/02/24 13:30
with v7.4.5

Mauro Marchino (italy)

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italy		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		Tracking system with backtracking			
PV Field Orientation		Tracking algorithm		Near Shadings	
Orientation		Astronomic calculation		Linear shadings : Fast (table)	
Tracking plane, tilted axis		Backtracking activated		Diffuse shading Automatic	
Avg axis tilt	-0.1 °				
Avg axis azim.	-5.6 °				
System information					
PV Array					
Nb. of modules	35208 units	Inverters		Nb. of units 60.2 units	
Pnom total	23.41 MWp			Pnom total 18.05 MWac	
				Pnom ratio 1.297	
User's needs					
Unlimited load (grid)					

Results summary

Produced Energy	44085906 kWh/year	Specific production	1883 kWh/kWp/year	Perf. Ratio PR	92.40 %
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Near shading definition - Iso-shadings diagram	6
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Loss diagram	8
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**PVsyst V7.4.5**

VCO, Simulation date:
26/02/24 13:30
with v7.4.5

Mauro Marchino (italy)

General parameters**Grid-Connected System****PV Field Orientation****Orientation**

Tracking plane, tilted axis
Avg axis tilt -0.1 °
Avg axis azim. -5.6 °

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

Horizon

Average Height 1.1 °

Bifacial system

Model 2D Calculation
unlimited trackers

Bifacial model geometry

Tracker Spacing 9.00 m
Tracker width 2.74 m
GCR 30.5 %
Axis height above ground 2.10 m

Tracking system with backtracking**Tracking algorithm**

Astronomic calculation
Backtracking activated

Near Shadings

Linear shadings : Fast (table)
Diffuse shading Automatic

Backtracking array

Nb. of trackers 1591 units
Identical arrays

Sizes

Tracker Spacing 9.00 m
Collector width 2.74 m
Ground Cov. Ratio (GCR) 30.5 %
Phi min / max. +/- 60.0 °

Backtracking strategy

Phi limits for BT +/- 72.1 °
Backtracking pitch 9.00 m
Backtracking width 2.74 m
Mode Automatic

User's needs

Unlimited load (grid)

Bifacial model definitions

Ground albedo 0.30
Bifaciality factor 72 %
Rear shading factor 5.0 %
Rear mismatch loss 10.0 %
Shed transparent fraction 0.0 %

PV Array Characteristics**PV module**

Manufacturer Trina Solar
Model TSM-DEG21C-20-665Wp Vertex
(Original PVsyst database)

Unit Nom. Power 665 Wp
Number of PV modules 35208 units
Nominal (STC) 23.41 MWp
Modules 1467 string x 24 In series

At operating cond. (50°C)

Pmpp 21.45 MWp
U mpp 834 V
I mpp 25731 A

Total PV power

Nominal (STC) 23413 kWp
Total 35208 modules
Module area 109368 m²

Inverter

Manufacturer Huawei Technologies
Model SUN2000-330KTL-H1-Preliminary V0.1
(Custom parameters definition)

Unit Nom. Power 300 kWac
Number of inverters 361 * MPPT 17% 60.2 units
Total power 18050 kWac
Operating voltage 500-1500 V
Max. power (=>30°C) 330 kWac
Pnom ratio (DC:AC) 1.30
No power sharing between MPPTs

Total inverter power

Total power 18050 kWac
Nb. of inverters 61 units
Pnom ratio 1.30
0.8 unused



PVsyst V7.4.5

VC0, Simulation date:
26/02/24 13:30
with v7.4.5

Array losses

Array Soiling Losses

Loss Fraction 0.5 %

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. 0.53 mΩ

Loss Fraction 1.5 % at STC

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.4 %

Module mismatch losses

Loss Fraction 0.3 % 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

System losses

Unavailability of the system

Time fraction 0.5 %
1.8 days,
3 periods



Project: Viterbo 2 sc6

Variant: Nuova variante di simulazione

PVsyst V7.4.5

VCO, Simulation date:
26/02/24 13:30
with v7.4.5

Mauro Marchino (italy)

Horizon definition

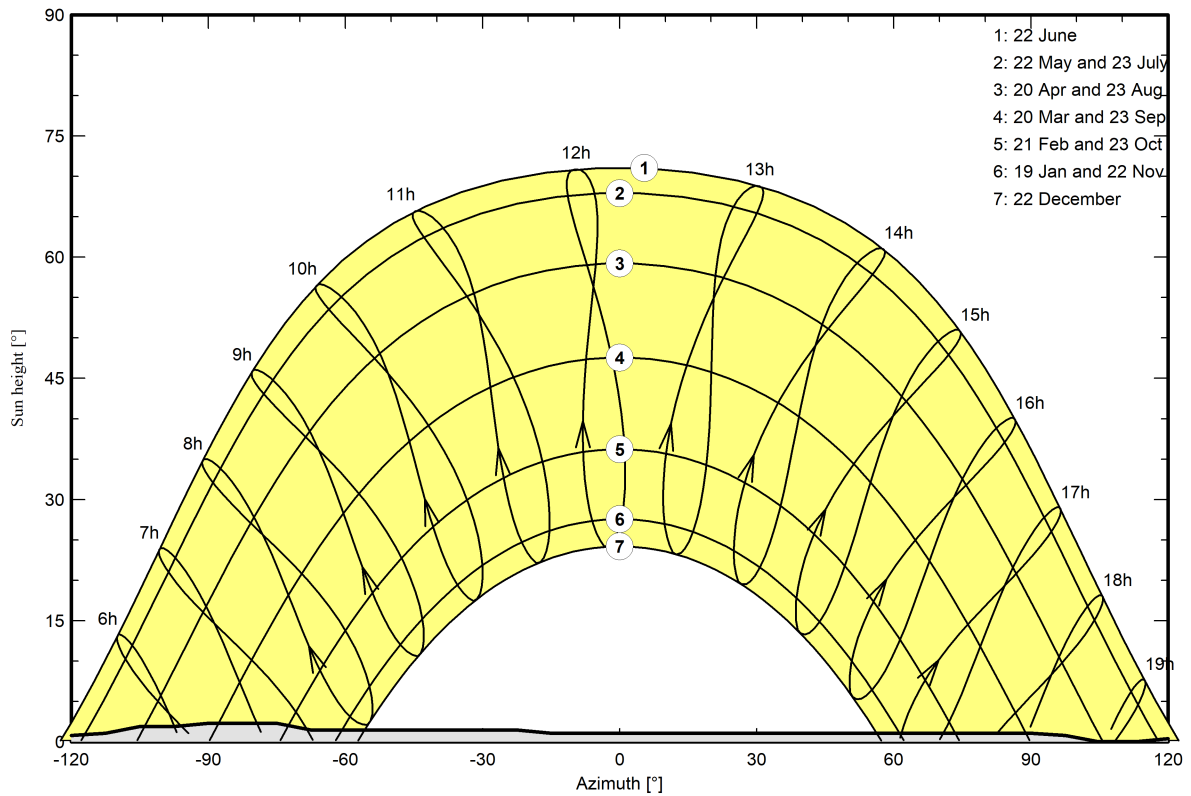
Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

Average Height	1.1 °	Albedo Factor	0.96
Diffuse Factor	1.00	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

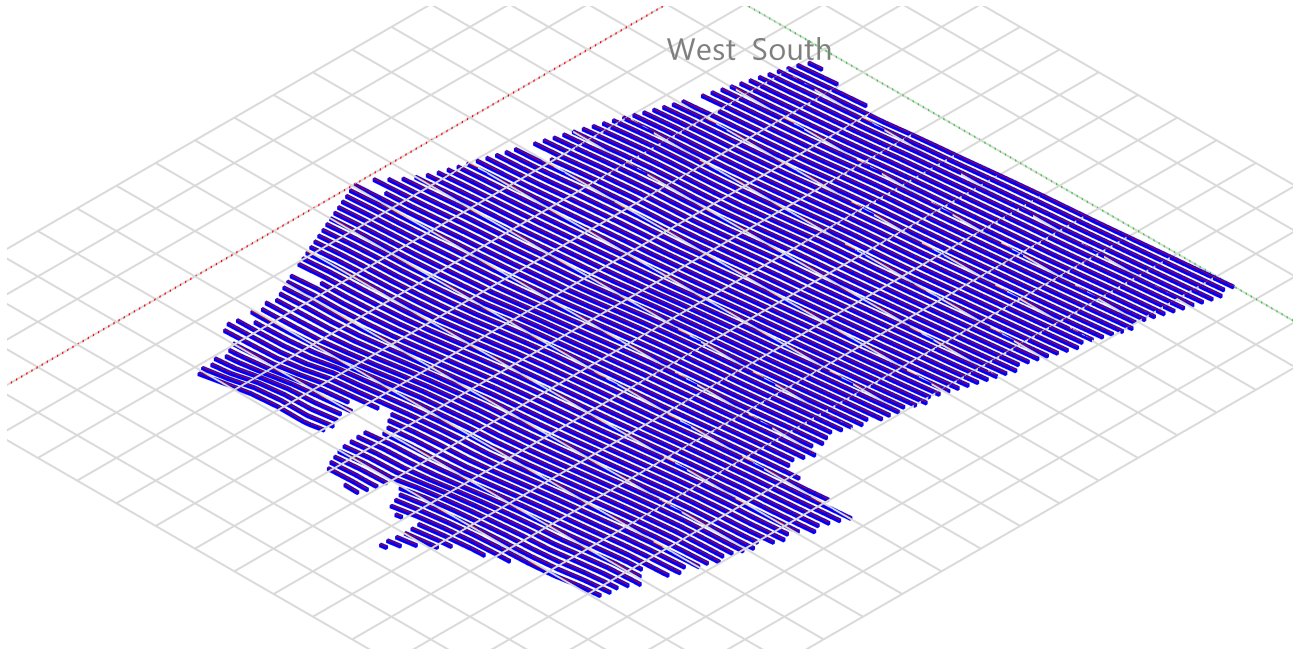
Sun Paths (Height / Azimuth diagram)





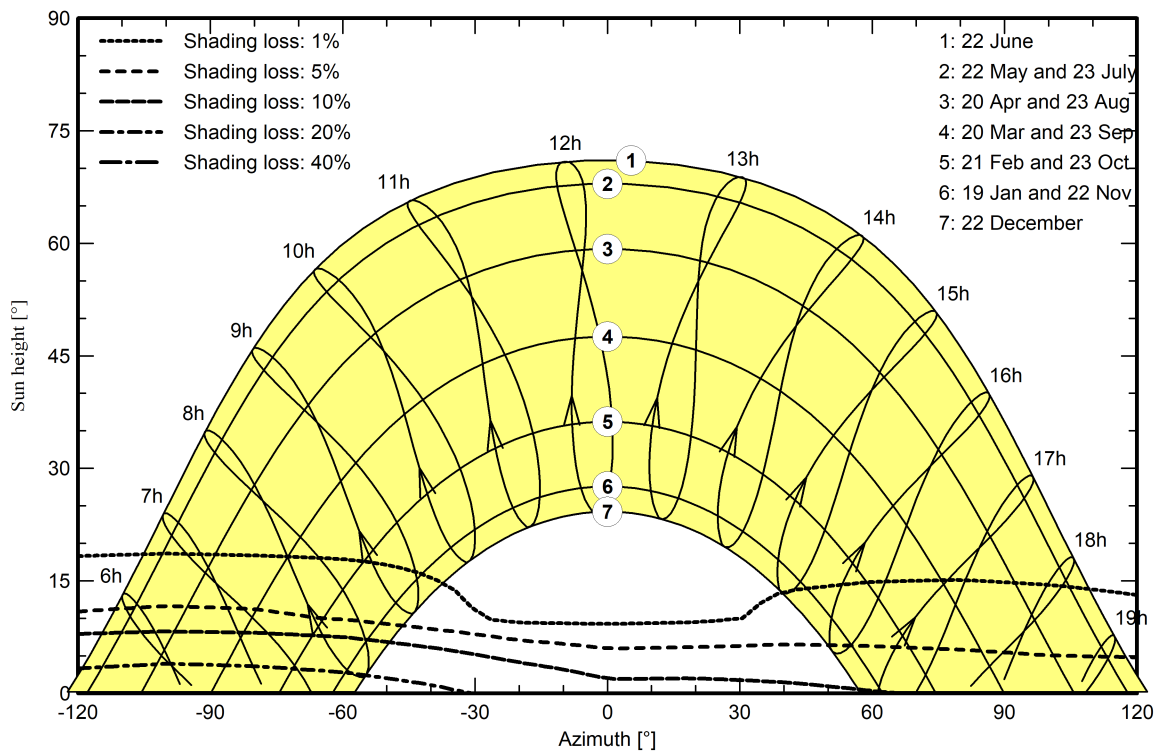
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy 44085906 kWh/year

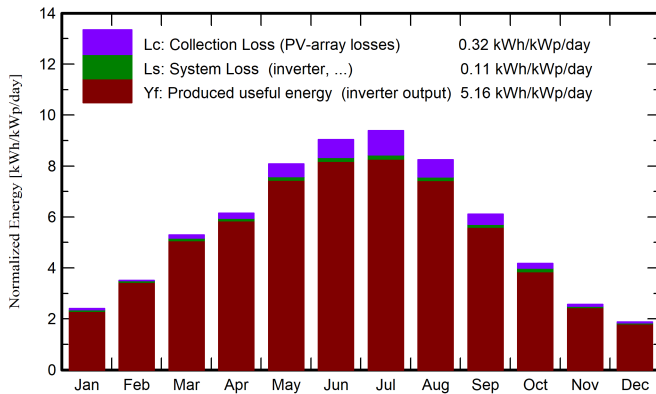
Specific production

1883 kWh/kWp/year

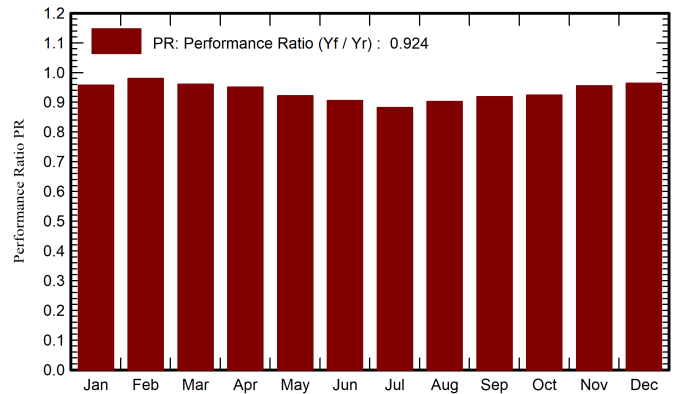
Perf. Ratio PR

92.40 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

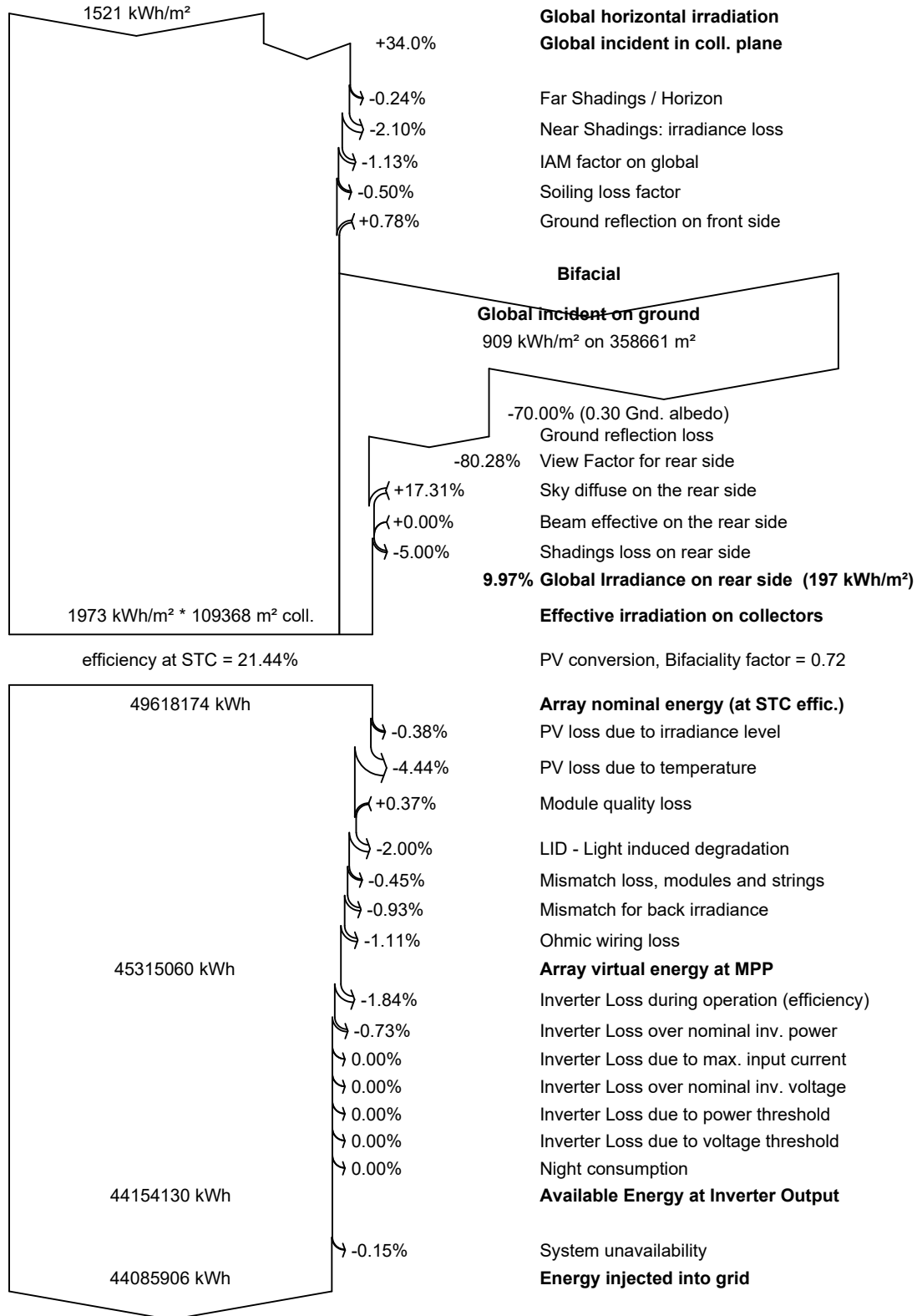
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_Grid kWh	PR ratio
January	53.2	23.51	7.29	74.7	70.3	1717418	1673836	0.957
February	73.1	35.29	8.18	98.4	94.4	2300662	2259553	0.981
March	121.1	50.30	11.12	163.9	158.5	3756937	3687673	0.961
April	145.0	72.00	14.38	184.6	178.8	4189603	4111776	0.952
May	190.6	81.52	18.64	250.5	243.6	5509068	5405731	0.922
June	206.0	80.87	23.28	271.3	264.6	5862866	5752515	0.906
July	214.9	68.32	26.40	290.9	284.1	6127899	6011882	0.883
August	188.9	72.65	26.14	255.5	249.1	5502767	5400328	0.903
September	134.3	51.32	21.17	183.4	177.6	4017995	3943173	0.918
October	93.8	41.79	17.33	129.3	124.5	2904776	2799509	0.925
November	56.2	26.25	12.27	77.1	73.3	1757252	1725179	0.956
December	44.0	24.75	8.54	58.2	54.5	1342517	1314750	0.964
Year	1521.1	628.56	16.28	2037.9	1973.4	44989760	44085906	0.924

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



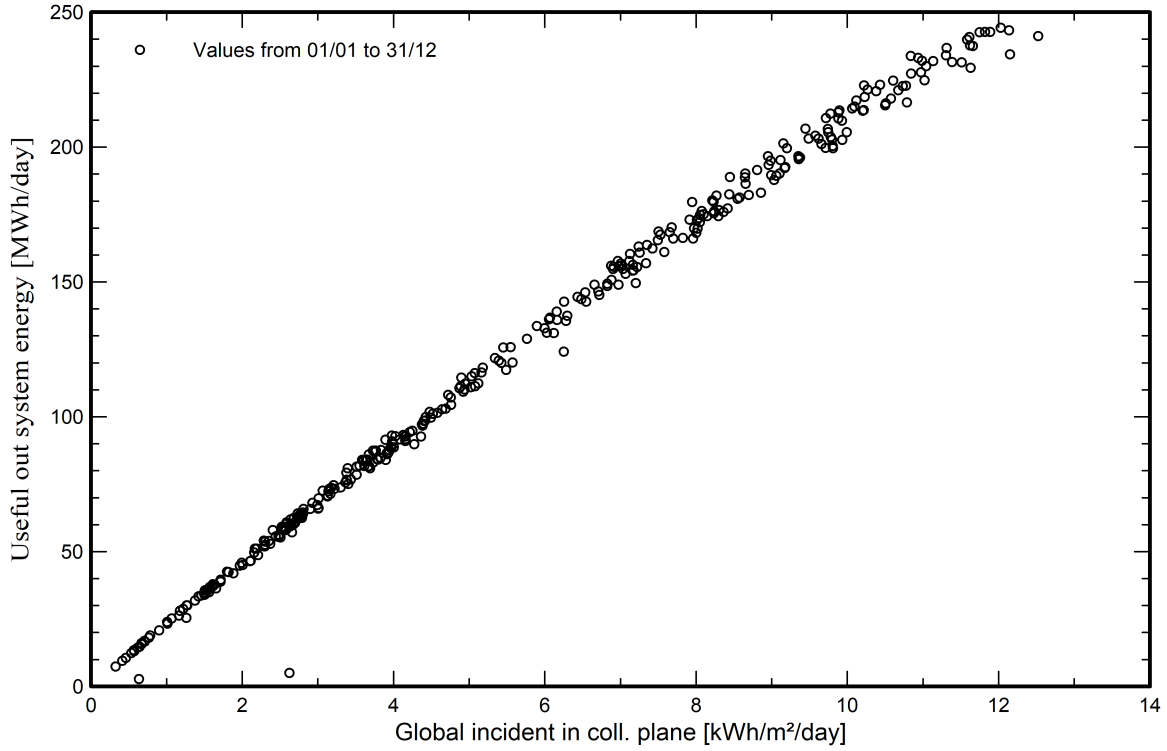
Loss diagram



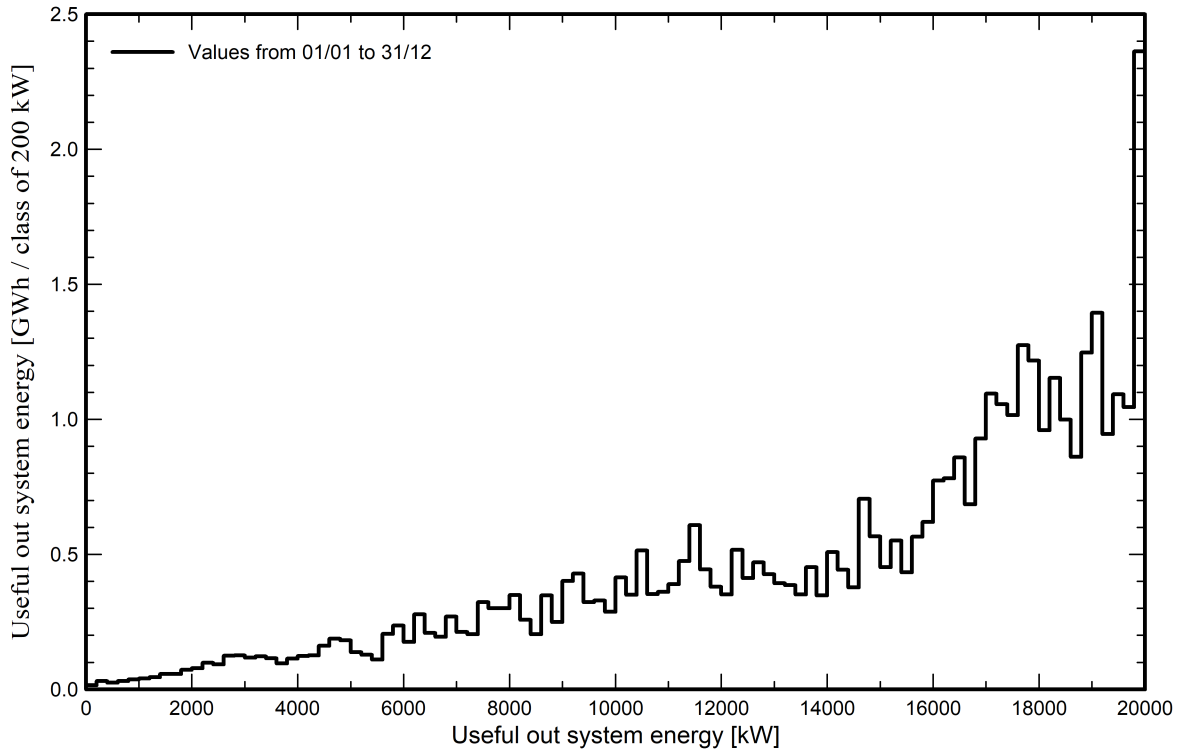


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema



PVsyst - Simulation report

Grid-Connected System

Project: Viterbo 2 - sc7

Variant: Nuova variante di simulazione

No 3D scene defined, no shadings

System power: 9704 kWp

Norchia - Italy

Author

Mauro Marchino (italy)



Project: Viterbo 2 - sc7

Variant: Nuova variante di simulazione

Mauro Marchino (italy)

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 12:47
with v7.4.5

Project summary

Geographical Site		Situation		Project settings	
Norchia		Latitude	42.35 °N	Albedo	0.20
Italy		Longitude	11.95 °E		
		Altitude	152 m		
		Time zone	UTC+1		
Meteo data					
Norchia					
Meteonorm 8.1 (1991-2014), Sat=44% - Sintetico					

System summary

Grid-Connected System		No 3D scene defined, no shadings			
PV Field Orientation		Near Shadings		User's needs	
Fixed plane		No Shadings		Unlimited load (grid)	
Tilt/Azimuth	15 / -37 °				
System information					
PV Array					
Nb. of modules	14592 units	Inverters		29 units	
Pnom total	9704 kWp	Nb. of units		8700 kWac	
		Pnom total		1.115	
		Pnom ratio			

Results summary

Produced Energy	14207613 kWh/year	Specific production	1464 kWh/kWp/year	Perf. Ratio PR	88.78 %
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Table of contents

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General parameters, PV Array Characteristics, System losses	3
Horizon definition	4
Main results	5
Loss diagram	6
Predef. graphs	7
Single-line diagram	8



Project: Viterbo 2 - sc7

Variant: Nuova variante di simulazione

PVsyst V7.4.5

VCO, Simulation date:
25/02/24 12:47
with v7.4.5

Mauro Marchino (italy)

General parameters

Grid-Connected System		No 3D scene defined, no shadings	
PV Field Orientation		Sheds configuration	Models used
Orientation			Transposition Perez
Fixed plane			Diffuse Perez, Meteonorm
Tilt/Azimuth	15 / -37 °		Circumsolar separate
Horizon		Near Shadings	User's needs
Average Height	1.1 °	No Shadings	Unlimited load (grid)

PV Array Characteristics

PV module		Inverter	
Manufacturer	Trina Solar	Manufacturer	Huawei Technologies
Model	TSM-DEG21C-20-665Wp Vertex	Model	SUN2000-330KTL-H1-Preliminary V0.1
(Original PVsyst database)		(Custom parameters definition)	
Unit Nom. Power	665 Wp	Unit Nom. Power	300 kWac
Number of PV modules	14592 units	Number of inverters	29 units
Nominal (STC)	9704 kWp	Total power	8700 kWac
Modules	608 string x 24 In series	Operating voltage	500-1500 V
At operating cond. (50°C)		Max. power (=>30°C)	330 kWac
Pmpp	8892 kWp	Pnom ratio (DC:AC)	1.12
U mpp	834 V	Power sharing within this inverter	
I mpp	10664 A		
Total PV power		Total inverter power	
Nominal (STC)	9704 kWp	Total power	8700 kWac
Total	14592 modules	Max. power	9570 kWac
Module area	45328 m ²	Number of inverters	29 units
		Pnom ratio	1.12

Array losses

Thermal Loss factor		DC wiring losses		Module Quality Loss				
Module temperature according to irradiance		Global array res.	1.3 mΩ	Loss Fraction	-0.4 %			
Uc (const)	29.0 W/m ² K	Loss Fraction	1.5 % at STC					
Uv (wind)	0.0 W/m ² K/m/s							
Module mismatch losses		Strings Mismatch loss						
Loss Fraction	2.0 % at MPP	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



PVsyst V7.4.5

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Horizon definition

Horizon from PVGIS website API, Lat=42°21'10", Long=11°56'53", Alt=152m

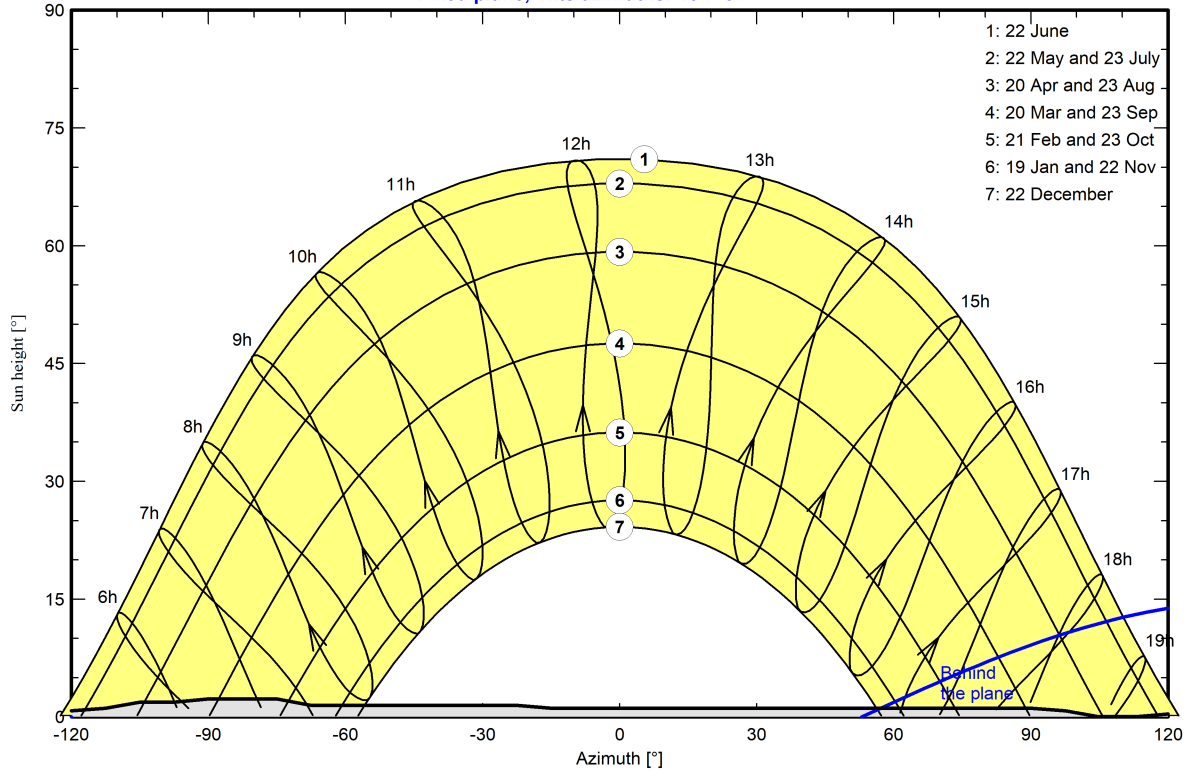
Average Height	1.1 °	Albedo Factor	0.93
Diffuse Factor	0.99	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-120	-113	-105	-98	-90	-75	-68
Height [°]	0.8	0.8	1.1	0.8	0.8	1.1	1.9	1.9	2.3	2.3	1.5
Azimuth [°]	-23	-15	90	98	105	113	120	135	143	180	
Height [°]	1.5	1.1	1.1	0.8	0.0	0.0	0.4	0.4	0.8	0.8	

Sun Paths (Height / Azimuth diagram)

Fixed plane, Tilts/azimuths: 15°/-37°





Main results

System Production

Produced Energy 14207613 kWh/year

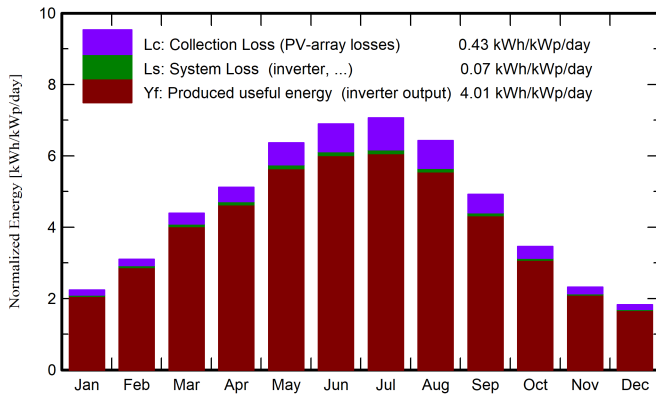
Specific production

1464 kWh/kWp/year

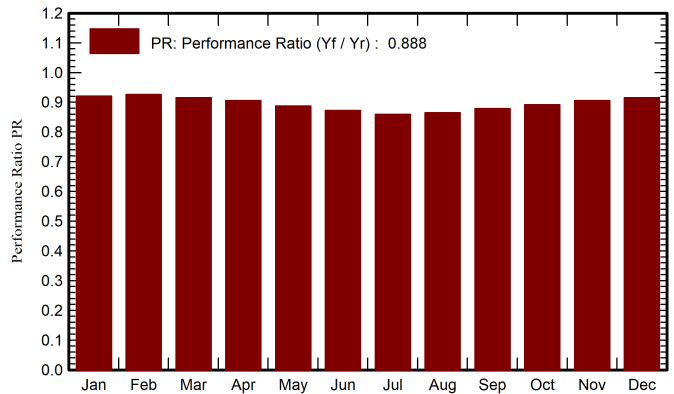
Perf. Ratio PR

88.78 %

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	53.2	23.51	7.29	69.5	66.5	632753	620977	0.921
February	73.1	35.29	8.18	86.9	83.9	795525	781269	0.927
March	121.1	50.30	11.12	136.1	132.3	1231608	1209292	0.916
April	145.0	72.00	14.38	153.6	149.5	1374804	1349787	0.906
May	190.6	81.52	18.64	197.2	192.3	1730288	1698790	0.888
June	206.0	80.87	23.28	206.8	201.9	1783306	1750770	0.872
July	214.9	68.32	26.40	218.9	213.9	1859072	1824997	0.859
August	188.9	72.65	26.14	199.3	194.5	1702477	1671800	0.865
September	134.3	51.32	21.17	147.6	143.4	1282417	1259080	0.879
October	93.8	41.79	17.33	107.1	103.3	943870	926673	0.892
November	56.2	26.25	12.27	69.6	66.8	623616	612016	0.906
December	44.0	24.75	8.54	56.5	53.9	511829	502161	0.916
Year	1521.1	628.56	16.28	1649.2	1602.1	14471565	14207613	0.888

Legends

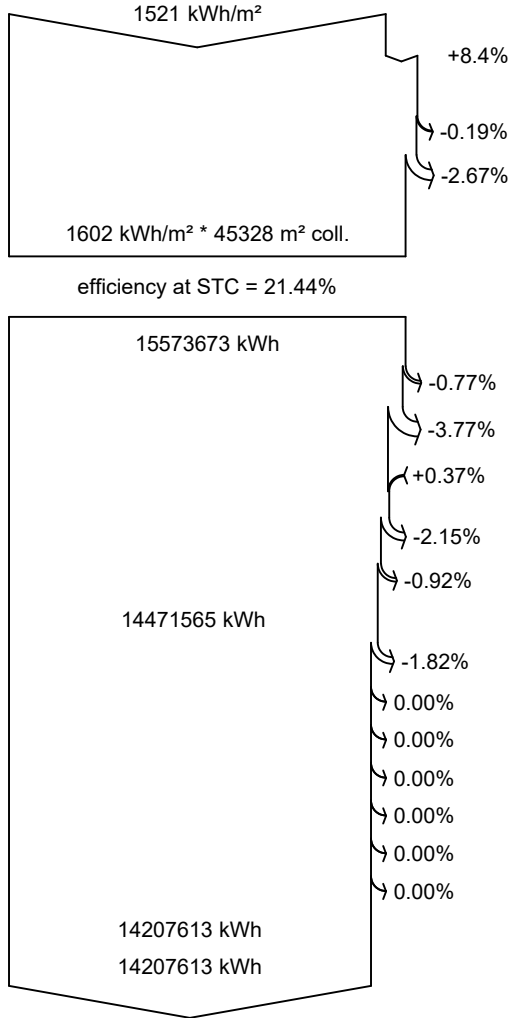
- GlobHor Global horizontal irradiation
- DiffHor Horizontal diffuse irradiation
- T_Amb Ambient Temperature
- GlobInc Global incident in coll. plane
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- EArray Effective energy at the output of the array
- E_Grid Energy injected into grid
- PR Performance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



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25/02/24 12:47
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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

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

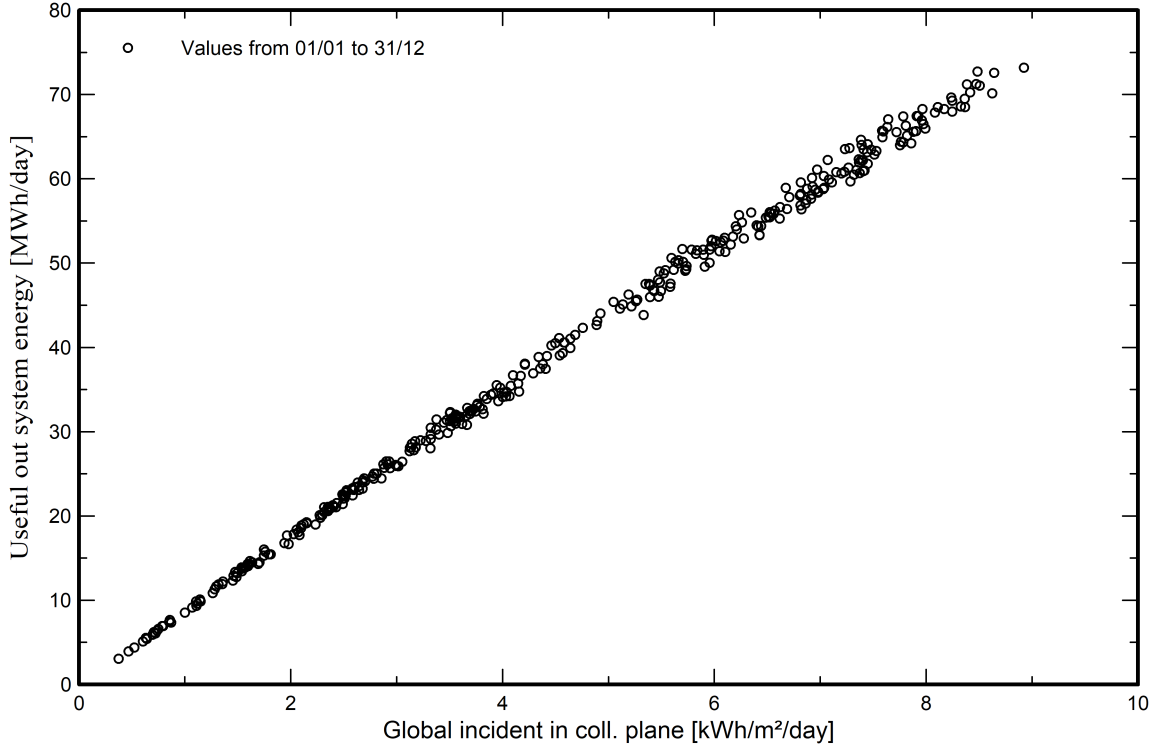
Available Energy at Inverter Output

Energy injected into grid

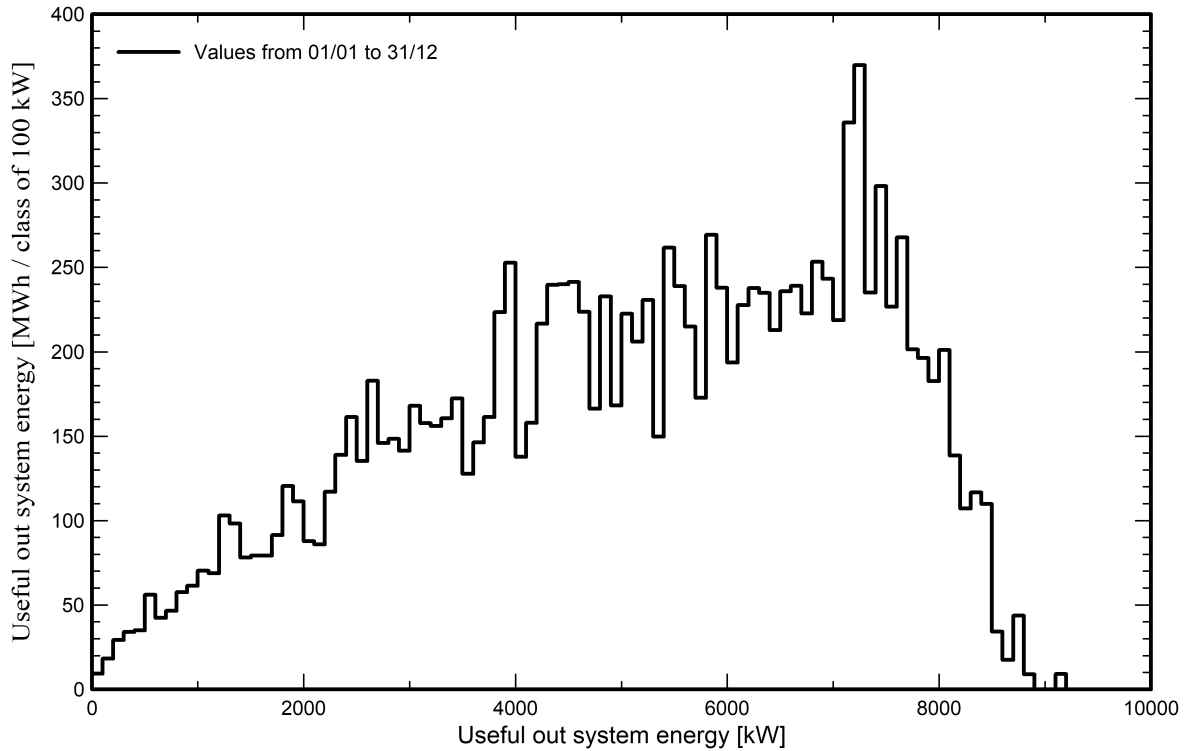


Predef. graphs

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema

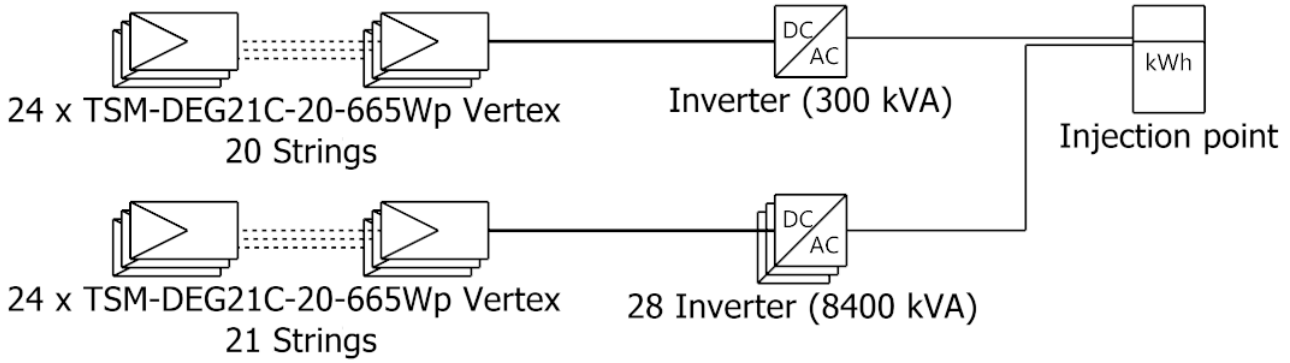




PVsyst V7.4.5

VC0, Simulation date:
25/02/24 12:47
with v7.4.5

Single-line diagram



PV module	TSM-DEG21C-20-665Wp Vertex
Inverter	SUN2000-330KTL-H1-Preliminary V0.1
String	24 x TSM-DEG21C-20-665Wp Vertex

Viterbo 2 - sc7

Mauro Marchino (it
aly)

VC0 : Nuova variante di simulazione

25/02/24