SIMULAZIONE PVSYST

IMPIANTO DI PRODUZIONE DA FONTE SOLARE "VIGARANO MAINARDA" DA INSTALLARE NEL COMUNE DI VIGARANO MAINARDA (FE)

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REV	DATA	DESCRIZIONE	BY	CHK	APP
00	08/2025	Prima emissione	MP	RM	RC

PVsyst - Simulation report

Grid-Connected System

Project: Vigarano Mainarda

Variant: Variante base

Tracking system with backtracking

System power: 25.92 MWp

Vigarano Mainarda - Italy

Author
GRID SHAPE SRL (Italy)

Project: Vigarano Mainarda

Variant: Variante base

GRID SHAPE SRL (Italy)

Project summary

Geographical Site
Vigarano Mainarda
Italy

Situation

Latitude	44.84 °(N)
Longitude	11.45 °(E)
Altitude	9 m
Time zone	UTC+1

Project settings

Albedo	0.20

Weather data
Vigarano Mainarda
PVGIS api TMY

System summary

Grid-Connected System

Tracking system with backtracking

Orientation #1
Tracking plane, horizontal N-S axis

Orientation #2
Tracking plane, horizontal N-S axis

Orientation #3
Tracking plane, horizontal N-S axis

Orientation #4
Tracking plane, horizontal N-S axis

Orientation #5
Tracking plane, horizontal N-S axis

Orientation #6
Tracking plane, horizontal N-S axis

Orientation #7
Tracking plane, horizontal N-S axis

Orientation #8
Tracking plane, horizontal N-S axis

Orientation #9
Tracking plane, horizontal N-S axis

Near Shadings
Linear shadings : Fast (table)

User's needs
Unlimited load (grid)

System information

PV Array		Inverters	
Nb. of modules	40824 units	Nb. of units	75 units
Pnom total	25.92 MWp	Total power	22500 kWac
		Pnom ratio	1.15

Results summary

Produced Energy	46652 MWh/year	Specific production	1800 kWh/kWp/year	Perf. Ratio PR	88.75 %
				Bifacial perf. ratio	87.85 %

Table of contents

General parameters

Grid-Connected System

Tracking system with backtracking

Orientation #1

Tracking plane, horizontal N-S axis

Axis azimuth	12.8 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation
Backtracking activated

Field properties

Nb. of trackers	245 units

Tracking plane, horizontal N-S axis

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #2

Tracking plane, horizontal N-S axis

Axis azimuth	12.3 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation
Backtracking activated

Field properties

Nb. of trackers	151 units

Tracking plane, horizontal N-S axis

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #3

Tracking plane, horizontal N-S axis

Axis azimuth	10.5 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation
Backtracking activated

Field properties

Nb. of trackers	119 units

Tracking plane, horizontal N-S axis

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Models used

Transposition	Perez
Diffuse	Imported
Circumsolar	separate

Horizon

Free Horizon

Near Shadings

Linear shadings : Fast (table)

General parameters

Orientation #4

Tracking plane, horizontal N-S axis

Axis azimuth	14.1 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	505 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #5

Tracking plane, horizontal N-S axis

Axis azimuth	13.5 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	144 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #6

Tracking plane, horizontal N-S axis

Axis azimuth	1.3 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	23 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

User's needs

Unlimited load (grid)

General parameters

Orientation #7

Tracking plane, horizontal N-S axis

Axis azimuth	-9 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	138 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #8

Tracking plane, horizontal N-S axis

Axis azimuth	-9.5 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	84 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

Orientation #9

Tracking plane, horizontal N-S axis

Axis azimuth	-9.1 °
Phi min / max.	-/+ 60 °
Diffuse shading	all trackers

Tracking algorithm

Astronomic calculation	
Backtracking activated	

Field properties

Nb. of trackers	205 units
Tracking plane, horizontal N-S axis	

Sizes

Tracker Spacing	6.00 m
Sensitive width	2.38 m
GCR Shading	39.7 %

Backtracking limit angle

Phi limits	+/- 66.6 °

Backtracking parameters

Backtracking pitch	6.00 m
Backtracking width	2.38 m
Left inactive band	0.00 m
Right inactive band	0.00 m
GCR Backtracking	39.7 %
Parameters choice	Automatic

General parameters

Bifacial system definition

Orientation #1

Bifacial system

Model	Unlimited Trackers 2D model

Bifacial model geometry

Tracker Spacing	6.00	m
Tracker width	2.38	m
Axis height above ground	3.20	m
Nb. of sheds	29	units

Bifacial model definitions

Ground albedo	0.20	
Bifaciality factor	80	%
Rear shading factor	5.0	%
Rear mismatch loss	10.0	%
Shed transparent fraction	0.0	%

PV Array Characteristics

PV module

Manufacturer	CSI Solar Co., Ltd.
Model	CS6.2-66TB635 1500V
(Custom parameters definition)	
CS6.2-66TB635_CSI_DRA_1500V_V7_40_A0.PAN	
Unit Nom. Power	635 Wp

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-330KTL-H1
(Original PVsyst database)	
Unit Nom. Power	300 kWac

Array #1 - Sottocampo 1

Mixed orient.
#1/#8: 88/84 strings

Tilt/Azimuth	0/103	°		
	0/81	°		
Number of PV modules	4816	units	Number of inverters	9 units
Nominal (STC)	3058	kWp	Total power	2700 kWac
Modules	172 string x 28	In series		
At operating cond. (50°C)			Operating voltage	550-1500 V
Pmpp	2849	kWp	Max. power (=>30°C)	330 kWac
U mpp	1060	V	Pnom ratio (DC:AC)	1.13
I mpp	2688	A	Power sharing within this inverter	

Array #2 - Sottocampo 2

Orientation	#1			
Tilt/Azimuth	0/103	°		
Number of PV modules	4396	units	Number of inverters	8 units
Nominal (STC)	2791	kWp	Total power	2400 kWac
Modules	157 string x 28	In series		
At operating cond. (50°C)			Operating voltage	550-1500 V
Pmpp	2601	kWp	Max. power (=>30°C)	330 kWac
U mpp	1060	V	Pnom ratio (DC:AC)	1.16
I mpp	2453	A	Power sharing within this inverter	

Array #3 - Sottocampo 3

Orientation	#4			
Tilt/Azimuth	0/104	°		
Number of PV modules	9772	units	Number of inverters	18 units
Nominal (STC)	6205	kWp	Total power	5400 kWac
Modules	349 string x 28	In series		

PV Array Characteristics

At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	5781 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.15
I mpp	5454 A	Power sharing within this inverter	

Array #4 - Sottocampo 4

Mixed orient.			
#9/#3: 47/119 strings			
Tilt/Azimuth	0/81 °		
	0/101 °		
Number of PV modules	4648 units	Number of inverters	9 units
Nominal (STC)	2951 kWp	Total power	2700 kWac
Modules	166 string x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	2750 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.09
I mpp	2594 A	Power sharing within this inverter	

Array #5 - Sottocampo 5

Orientation	#2		
Tilt/Azimuth	0/102 °		
Number of PV modules	4228 units	Number of inverters	8 units
Nominal (STC)	2685 kWp	Total power	2400 kWac
Modules	151 string x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	2501 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.12
I mpp	2360 A	Power sharing within this inverter	

Array #6 - Sottocampo 6

Orientation	#9		
Tilt/Azimuth	0/81 °		
Number of PV modules	4424 units	Number of inverters	8 units
Nominal (STC)	2809 kWp	Total power	2400 kWac
Modules	158 string x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	2617 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.17
I mpp	2469 A	Power sharing within this inverter	

Array #7 - Sottocampo 7

Orientation	#5		
Tilt/Azimuth	0/104 °		
Number of PV modules	4032 units	Number of inverters	7 units
Nominal (STC)	2560 kWp	Total power	2100 kWac
Modules	144 string x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	2385 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.22
I mpp	2250 A	Power sharing within this inverter	

PV Array Characteristics

Array #8 - Sottocampo 8

Mixed orient.
#6/#7: 23/138 strings

Tilt/Azimuth	0/91 °		
	0/81 °		
Number of PV modules	4508 units	Number of inverters	8 units
Nominal (STC)	2863 kWp	Total power	2400 kWac
Modules	161 string x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	2667 kWp	Max. power (=>30°C)	330 kWac
U mpp	1060 V	Pnom ratio (DC:AC)	1.19
I mpp	2516 A	Power sharing within this inverter	

Total PV power		**Total inverter power**	
Nominal (STC)	25923 kWp	Total power	22500 kWac
Total	40824 modules	Max. power	24750 kWac
Module area	110273 m²	Number of inverters	75 units
Cell area	102979 m²	Pnom ratio	1.15

Array losses

Array Soiling Losses
Loss Fraction 1.0 %

Thermal Loss factor
Module temperature according to irradiance
Uc (const) 29.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation
Loss Fraction 1.0 %

Module Quality Loss
Loss Fraction -0.10 %

Module mismatch losses
Loss Fraction 0.50 % at MPP

Strings Mismatch loss
Loss Fraction 0.10 %

IAM loss factor
Incidence effect (IAM): User defined profile

20°	40°	60°	65°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.990	0.960	0.920	0.840	0.720	0.000

DC wiring losses

Global wiring resistance 0.32 mΩ
Loss Fraction 0.6 % at STC

Array #1 - Sottocampo 1		**Array #2 - Sottocampo 2**	
Global array res.	2.7 mΩ	Global array res.	3.0 mΩ
Loss Fraction	0.6 % at STC	Loss Fraction	0.6 % at STC
Array #3 - Sottocampo 3		**Array #4 - Sottocampo 4**	
Global array res.	1.4 mΩ	Global array res.	2.9 mΩ
Loss Fraction	0.6 % at STC	Loss Fraction	0.6 % at STC
Array #5 - Sottocampo 5		**Array #6 - Sottocampo 6**	
Global array res.	3.1 mΩ	Global array res.	3.0 mΩ
Loss Fraction	0.6 % at STC	Loss Fraction	0.6 % at STC
Array #7 - Sottocampo 7		**Array #8 - Sottocampo 8**	
Global array res.	3.3 mΩ	Global array res.	2.9 mΩ
Loss Fraction	0.6 % at STC	Loss Fraction	0.6 % at STC

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VC0, Simulation date:
25/08/25 17:37
with V8.0.15

System losses

Auxiliary losses

Proportional to Power	4.0 W/kW
0.0 kW from Power thresh.	
Night aux. cons.	10.00 kW

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage	800 Vac tri
Loss Fraction	0.84 % at STC

Inverter: SUN2000-330KTL-H1

Wire section (75 Inv.)	Alu 75 x 3 x 300 mm²
Average wires length	150 m

MV line up to Injection

MV Voltage	36 kV
Average loss Fraction	0.02 % at STC

Array #1 - Sottocampo 1		**Array #2 - Sottocampo 2**	
Wires	Alu 3 x 240 mm²	Wires	Alu 3 x 240 mm²
Length	600 m	Length	800 m
Array #3 - Sottocampo 3		**Array #4 - Sottocampo 4**	
Wires	Alu 3 x 240 mm²	Wires	Alu 3 x 240 mm²
Length	1100 m	Length	600 m
Array #5 - Sottocampo 5		**Array #6 - Sottocampo 6**	
Wires	Alu 3 x 240 mm²	Wires	Alu 3 x 240 mm²
Length	670 m	Length	350 m
Array #7 - Sottocampo 7		**Array #8 - Sottocampo 8**	
Wires	Alu 3 x 240 mm²	Wires	Alu 3 x 240 mm²
Length	400 m	Length	90 m

AC losses in transformers

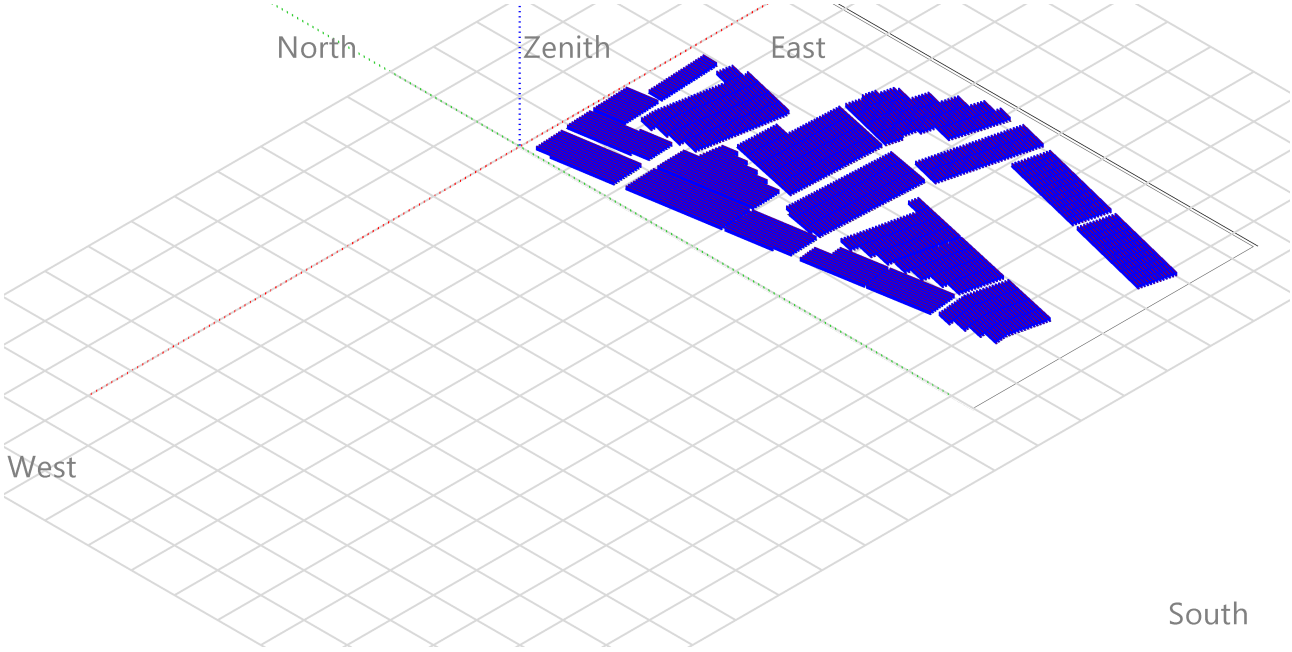
MV transfo	
Grid voltage	36 kV
One transfo in each sub-array	
Array #1 - Sottocampo 1	
Transformer parameters	
Nominal power at STC	3.03 MVA
Iron Loss (24/24 Connexion)	3.03 kVA
Iron loss fraction	0.10 % at STC
Copper loss	30.26 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.11 mΩ
Array #2 - Sottocampo 2	
Transformer parameters	
Nominal power at STC	2.76 MVA
Iron Loss (24/24 Connexion)	2.76 kVA
Iron loss fraction	0.10 % at STC
Copper loss	27.63 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.32 mΩ
Array #3 - Sottocampo 3	
Transformer parameters	
Nominal power at STC	6.14 MVA
Iron Loss (24/24 Connexion)	6.14 kVA
Iron loss fraction	0.10 % at STC
Copper loss	61.41 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 1.04 mΩ
Array #4 - Sottocampo 4	
Transformer parameters	
Nominal power at STC	2.92 MVA
Iron Loss (24/24 Connexion)	2.92 kVA
Iron loss fraction	0.10 % at STC
Copper loss	29.21 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.19 mΩ
Array #5 - Sottocampo 5	
Transformer parameters	
Nominal power at STC	2.66 MVA
Iron Loss (24/24 Connexion)	2.66 kVA
Iron loss fraction	0.10 % at STC
Copper loss	26.57 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.41 mΩ
Array #6 - Sottocampo 6	
Transformer parameters	
Nominal power at STC	2.78 MVA
Iron Loss (24/24 Connexion)	2.78 kVA
Iron loss fraction	0.10 % at STC
Copper loss	27.80 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.30 mΩ

AC losses in transformers

MV transfo	
Grid voltage	36 kV
One transfo in each sub-array	
Array #7 - Sottocampo 7	
Transformer parameters	
Nominal power at STC	2.53 MVA
Iron Loss (24/24 Connexion)	2.53 kVA
Iron loss fraction	0.10 % at STC
Copper loss	25.34 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.53 mΩ
Array #8 - Sottocampo 8	
Transformer parameters	
Nominal power at STC	2.83 MVA
Iron Loss (24/24 Connexion)	2.83 kVA
Iron loss fraction	0.10 % at STC
Copper loss	28.33 kVA
Copper loss fraction	1.00 % at STC
Coils equivalent resistance	3 x 2.26 mΩ

Near shadings parameter

Perspective of the PV-field and surrounding shading scene



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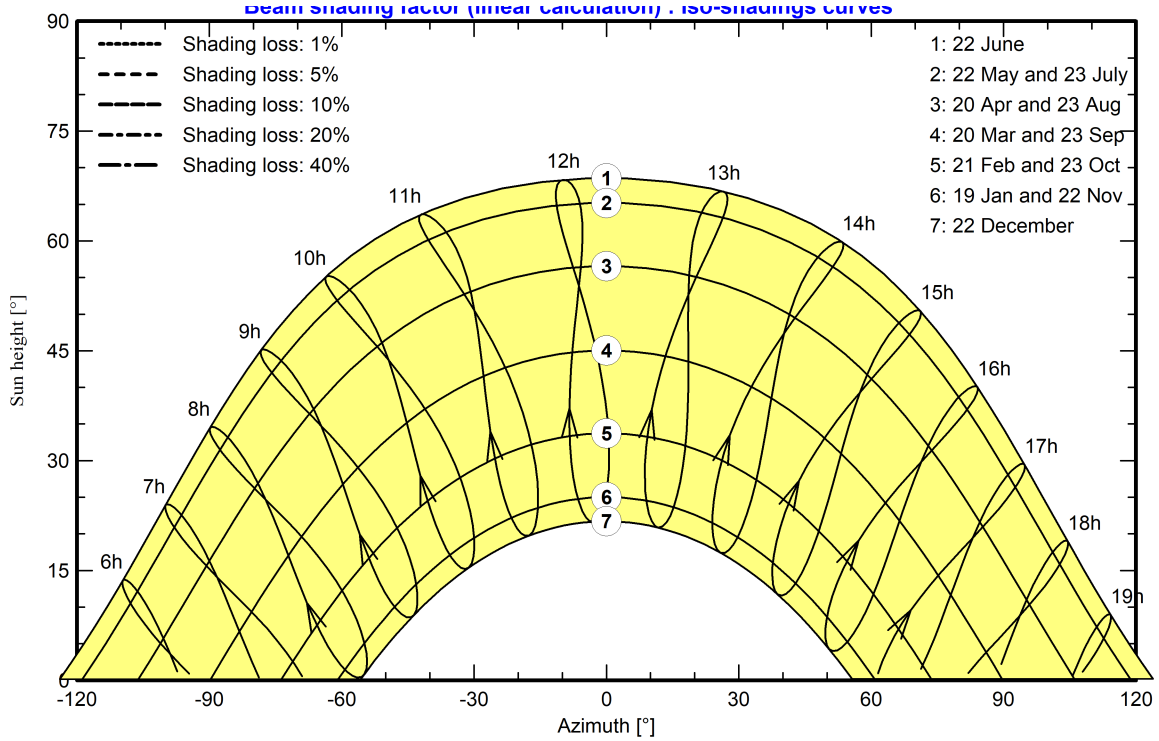
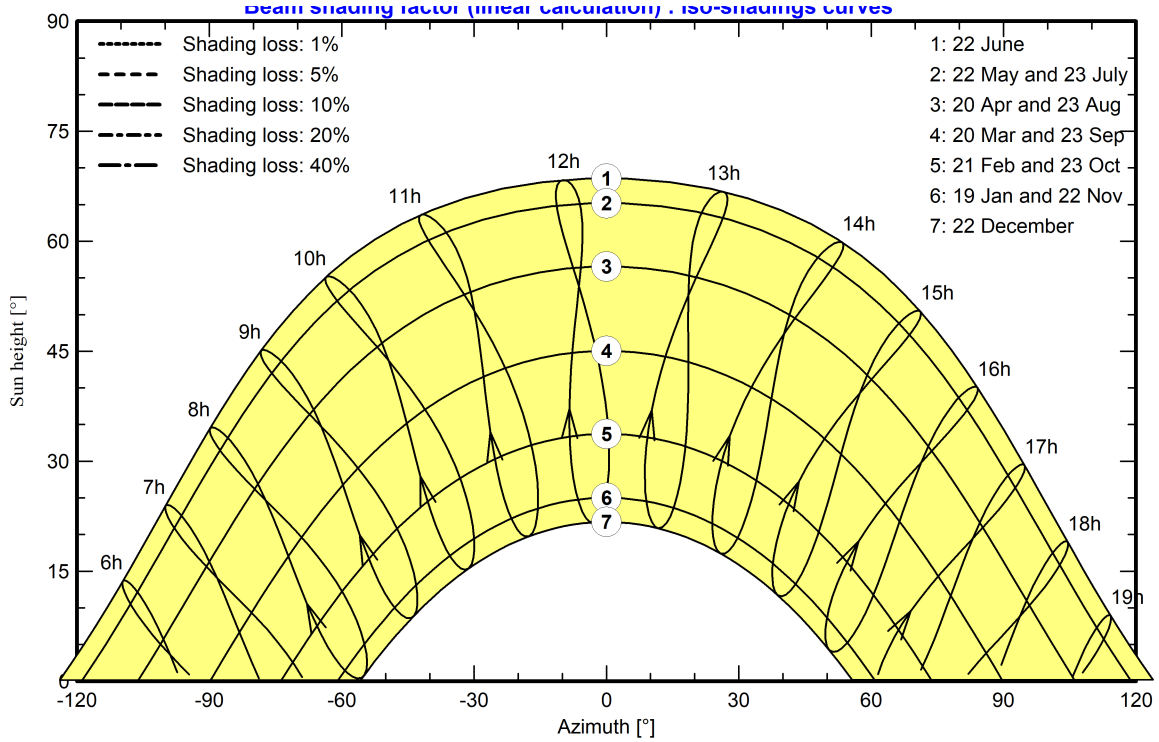
VC0, Simulation date:
25/08/25 17:37
with V8.0.15

Iso-shadings diagram

Orientation #1 -

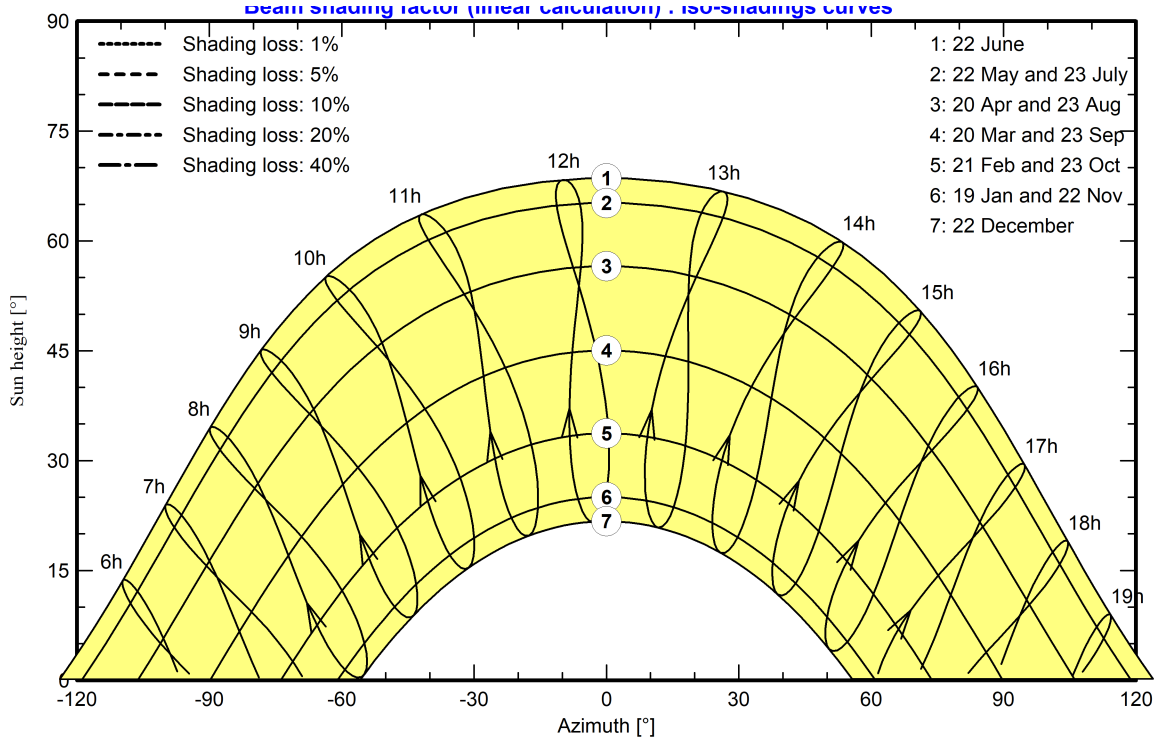


Orientation #2 -

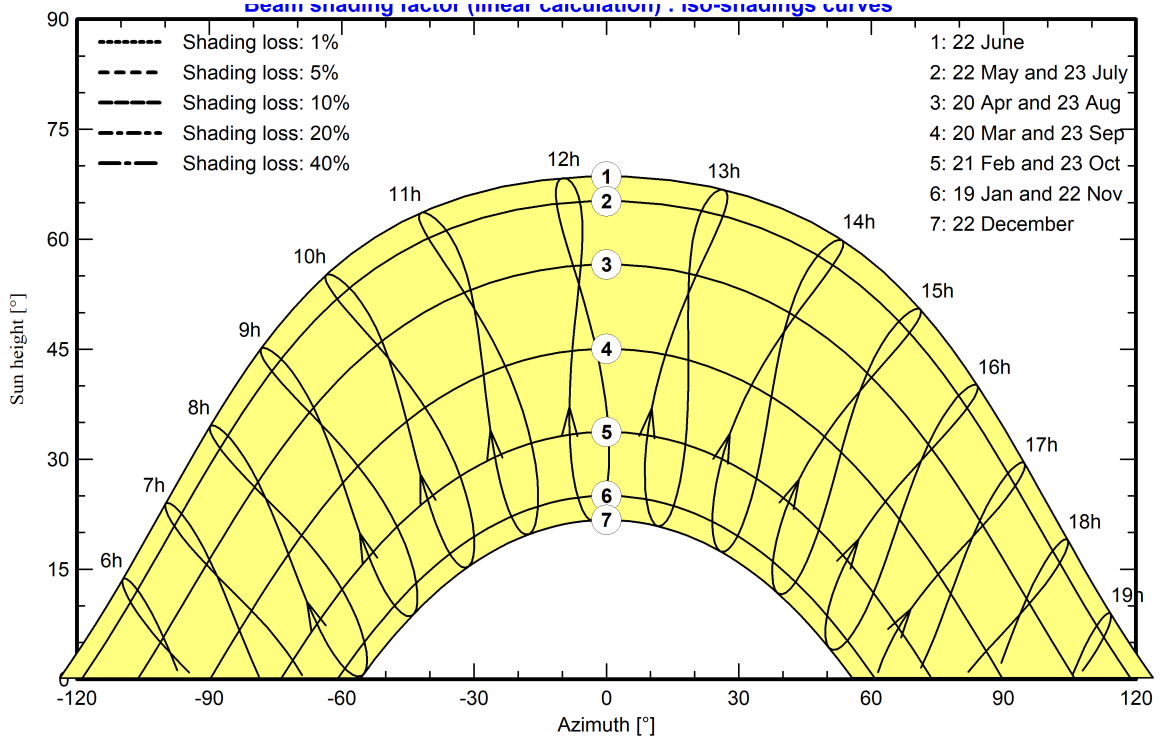


Iso-shadings diagram

Orientation #3 -



Orientation #4 -



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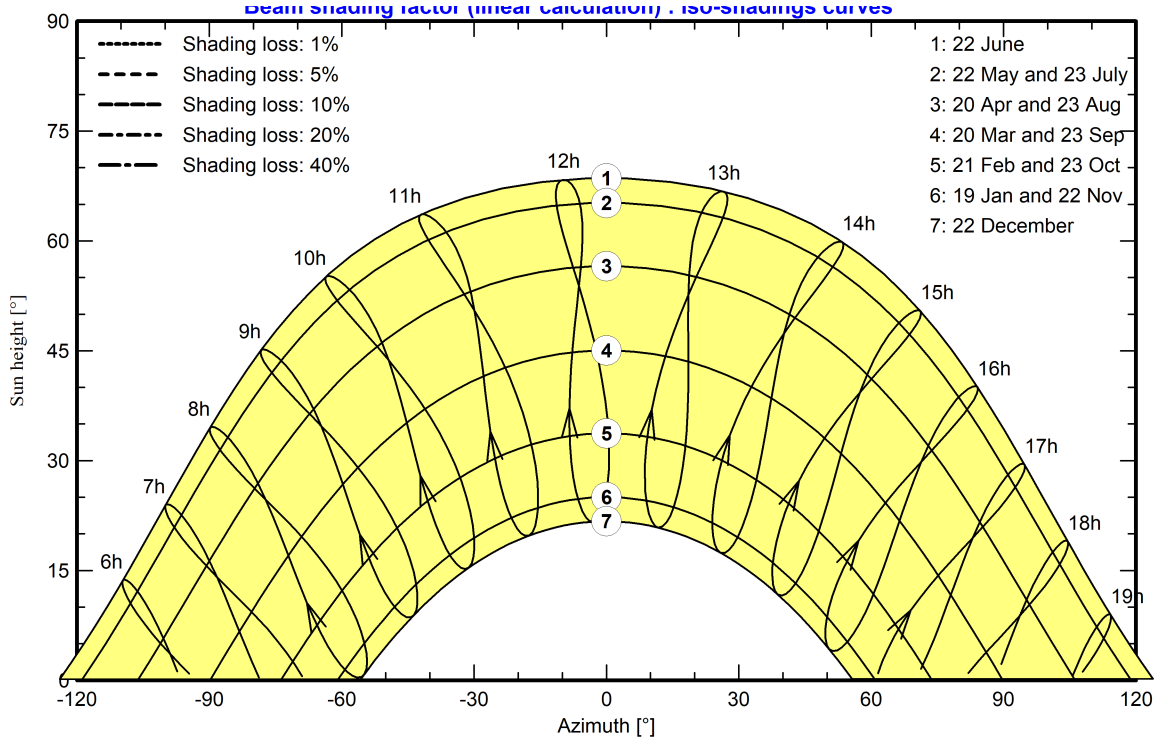
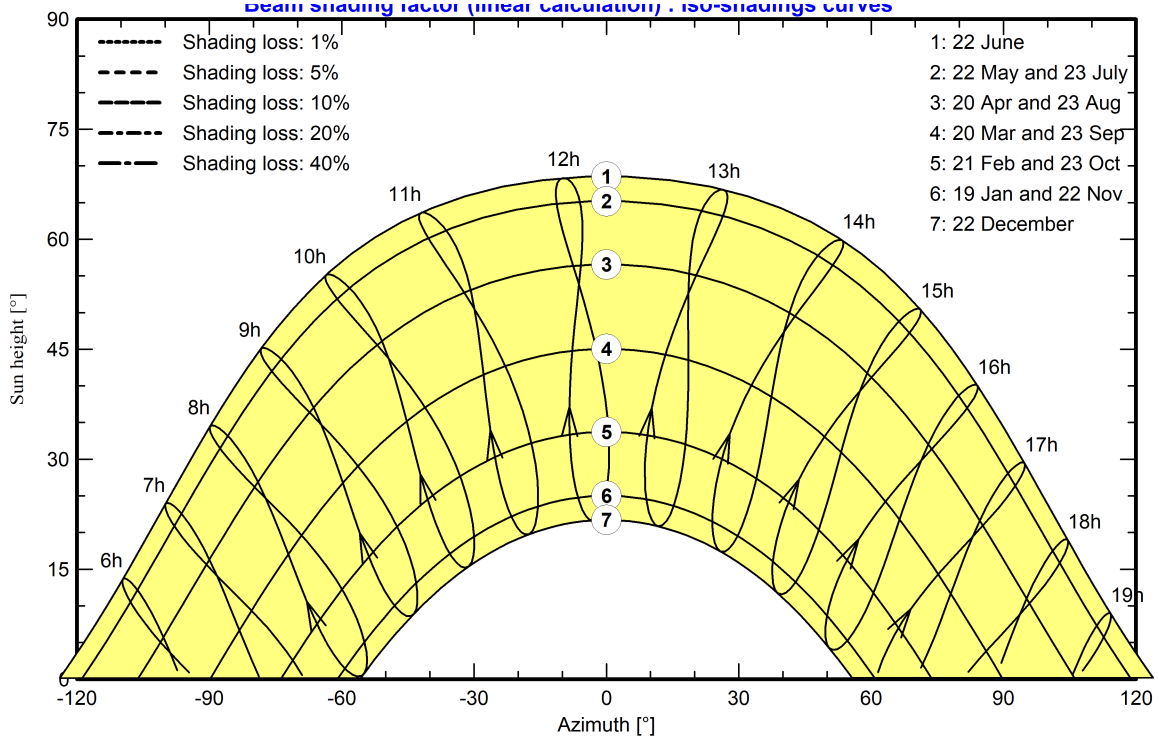
25/08/25 17:37
with V8.0.15

Iso-shadings diagram

Orientation #5 -



Orientation #6 -



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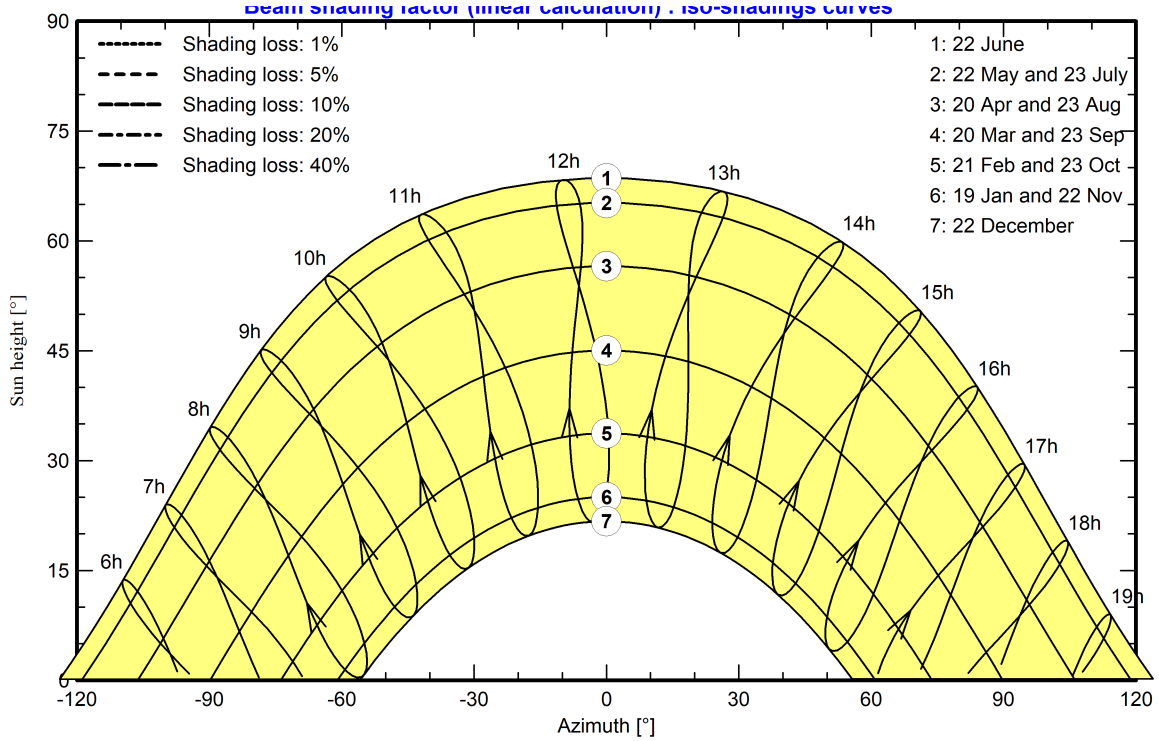
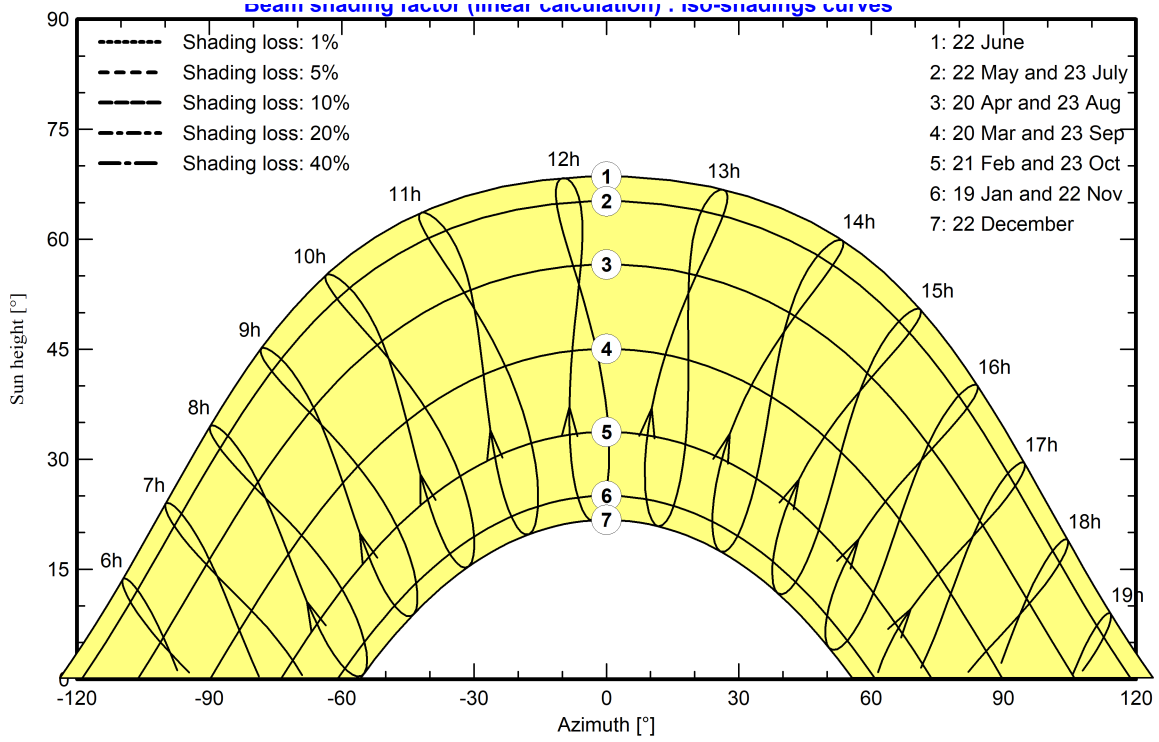
with V8.0.15

Iso-shadings diagram

Orientation #7 -



Orientation #8 -



PVsyst V8.0.15
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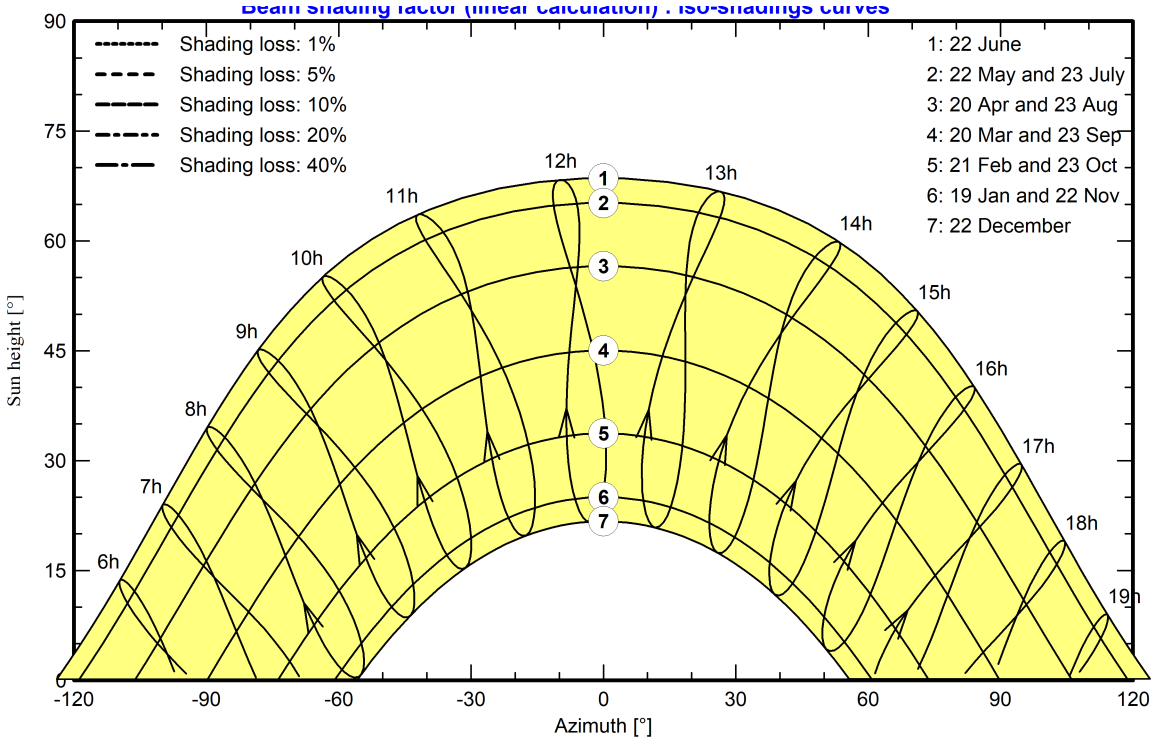
Iso-shadings diagram

Orientation #9 -



PVsyst V8.0.15
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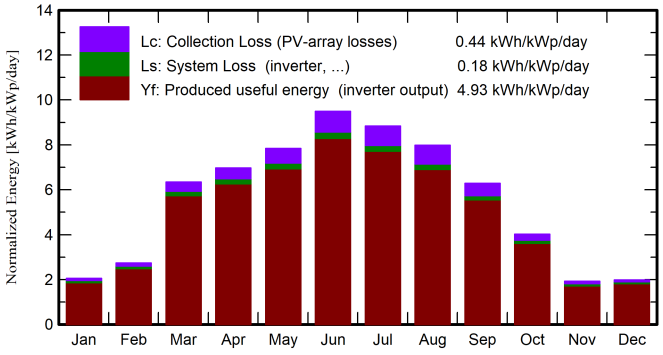
Main results

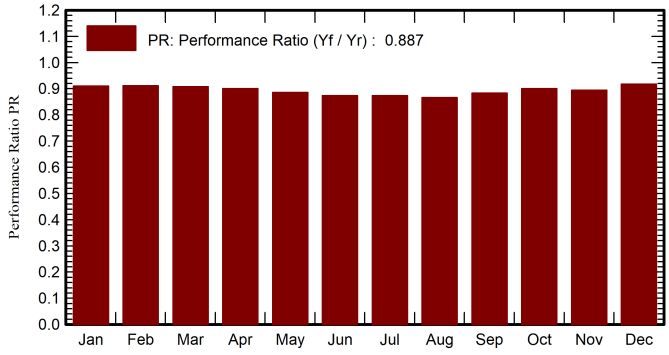
System Production

Produced Energy	46652 MWh/year	Specific production	1800 kWh/kWp/year
		Perf. Ratio PR	88.75 %
		Bifacial perf. ratio	87.85 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

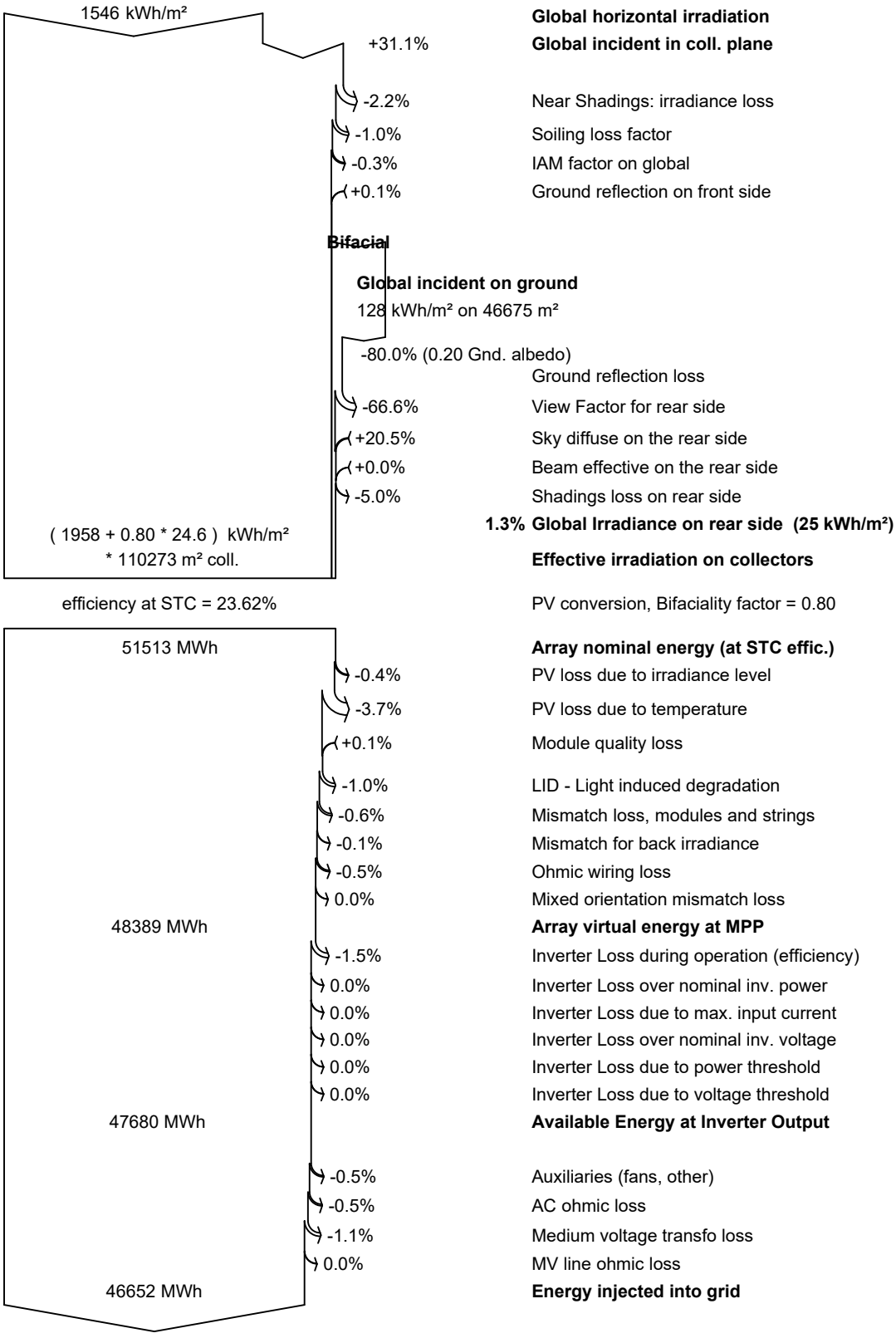
	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio	PRBifi ratio
January	47.6	23.52	5.95	63.6	60.7	1581	1502	0.911	0.901
February	59.2	28.87	6.92	76.7	73.5	1897	1812	0.912	0.902
March	143.5	46.76	12.30	196.5	190.1	4779	4622	0.908	0.899
April	159.2	60.59	13.09	209.1	202.1	5058	4884	0.901	0.892
May	194.0	75.93	18.44	243.2	235.1	5780	5582	0.885	0.876
June	220.6	76.21	23.24	284.7	275.7	6671	6451	0.874	0.865
July	213.1	78.43	24.02	273.9	265.1	6417	6205	0.874	0.865
August	187.3	63.06	26.47	247.5	239.7	5751	5561	0.867	0.858
September	139.5	53.69	21.90	188.7	182.4	4469	4320	0.883	0.875
October	93.4	40.01	14.66	124.6	119.9	3023	2910	0.901	0.892
November	45.1	23.54	9.97	57.7	55.1	1417	1339	0.895	0.885
December	43.7	18.84	3.67	61.6	58.7	1542	1463	0.917	0.909
Year	1546.2	589.47	15.10	2027.8	1958.0	48386	46652	0.887	0.879

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
PRBifi	Bifacial Performance Ratio

PVsyst V8.0.15
VC0, Simulation date:
25/08/25 17:37
with V8.0.15

Loss diagram



PVsyst V8.0.15
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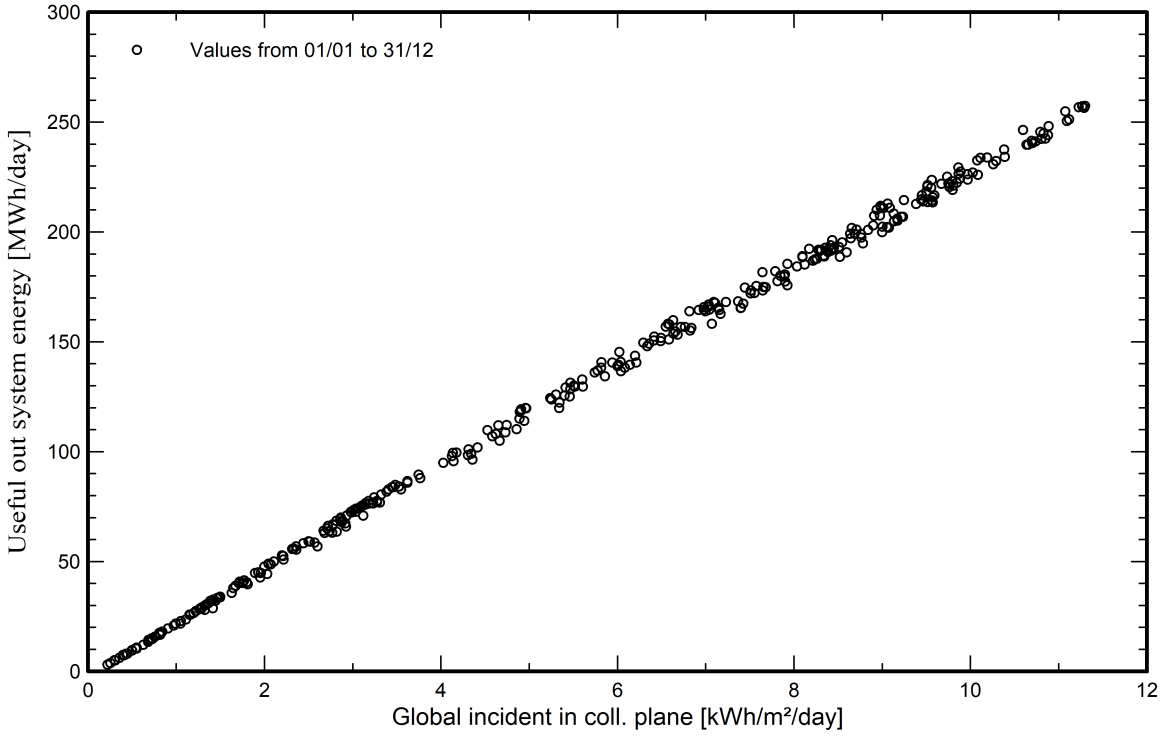
with V8.0.15

Predef. graphs

Daily Input/Output diagram



System Output Power Distribution