

Regione  
Emilia Romagna



Provincia di  
Ferrara



Comune di  
Bondeno



# IMPIANTO AGROVOLTAICO DI 60MW SITO NEL COMUNE DI BONDENO (FE) E RELATIVE OPERE CONNESSE

PROGETTISTA INCARICATO:  
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Scala

n.d.

Titolo elaborato:

SIMULAZIONE PVSYST

Formato

A4

TECNICI COINVOLTI

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Dott. Agr. Stefano Pesavento  
Dott. Geol. Loris Tietto

CODICE ELABORATO

PROGETTO	CLASSE	TIPO	PROG.
RVFVER32	VIA2	R	27

Rev.	Data	Descrizione	Redige	Verifica	Approva
00	02/23	Prima emissione	RC	RC	RC
01	12/23	Prima Revisione	RC	RC	RC
02					
03					
04					
05					
06					

GESTORE RETE ELETTRICA



SOCIETA' PROPONENTE:

**Bondeno SRL**  
Via Mike Bongiorno, 13 - 20124 Milano  
PEC: bondeno@pec-legal.it  
REA: MI - 2677347  
P.iva 05496160283

SOCIETA' di PROGETTAZIONE:

**Renvalue SRL**  
Via Quattro Novembre, 2 Padova  
PEC: cert@pec.renvalue.it

# *PVsyst - Rapporto di simulazione*

## *Sistema connesso in rete*

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*Progetto: Bondeno agrivoltaico sotto-campo Nord*

*Variante: Nuova variante di simulazione*

*Sistema inseguitori con indetreggiamento (backtracking)*

*Potenza di sistema: 35.77 MWc*

*Santa Bianca - Italia*



# Progetto: Bondeno agrivoltaico sotto-campo Nord

Variante: Nuova variante di simulazione

## PVsyst V7.2.8

VCO, Simulato su  
13/12/23 14:27  
con v7.2.8

### Sommario del progetto

#### Luogo geografico

**Santa Bianca**  
Italia

#### Ubicazione

Latitudine 44.86 °N  
Longitudine 11.38 °E  
Altitudine 13 m  
Fuso orario UTC+1

#### Parametri progetto

Albedo 0.20

#### Dati meteo

Santa Bianca

PVGIS TMY: SARAH, COSMO or NSRDB - Sintetico

### Sommario del sistema

#### Sistema connesso in rete

#### Orientamento campo FV

Piano d'inseguimento, asse orizzon. N-S  
Asse dell'azimut 16 °

#### Informazione sistema

##### Campo FV

Numero di moduli 52220 unità  
Pnom totale 35.77 MWc

#### Sistema inseguitori con indetreggiamento (backtracking)

#### Ombre vicine

Ombre lineari

#### Inverter

Numero di unità 8 unità  
Pnom totale 36.48 MWac  
Rapporto Pnom 0.981

#### Bisogni dell'utente

Carico illimitato (rete)

### Sommario dei risultati

Energia prodotta 60058 MWh/anno Prod. Specif. 1679 kWh/kWc/anno Indice rendimento PR 90.54 %

### Indice dei contenuti

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# Progetto: Bondeno agrivoltaico sotto-campo Nord

Variante: Nuova variante di simulazione

## PVsyst V7.2.8

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### Parametri principali

#### Sistema connesso in rete

#### Orientamento campo FV

##### Orientamento

Piano d'inseguimento, asse orizzon. N-S  
Asse dell'azimut 16 °

#### Orizzonte

Orizzonte libero

#### Sistema a moduli bifacciali

Modello Calcolo 2D  
eliostati illimitati

#### Geometria del modello bifacciale

Distanza eliostati 6.00 m  
ampiezza eliostati 2.38 m  
GCR 39.7 %  
Altezza dell'asse dal suolo 3.00 m

#### Sistema inseguitori con indetreggiamento (backtracking)

#### Strategia Backtracking

N. di eliostati 1922 unità

#### Dimensioni

Distanza eliostati 6.00 m  
Larghezza collettori 2.38 m  
Fattore occupazione (GCR) 39.7 %  
Phi min / max +/- 45.0 °

#### Angolo limite indetreggiamento

Limiti phi +/- 66.4 °

#### Ombre vicine

Ombre lineari

#### Modelli utilizzati

Trasposizione Perez  
Diffuso Perez, Meteonorm  
Circumsolare separare

#### Bisogni dell'utente

Carico illimitato (rete)

#### Definizioni per il modello bifacciale

Albedo dal suolo 0.20  
Fattore di Bifaccialità 80 %  
Ombreg. posteriore 5.0 %  
Perd. Mismatch post. 10.0 %  
Frazione trasparente della tettoia 0.0 %

### Caratteristiche campo FV

#### Modulo FV

Costruttore Risen Energy Co., Ltd  
Modello RSM132-8-685BNDG  
(PVsyst database originale)  
Potenza nom. unit. 685 Wp  
Numero di moduli FV 52220 unità  
Nominale (STC) 35.77 MWc  
Moduli 1865 Stringhe x 28 In serie  
In cond. di funz. (50°C)  
Pmpp 32.92 MWc  
U mpp 1018 V  
I mpp 32344 A

#### Potenza PV totale

Nominale (STC) 35771 kWp  
Totale 52220 moduli  
Superficie modulo 162214 m<sup>2</sup>  
Superficie cella 151992 m<sup>2</sup>

#### Inverter

Costruttore Siemens  
Modello Sinacon PV4560  
(PVsyst database originale)  
Potenza nom. unit. 4560 kWac  
Numero di inverter 8 units  
Potenza totale 36480 kWac  
Voltaggio di funzionamento 919-1500 V  
Rapporto Pnom (DC:AC) 0.98

#### Potenza totale inverter

Potenza totale 36480 kWac  
N. di inverter 8 unità  
Rapporto Pnom 0.98



**PVsyst V7.2.8**

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**Perdite campo**

**Perdite per sporco campo**

Fraz. perdite 1.0 %

**Fatt. di perdita termica**

Temperatura modulo secondo irraggiamento

Uc (cost) 29.0 W/m<sup>2</sup>K

Uv (vento) 0.0 W/m<sup>2</sup>K/m/s

**Perdite DC nel cablaggio**

Res. globale campo 0.52 mΩ

Fraz. perdite 1.5 % a STC

**LID - Light Induced Degradation**

Fraz. perdite 2.0 %

**Perdita di qualità moduli**

Fraz. perdite -0.1 %

**Perdite per mismatch del modulo**

Fraz. perdite 2.0 % a MPP

**Perdita disadattamento Stringhe**

Fraz. perdite 0.1 %

**Fattore di perdita IAM**

Effetto d'incidenza, profilo definito utente (IAM): Profilo definito utente

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.992	0.978	0.946	0.850	0.000

**Perdite sistema**

**Perdite ausiliarie**

Proporzionali alla potenza 4.0 W/kW

0.0 kW dalla soglia di potenza

**Perdite cablaggio AC**

**Linea uscita inv. sino al trasformatore MT**

Tensione inverter 630 Vac tri

Fraz. perdite 1.47 % a STC

**Inverter: Sinacon PV4560**

Sezione cavi (8 Inv.) All 8 x 3 x 4000 mm<sup>2</sup>

Lunghezza media dei cavi 168 m

**Linea MV fino alla iniezione**

Voltaggio MV 20 kV

Media ciascun inverter

Conduttori All 3 x 95 mm<sup>2</sup>

Lunghezza 161 m

Fraz. perdite 0.08 % a STC

**Perdite AC nei trasformatori**

**Trafo MV**

Tensione rete 20 kV

**Perdite di operazione in STC**

Potenza nominale a STC 35229 kVA

Perdita ferro (Connessione 24/24) 5.87 kW/Inv.

Fraz. perdite 0.10 % a STC

Resistenza equivalente induttori 3 x 0.68 mΩ/inv.

Fraz. perdite 1.00 % a STC



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13/12/23 14:27  
con v7.2.8

Parametri per ombre vicine

Prospettiva campo FV e area d'ombra circostante

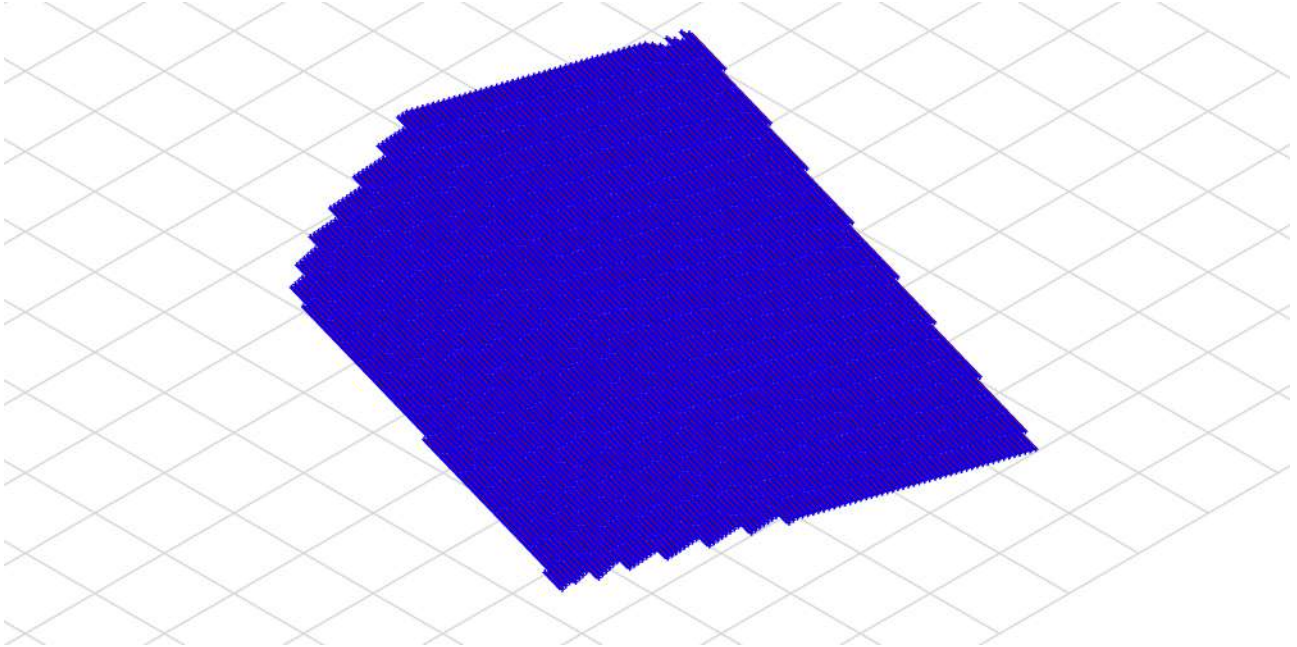
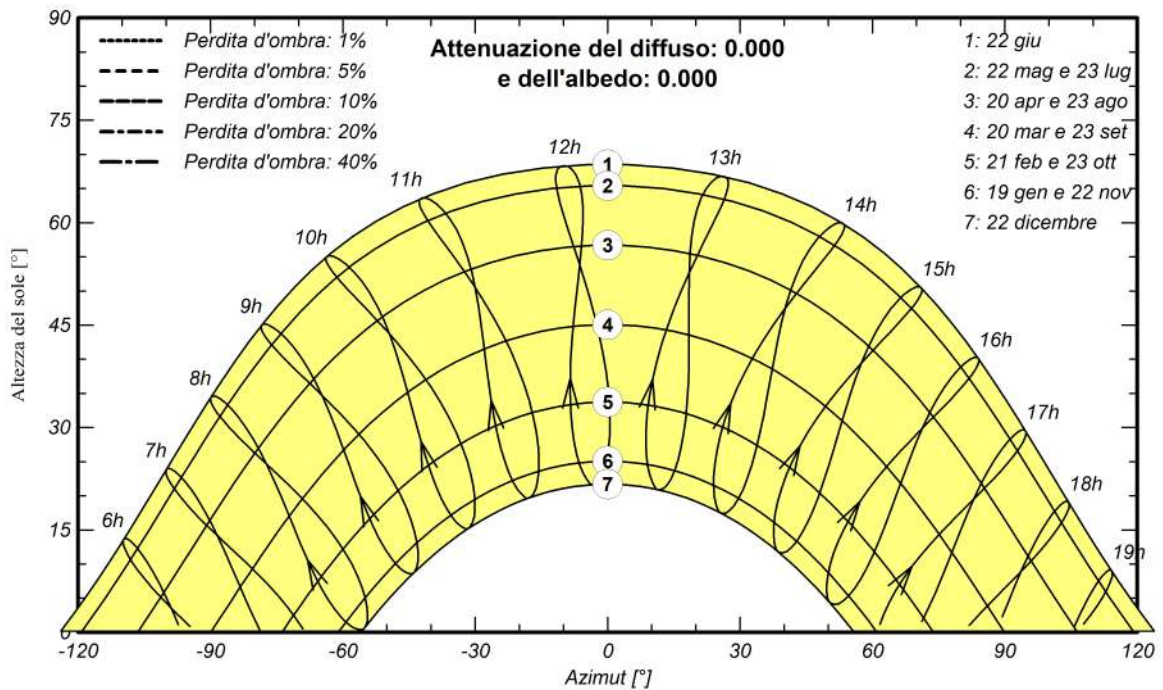


Diagramma iso-ombre

Bondeno agrivoltaico sotto-campo Nord - Ora legale







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**Risultati principali**

**Produzione sistema**

Energia prodotta

60058 MWh/anno

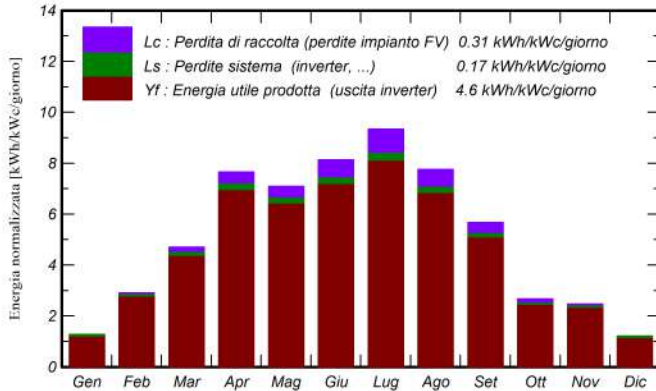
Prod. Specif.

1679 kWh/kWc/anno

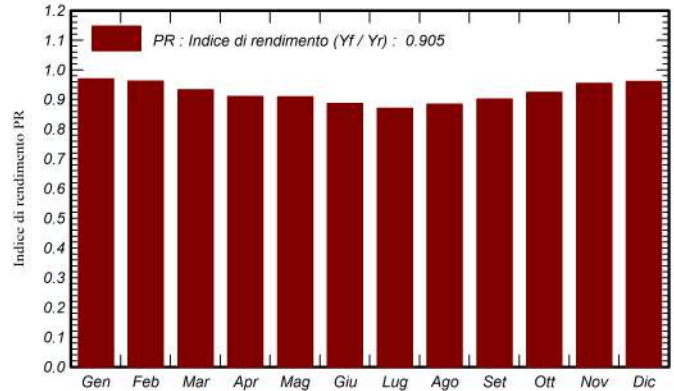
Indice di rendimento PR

90.54 %

**Produzione normalizzata (per kWp installato)**



**Indice di rendimento PR**



**Bilanci e risultati principali**

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	MWh	MWh	ratio
Gennaio	34.0	24.60	1.22	39.1	37.4	1419	1355	0.970
Febbraio	61.1	28.80	3.23	81.3	78.9	2901	2798	0.962
Marzo	111.2	48.80	10.00	145.8	141.8	5046	4867	0.933
Aprile	174.3	62.10	14.87	229.8	224.2	7769	7484	0.910
Maggio	170.0	73.20	16.33	219.9	214.2	7416	7152	0.909
Giugno	191.3	78.40	22.25	244.1	237.9	8033	7743	0.887
Luglio	221.8	73.00	25.07	289.6	282.8	9363	9017	0.870
Agosto	181.0	67.50	23.17	240.5	234.6	7888	7606	0.884
Settembre	129.6	53.60	19.56	170.1	165.5	5686	5487	0.902
Ottobre	64.9	38.10	16.16	82.7	79.9	2835	2733	0.924
Novembre	54.9	26.70	7.13	74.2	71.9	2627	2533	0.954
Dicembre	30.0	18.80	3.94	37.3	35.9	1342	1282	0.961
Anno	1424.1	593.60	13.64	1854.3	1804.9	62327	60058	0.905

**Legenda**

GlobHor Irraggiamento orizzontale globale

DiffHor Irraggiamento diffuso orizz.

T\_Amb Temperatura ambiente

GlobInc Globale incidente piano coll.

GlobEff Globale "effettivo", corr. per IAM e ombre

EArray Energia effettiva in uscita campo

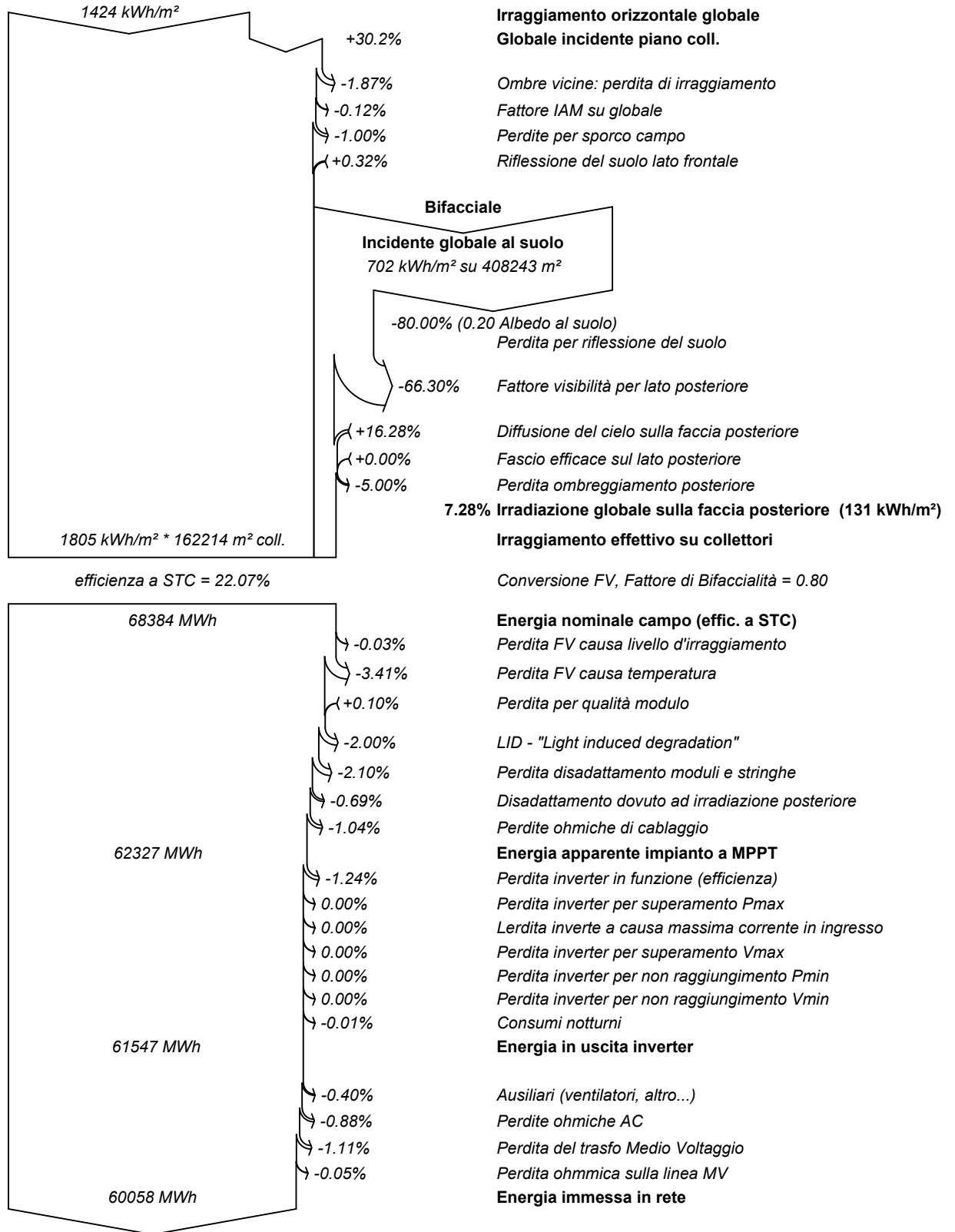
E\_Grid Energia immessa in rete

PR Indice di rendimento



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Diagramma perdite



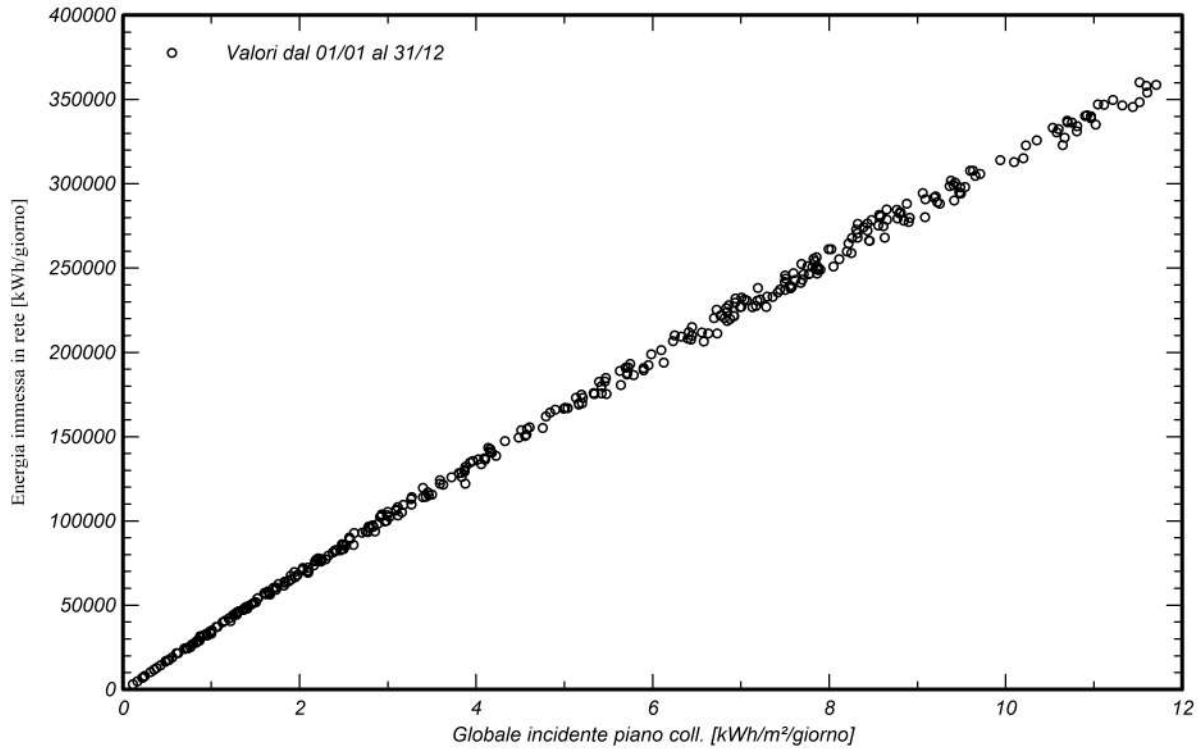




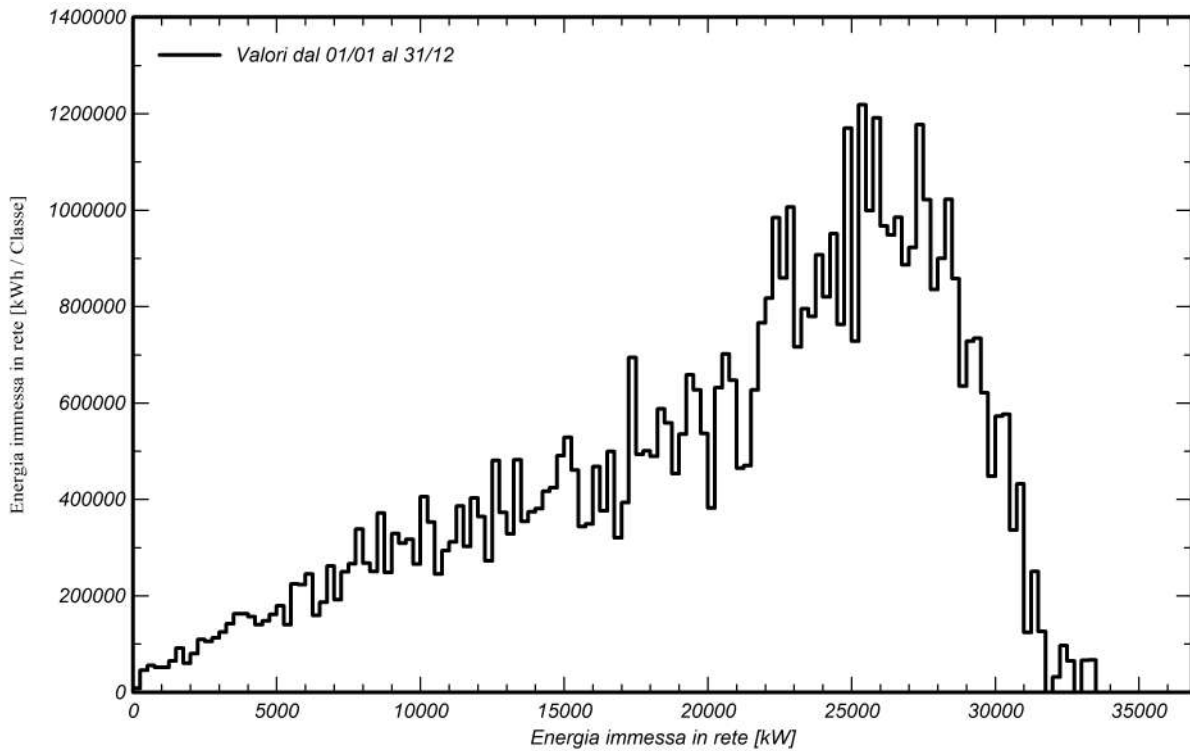
PVsyst V7.2.8  
VC0, Simulato su  
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con v7.2.8

Grafici speciali

Diagramma giornaliero entrata/uscita



Distribuzione potenza in uscita sistema



# PVsyst - Simulation report

## Grid-Connected System

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Project: Bondeno agrivoltaico Sotto campo Sud 1

Variant: Nuova variante di simulazione

Tracking system with backtracking

System power: 16.97 MWp

Ponte Trevisani - Italia



# Project: Bondeno agrivoltaico Sotto campo Sud 1

Variant: Nuova variante di simulazione

## PVsyst V7.2.8

VCO, Simulation date:  
21/03/23 11:42  
with v7.2.8

### Project summary

<b>Geographical Site</b> Ponte Trevisani Italia	<b>Situation</b> Latitude 44.85 °N Longitude 11.38 °E Altitude 14 m Time zone UTC+1	<b>Project settings</b> Albedo 0.20
<b>Meteo data</b> Ponte Trevisani PVGIS api TMY		

### System summary

<b>Grid-Connected System</b>	<b>Tracking system with backtracking</b>	
<b>PV Field Orientation</b> Tracking plane, horizontal N-S axis Axis azimuth -11 °	<b>Near Shadings</b> Linear shadings	<b>User's needs</b> Unlimited load (grid)
<b>System information</b>		
<b>PV Array</b>		<b>Inverters</b>
Nb. of modules 24780 units Pnom total 16.97 MWp		Nb. of units 3 units Pnom total 13.68 MWac Pnom ratio 1.241

### Results summary

Produced Energy 27993 MWh/year	Specific production 1649 kWh/kWp/year	Perf. Ratio PR 90.34 %
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General parameters, PV Array Characteristics, System losses	3
Near shading definition - Iso-shadings diagram	5
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# Project: Bondeno agrivoltaico Sotto campo Sud 1

Variant: Nuova variante di simulazione

## PVsyst V7.2.8

VCO, Simulation date:  
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### General parameters

Grid-Connected System		Tracking system with backtracking	
<b>PV Field Orientation</b>		<b>Backtracking strategy</b>	
<b>Orientation</b>		<b>Nb. of trackers</b>	885 units
Tracking plane, horizontal N-S axis		<b>Sizes</b>	
Axis azimuth	-11 °	Tracker Spacing	6.00 m
		Collector width	2.38 m
		Ground Cov. Ratio (GCR)	39.7 %
		Phi min / max.	-/+ 45.0 °
		<b>Backtracking limit angle</b>	
		Phi limits	+/- 66.4 °
<b>Horizon</b>		<b>Near Shadings</b>	
Free Horizon		Linear shadings	
<b>Bifacial system</b>		<b>User's needs</b>	
Model	2D Calculation	Unlimited load (grid)	
	unlimited trackers		
<b>Bifacial model geometry</b>		<b>Bifacial model definitions</b>	
Tracker Spacing	6.00 m	Ground albedo	0.20
Tracker width	2.38 m	Bifaciality factor	85 %
GCR	39.7 %	Rear shading factor	5.0 %
Axis height above ground	3.00 m	Rear mismatch loss	10.0 %
		Shed transparent fraction	0.0 %

### PV Array Characteristics

PV module		Inverter	
Manufacturer	Risen Energy Co., Ltd	Manufacturer	Siemens
Model	RSM132-8-685BHDG	Model	Sinacon PV4560
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	685 Wp	Unit Nom. Power	4560 kWac
Number of PV modules	24780 units	Number of inverters	3 units
Nominal (STC)	16.97 MWp	Total power	13680 kWac
Modules	885 Strings x 28 In series	Operating voltage	919-1500 V
<b>At operating cond. (50°C)</b>		Pnom ratio (DC:AC)	1.24
Pmpp	16.00 MWp		
U mpp	1074 V		
I mpp	14902 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	16974 kWp	Total power	13680 kWac
Total	24780 modules	Nb. of inverters	3 units
Module area	76975 m²	Pnom ratio	1.24
Cell area	72125 m²		



**PVsyst V7.2.8**

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**Array losses**

**Array Soiling Losses**

Loss Fraction 1.0 %

**Thermal Loss factor**

Module temperature according to irradiance

Uc (const) 29.0 W/m<sup>2</sup>K

Uv (wind) 0.0 W/m<sup>2</sup>K/m/s

**DC wiring losses**

Global array res. 1.2 mΩ

Loss Fraction 1.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 2.0 %

**Module Quality Loss**

Loss Fraction -0.1 %

**Module mismatch losses**

Loss Fraction 2.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.1 %

**IAM loss factor**

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.992	0.977	0.945	0.852	0.000

**AC wiring losses**

**Inv. output line up to MV transfo**

Inverter voltage 630 Vac tri

Loss Fraction 1.50 % at STC

**Inverter: Sinacon PV4560**

Wire section (3 Inv.) Alu 3 x 3 x 5000 mm<sup>2</sup>

Average wires length 170 m

**MV line up to Injection**

MV Voltage 15 kV

Average each inverter

Wires Alu 3 x 150 mm<sup>2</sup>

Length 154 m

Loss Fraction 0.08 % at STC

**AC losses in transformers**

**MV transfo**

Grid voltage 15 kV

**Operating losses at STC**

Nominal power at STC 16696 kVA

Iron loss (24/24 Connexion) 5.57 kW/Inv.

Loss Fraction 0.10 % at STC

Coils equivalent resistance 3 x 0.71 mΩ/inv.

Loss Fraction 1.00 % at STC

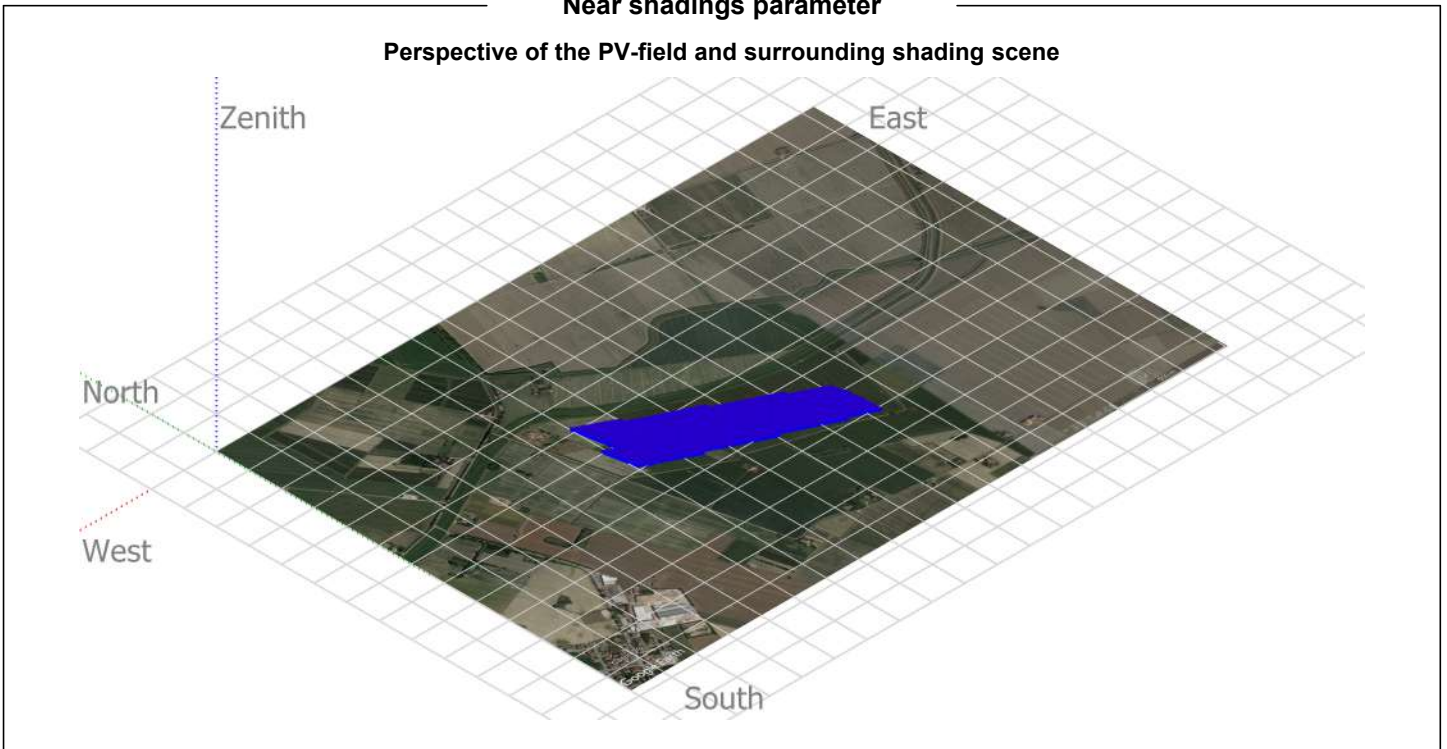


**PVsyst V7.2.8**

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with v7.2.8

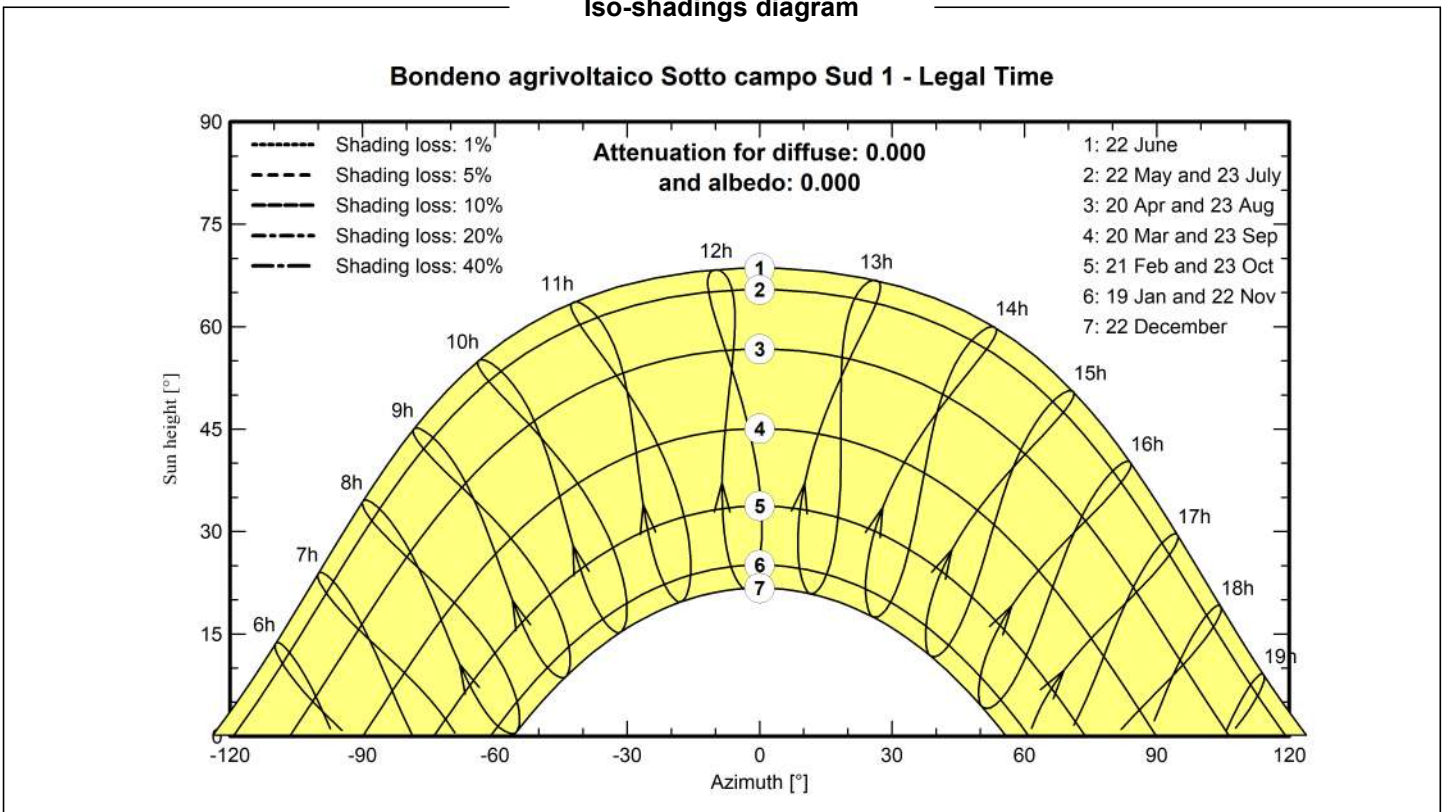
**Near shadings parameter**

**Perspective of the PV-field and surrounding shading scene**



**Iso-shadings diagram**

**Bondeno agrivoltaico Sotto campo Sud 1 - Legal Time**





# Project: Bondeno agrivoltaico Sotto campo Sud 1

Variant: Nuova variante di simulazione

## PVsyst V7.2.8

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21/03/23 11:42  
with v7.2.8

### Main results

#### System Production

Produced Energy 27993 MWh/year

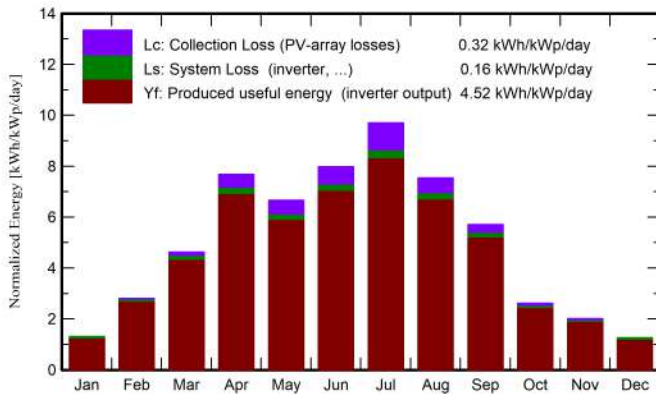
Specific production

1649 kWh/kWp/year

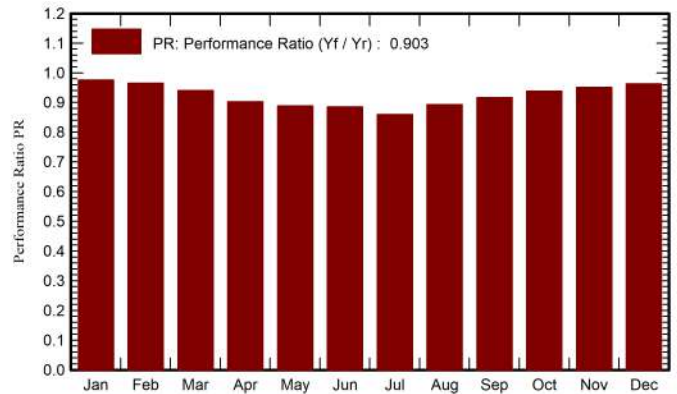
Performance Ratio PR

90.34 %

Normalized productions (per installed kWp)



Performance Ratio PR



#### Balances and main results

	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	°C	kWh/m <sup>2</sup>	kWh/m <sup>2</sup>	MWh	MWh	ratio
January	34.0	24.45	1.22	40.2	38.5	693	666	0.976
February	59.8	28.47	3.23	78.5	76.1	1330	1285	0.965
March	111.2	48.57	10.00	143.7	139.6	2373	2293	0.940
April	174.2	62.29	14.87	230.5	224.8	3659	3531	0.902
May	170.9	73.54	16.33	206.6	201.0	3227	3114	0.888
June	191.7	77.32	22.25	239.5	233.4	3725	3598	0.885
July	230.8	69.02	26.00	300.9	294.1	4554	4393	0.860
August	180.9	66.79	23.17	233.8	227.9	3669	3542	0.893
September	130.2	53.42	19.56	171.3	166.7	2758	2666	0.917
October	65.1	37.96	16.16	81.3	78.5	1340	1295	0.938
November	46.0	23.65	10.58	60.3	58.4	1009	973	0.951
December	30.5	18.53	3.95	38.9	37.4	662	635	0.963
Year	1425.3	583.99	14.00	1825.4	1776.3	29001	27993	0.903

#### 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		

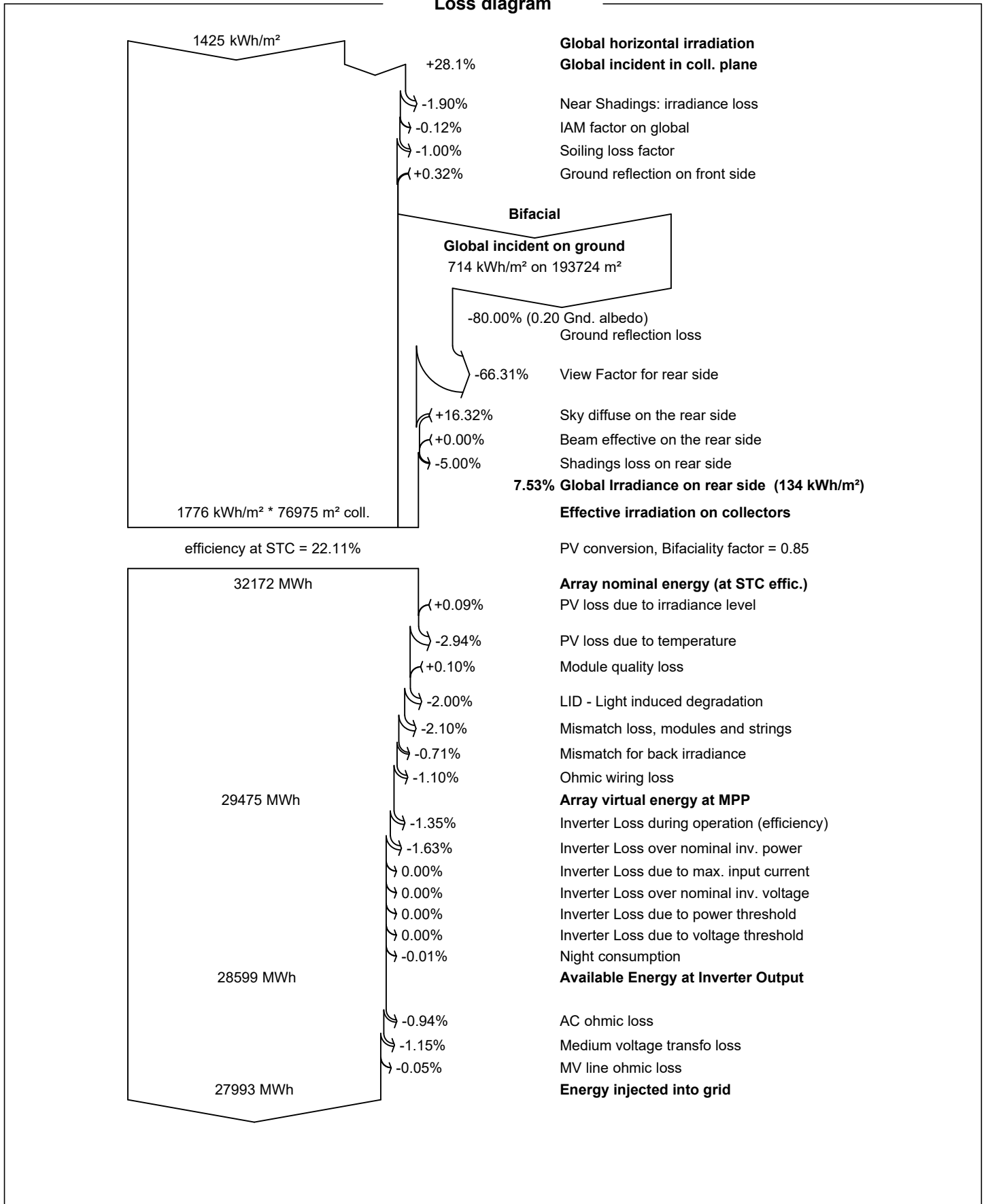




PVsyst V7.2.8

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with v7.2.8

Loss diagram



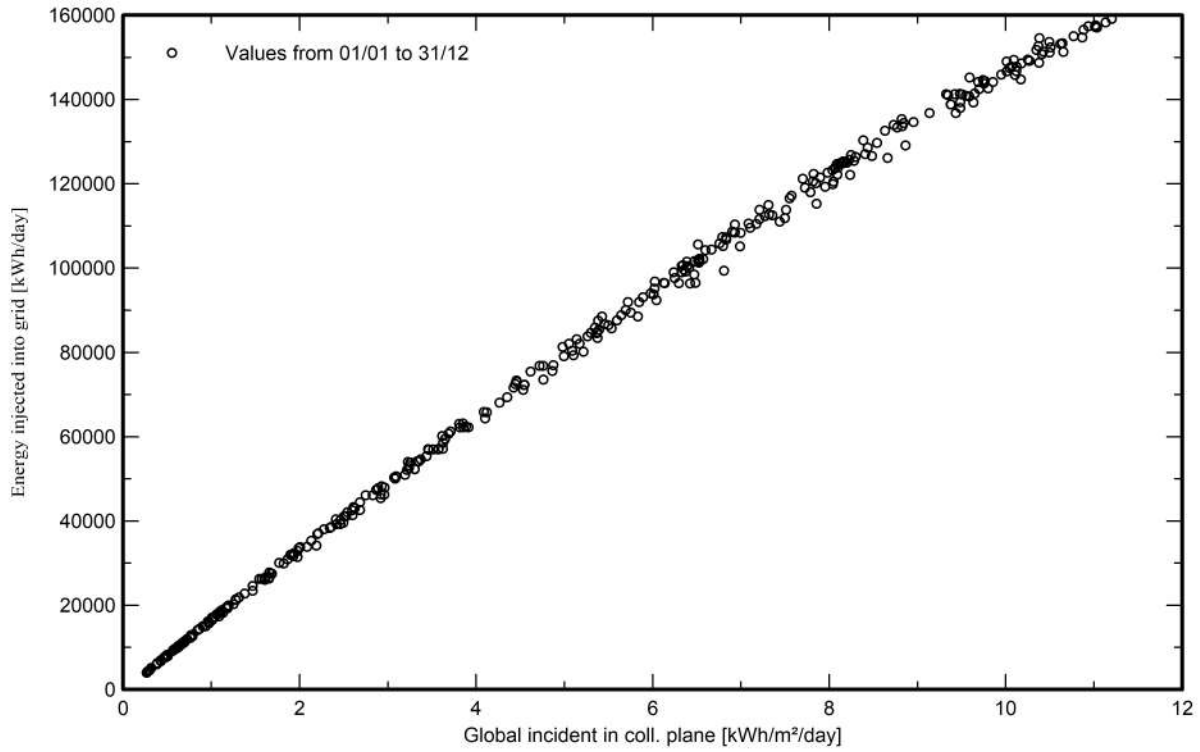


**PVsyst V7.2.8**

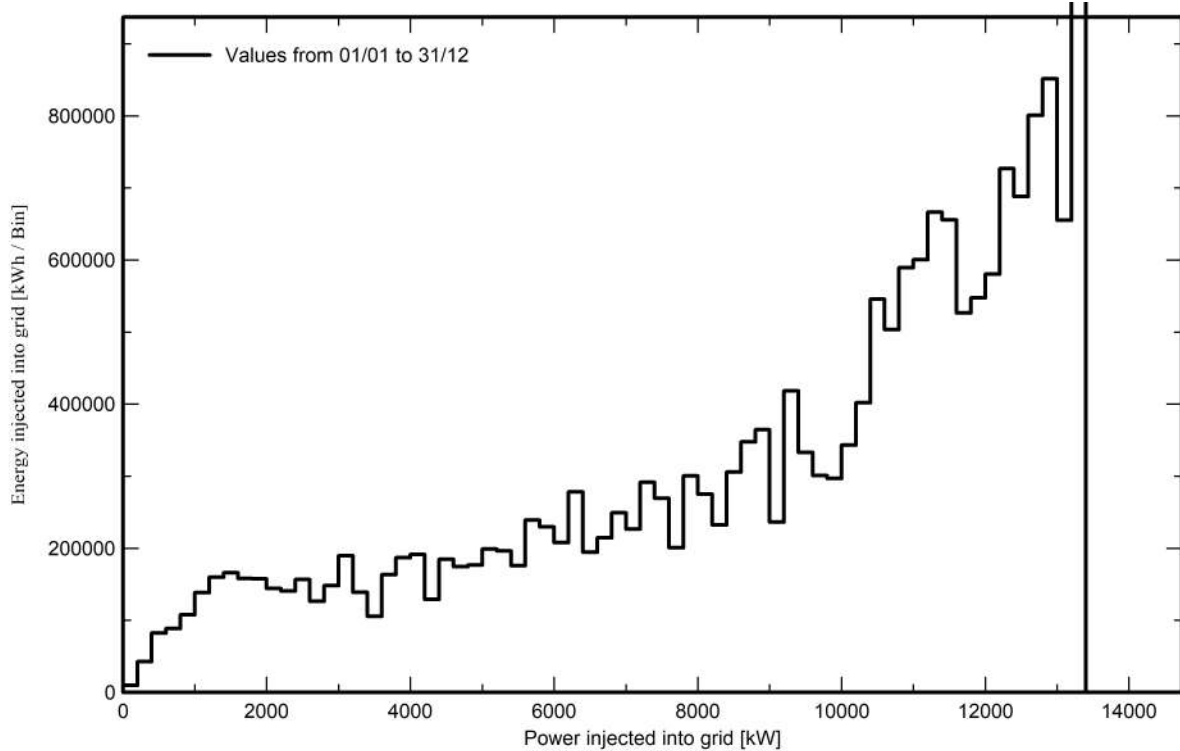
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21/03/23 11:42  
with v7.2.8

**Special graphs**

**Diagramma giornaliero entrata/uscita**



**Distribuzione potenza in uscita sistema**



# PVsyst - Simulation report

## Grid-Connected System

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Project: Bondeno agrivoltaico sotto campo Sud 2

Variant: Nuova variante di simulazione

Tracking system with backtracking

System power: 9226 kWp

Ponte Trevisani - Italy



# Project: Bondeno agrivoltaico sotto campo Sud 2

Variant: Nuova variante di simulazione

## PVsyst V7.2.8

VCO, Simulation date:  
21/03/23 12:11  
with v7.2.8

### Project summary

<b>Geographical Site</b> Ponte Trevisani Italy	<b>Situation</b> Latitude 44.84 °N Longitude 11.38 °E Altitude 11 m Time zone UTC+1	<b>Project settings</b> Albedo 0.20
<b>Meteo data</b> Ponte Trevisani PVGIS api TMY		

### System summary

<b>Grid-Connected System</b>	<b>Tracking system with backtracking</b>	
<b>PV Field Orientation</b> Tracking plane, horizontal N-S axis Axis azimuth -5 °	<b>Near Shadings</b> Linear shadings	<b>User's needs</b> Unlimited load (grid)
<b>System information</b>		
<b>PV Array</b>		<b>Inverters</b>
Nb. of modules 13468 units Pnom total 9226 kWp		Nb. of units 3 units Pnom total 13.68 MWac Pnom ratio 0.674

### Results summary

Produced Energy 15427 MWh/year	Specific production 1672 kWh/kWp/year	Perf. Ratio PR 91.55 %
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# Project: Bondeno agrivoltaico sotto campo Sud 2

Variant: Nuova variante di simulazione

## PVsyst V7.2.8

VCO, Simulation date:  
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### General parameters

Grid-Connected System		Tracking system with backtracking	
<b>PV Field Orientation</b>		<b>Backtracking strategy</b>	
<b>Orientation</b>		<b>Nb. of trackers</b>	481 units
Tracking plane, horizontal N-S axis		<b>Sizes</b>	
Axis azimuth	-5 °	Tracker Spacing	6.00 m
		Collector width	2.38 m
		Ground Cov. Ratio (GCR)	39.7 %
		Phi min / max.	-/+ 45.0 °
		<b>Backtracking limit angle</b>	
		Phi limits	+/- 66.4 °
<b>Horizon</b>		<b>Near Shadings</b>	
Free Horizon		Linear shadings	
<b>Bifacial system</b>		<b>User's needs</b>	
Model	2D Calculation	Unlimited load (grid)	
	unlimited trackers		
<b>Bifacial model geometry</b>		<b>Bifacial model definitions</b>	
Tracker Spacing	6.00 m	Ground albedo	0.20
Tracker width	2.38 m	Bifaciality factor	85 %
GCR	39.7 %	Rear shading factor	5.0 %
Axis height above ground	2.10 m	Rear mismatch loss	10.0 %
		Shed transparent fraction	0.0 %

### PV Array Characteristics

PV module		Inverter	
Manufacturer	Risen Energy Co., Ltd	Manufacturer	Siemens
Model	RSM132-8-685BHDG	Model	Sinacon PV4560
(Original PVsyst database)		(Original PVsyst database)	
Unit Nom. Power	685 Wp	Unit Nom. Power	4560 kWac
Number of PV modules	13468 units	Number of inverters	3 units
Nominal (STC)	9226 kWp	Total power	13680 kWac
Modules	481 Strings x 28 In series	Operating voltage	919-1500 V
<b>At operating cond. (50°C)</b>		Pnom ratio (DC:AC)	0.67
Pmpp	8695 kWp		
U mpp	1074 V		
I mpp	8099 A		
<b>Total PV power</b>		<b>Total inverter power</b>	
Nominal (STC)	9226 kWp	Total power	13680 kWac
Total	13468 modules	Nb. of inverters	3 units
Module area	41836 m²	Pnom ratio	0.67
Cell area	39200 m²		



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**Array losses**

**Array Soiling Losses**

Loss Fraction 1.0 %

**Thermal Loss factor**

Module temperature according to irradiance  
Uc (const) 29.0 W/m<sup>2</sup>K  
Uv (wind) 0.0 W/m<sup>2</sup>K/m/s

**DC wiring losses**

Global array res. 2.1 mΩ  
Loss Fraction 1.5 % at STC

**LID - Light Induced Degradation**

Loss Fraction 2.0 %

**Module Quality Loss**

Loss Fraction -0.1 %

**Module mismatch losses**

Loss Fraction 2.0 % at MPP

**Strings Mismatch loss**

Loss Fraction 0.1 %

**IAM loss factor**

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.992	0.977	0.945	0.852	0.000

**AC wiring losses**

**Inv. output line up to MV transfo**

Inverter voltage 630 Vac tri  
Loss Fraction 1.50 % at STC

**Inverter: Sinacon PV4560**

Wire section (3 Inv.) Alu 3 x 3 x 2500 mm<sup>2</sup>  
Average wires length 156 m

**MV line up to Injection**

MV Voltage 15 kV  
Average each inverter  
Wires Alu 3 x 50 mm<sup>2</sup>  
Length 94 m  
Loss Fraction 0.08 % at STC

**AC losses in transformers**

**MV transfo**

Grid voltage 15 kV

**Operating losses at STC**

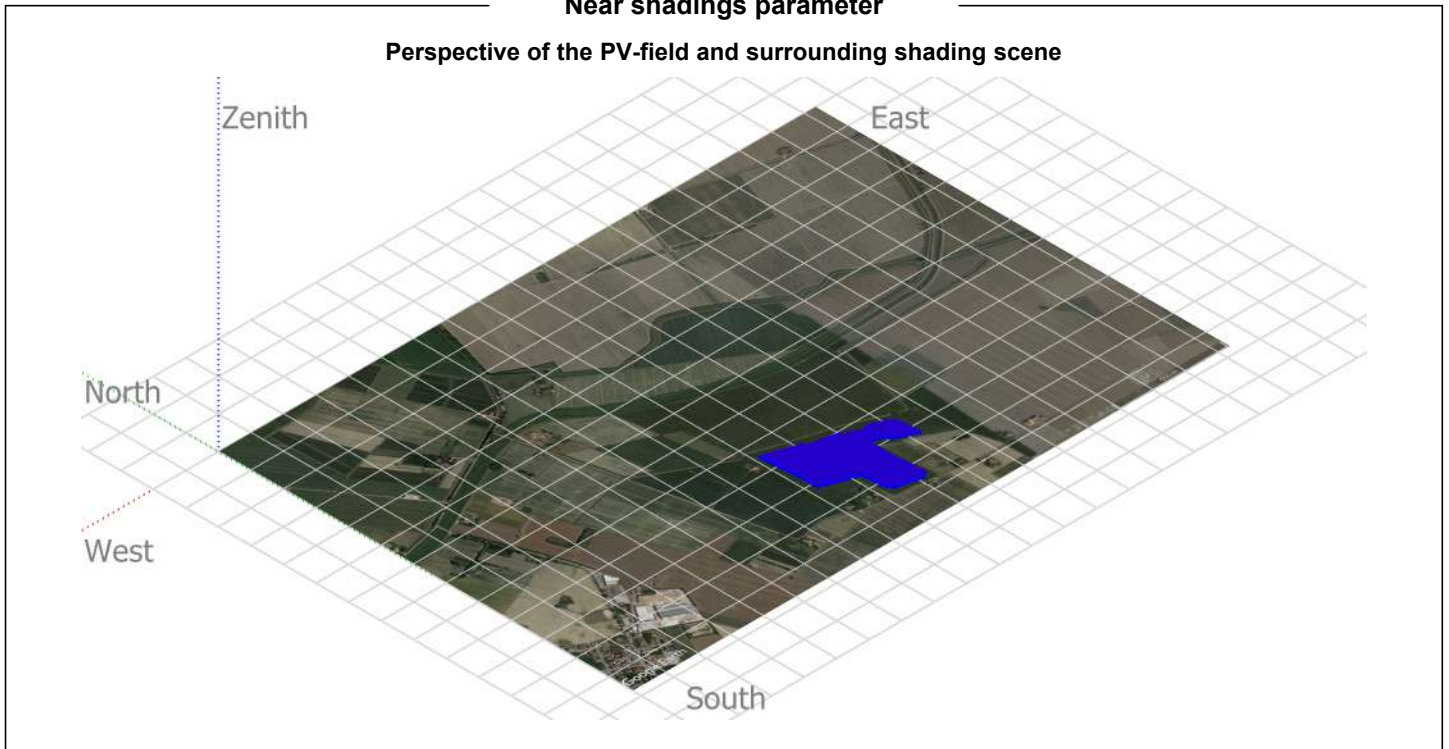
Nominal power at STC 9105 kVA  
Iron loss (24/24 Connexion) 3.03 kW/Inv.  
Loss Fraction 0.10 % at STC  
Coils equivalent resistance 3 x 1.31 mΩ/inv.  
Loss Fraction 1.00 % at STC



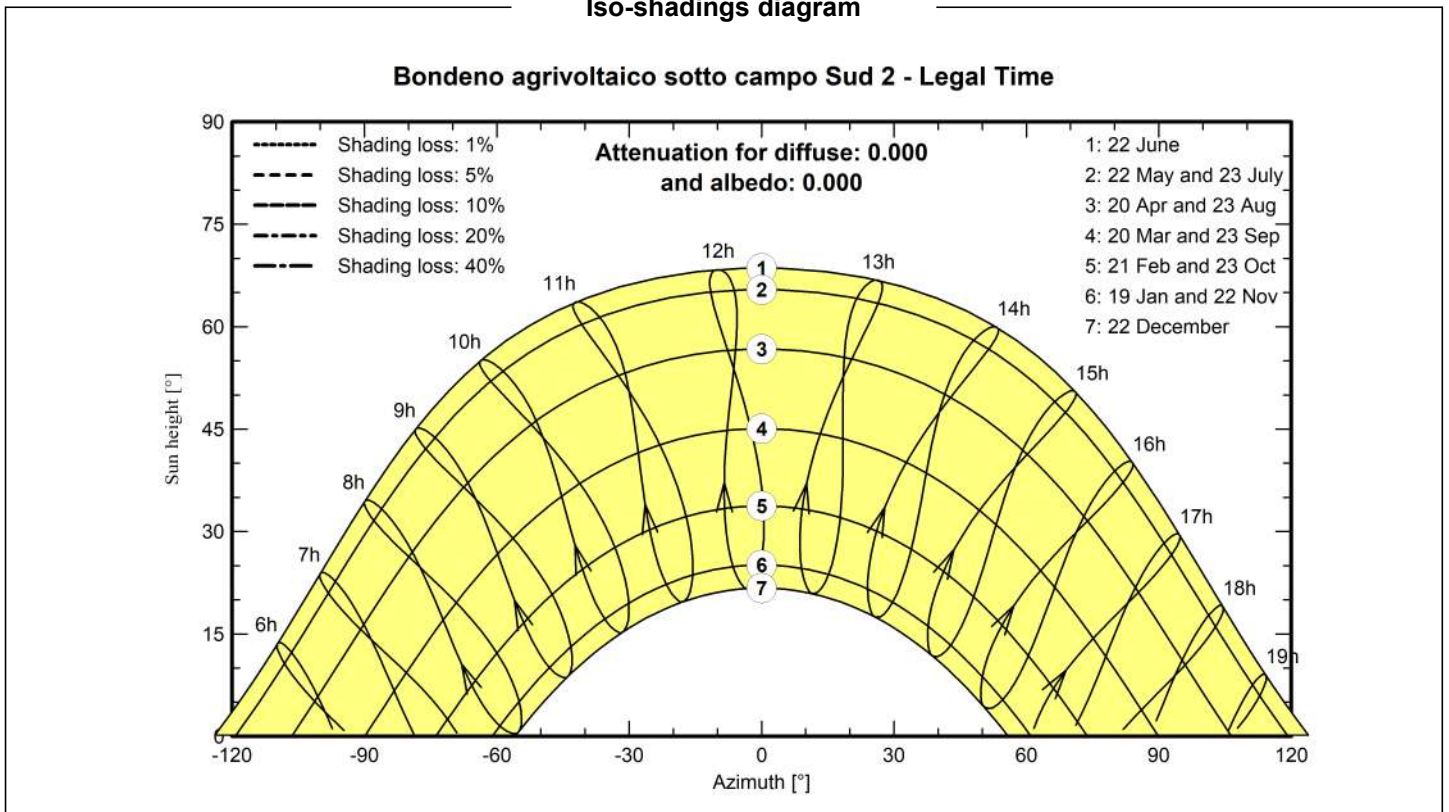
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**Near shadings parameter**



**Iso-shadings diagram**







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Variant: Nuova variante di simulazione

## PVsyst V7.2.8

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### Main results

#### System Production

Produced Energy 15427 MWh/year

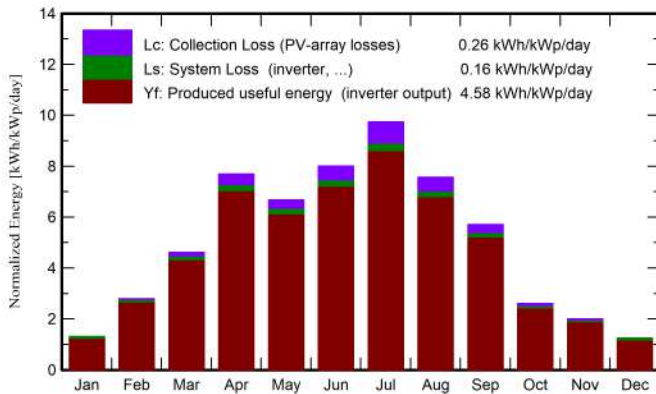
Specific production

1672 kWh/kWp/year

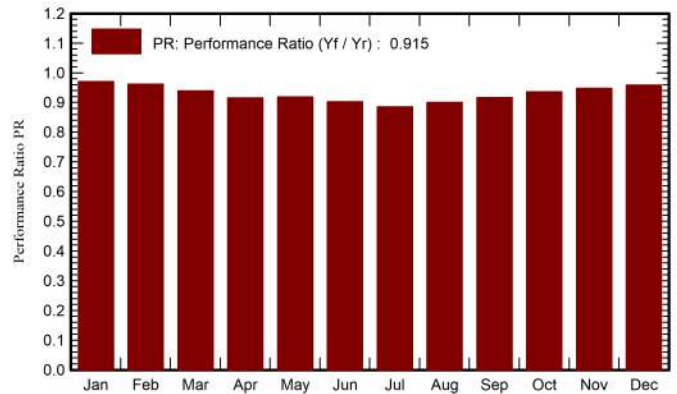
Performance Ratio PR

91.55 %

Normalized productions (per installed kWp)



Performance Ratio PR



### Balances and main results

	GlobHor kWh/m <sup>2</sup>	DiffHor kWh/m <sup>2</sup>	T_Amb °C	GlobInc kWh/m <sup>2</sup>	GlobEff kWh/m <sup>2</sup>	EArray MWh	E_Grid MWh	PR ratio
January	34.0	24.45	1.22	40.1	38.4	375	359	0.971
February	59.8	28.47	3.23	78.2	75.8	718	694	0.962
March	111.2	48.57	10.00	143.2	139.2	1284	1241	0.939
April	174.2	62.29	14.87	230.8	225.1	2018	1950	0.916
May	170.9	73.54	16.33	207.1	201.4	1819	1756	0.919
June	191.7	77.32	22.25	240.2	234.1	2069	2001	0.903
July	230.8	69.02	26.00	301.9	294.9	2551	2465	0.885
August	180.9	66.79	23.17	234.4	228.5	2014	1948	0.901
September	130.2	53.42	19.56	171.3	166.7	1497	1449	0.917
October	65.1	37.96	16.16	80.8	78.1	723	698	0.936
November	46.0	23.65	10.58	60.1	58.1	545	525	0.948
December	30.5	18.53	3.95	38.5	37.1	356	341	0.959
Year	1425.3	583.99	14.00	1826.6	1777.4	15970	15427	0.915

#### Legends

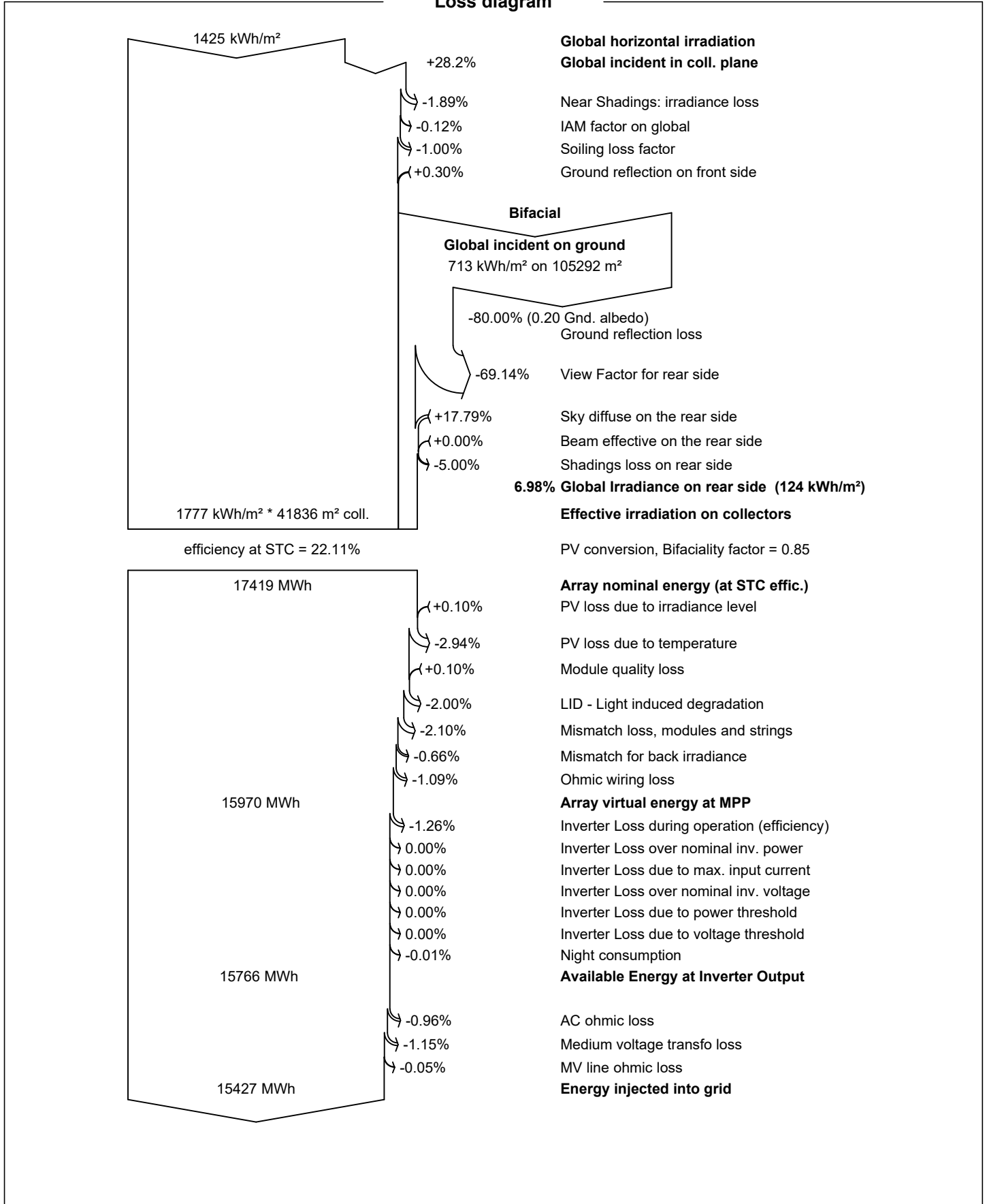
GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_Grid	Energy injected into grid
T_Amb	Ambient Temperature	PR	Performance Ratio
GlobInc	Global incident in coll. plane		
GlobEff	Effective Global, corr. for IAM and shadings		



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Loss diagram



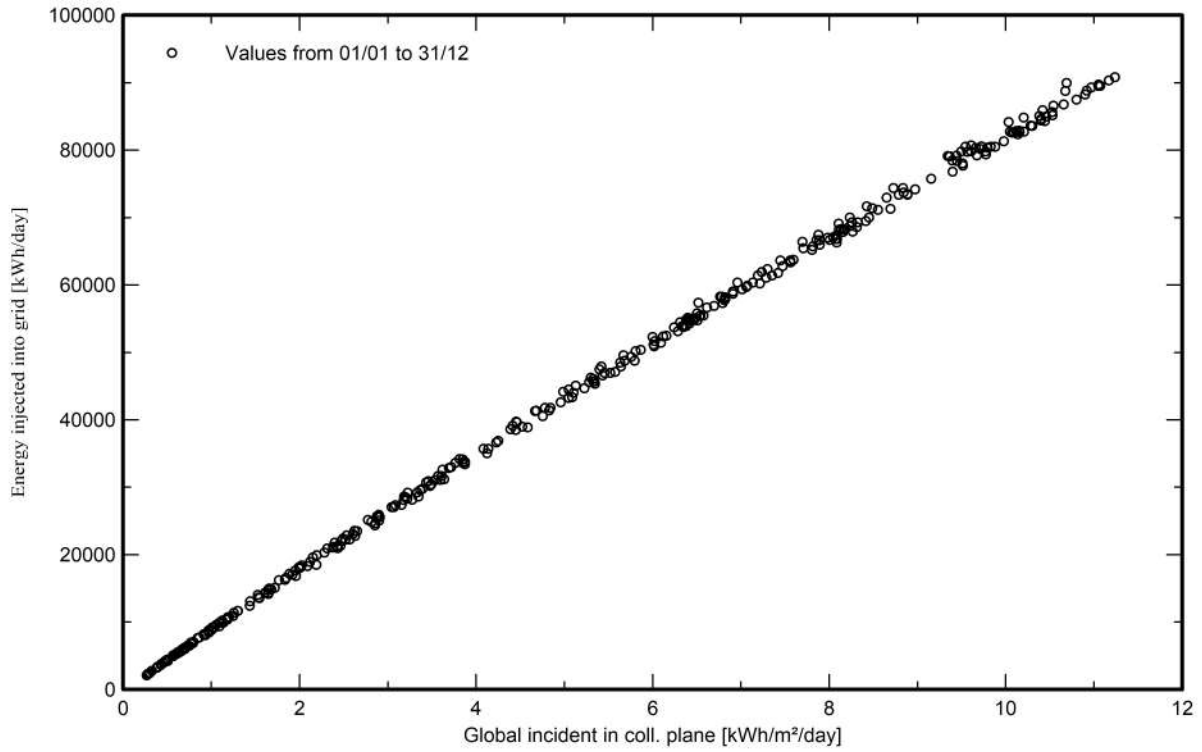


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**Special graphs**

**Diagramma giornaliero entrata/uscita**



**Distribuzione potenza in uscita sistema**

