



IMPIANTO AGRIVOLTAICO GREENFRUT E OPERE CONNESSE

POTENZA 68,51 MWp - COMUNE DI BICINICCO, CASTIONS DI STRADA, MORTEGLIANO,
SANTA MARIA LA LONGA, PAVIA DI UDINE - PROVINCIA DI UDINE

Proponente

ALPENFRUT - Società Agricola a Responsabilità Limitata

STRADA PROVINCIALE N.82 DI CHIASIELLIS - 33050 BICINICCO (UD) - C.F e P.IVA 02474100308
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Progettazione

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Titolo Elaborato

STIMA PRODUCIBILITÀ

LIVELLO PROGETTAZIONE	CODICE ELABORATO	FILE NAME	DATA	SCALA
DEFINITIVO	PD_REL04	PD_REL04_ Stima producibilità	29/11/2023	

Revisioni

REV.	DATA	DESCRIZIONE	ESEGUITO	VERIFICATO	APPROVATO
00	29/11/23	EMISSIONE PER PERMITTING	AAR	FTE	FTE



PVsyst - Simulation report

Grid-Connected System

Project: ALPENFRUT_55

Variant: ALPENFRUT_68.51

Tracking system

System power: 68.51 MWp

Gris - Italy

Author

ARTELIA Italia Spa (Italy)

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Project summary

Geographical Site	Situation	Project settings
Gris	Latitude 45.92 °N	Albedo 0.20
Italy	Longitude 13.21 °E	
	Altitude 23 m	
	Time zone UTC+1	
Meteo data		
Gris		
PVGIS api TMY		

System summary

Grid-Connected System	Tracking system	Near Shadings
PV Field Orientation	Tracking algorithm	Linear shadings : Fast (table)
Orientation	Astronomic calculation	Diffuse shading Automatic
Tracking plane, horizontal N-S axis	Wind Speed threshold 0 m/s	
Axis azimuth 0 °	Wind stow position 0 °	
System information	Inverters	
PV Array	Nb. of units 17 units	
Nb. of modules 99288 units	Pnom total 63.13 MWac	
Pnom total 68.51 MWp	Pnom ratio 1.085	
User's needs		
Unlimited load (grid)		

Results summary

Produced Energy 106406465 kWh/year	Specific production 1553 kWh/kWp/year	Perf. Ratio PR 82.44 %
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General parameters**Grid-Connected System****PV Field Orientation****Orientation**Tracking plane, horizontal N-S axis
Axis azimuth 0 °**Models used**Transposition Perez
Diffuse Imported
Circumsolar separate**Horizon**

Free Horizon

Bifacial systemModel 2D Calculation
unlimited trackers**Bifacial model geometry**Tracker Spacing 10.00 m
Tracker width 4.79 m
GCR 47.9 %
Axis height above ground 2.10 m**Tracking system****Tracking algorithm**Astronomic calculation
Wind Speed threshold 0 m/s
Wind stow position 0 °**Near Shadings**Linear shadings : Fast (table)
Diffuse shading Automatic**Trackers configuration**

Nb. of trackers 3351 units

SizesTracker Spacing 10.00 m
Collector width 4.79 m
Ground Cov. Ratio (GCR) 47.9 %
Phi min / max. -/+ 90.0 °**Shading limit angles**

Phi limits for BT -/+ 61.2 °

User's needs

Unlimited load (grid)

Bifacial model definitionsGround albedo 0.17
Bifaciality factor 80 %
Rear shading factor 5.0 %
Rear mismatch loss 10.0 %
Shed transparent fraction 0.0 %**PV Array Characteristics****Array #1 - A-B-C-E-F-I-K****PV module**Manufacturer CSI Solar
Model CS7N-690TB-AG
(Custom parameters definition)Unit Nom. Power 690 Wp
Number of PV modules 46648 units
Nominal (STC) 32.19 MWp
Modules 1666 Strings x 28 In series**At operating cond. (50°C)**Pmpp 29.97 MWp
U mpp 1026 V
I mpp 29208 A**Inverter**Manufacturer SMA
Model Sunny Central 4400 UP
(Original PVsyst database)Unit Nom. Power 4400 kWac
Number of inverters 6 units
Total power 26400 kWac
Operating voltage 962-1325 V
Pnom ratio (DC:AC) 1.22



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PV Array Characteristics

Array #2 - J

PV module

Manufacturer CSI Solar
Model CS7N-690TB-AG

(Custom parameters definition)

Unit Nom. Power 690 Wp
Number of PV modules 6048 units
Nominal (STC) 4173 kWp
Modules 216 Strings x 28 In series

At operating cond. (50°C)

Pmpp 3886 kWp
U mpp 1026 V
I mpp 3787 A

Inverter

Manufacturer SMA
Model Sunny Central 4200 UP

(Original PVsyst database)

Unit Nom. Power 4200 kWac
Number of inverters 1 unit
Total power 4200 kWac
Operating voltage 921-1325 V
Pnom ratio (DC:AC) 0.99

Array #3 - D-P

PV module

Manufacturer CSI Solar
Model CS7N-690TB-AG

(Custom parameters definition)

Unit Nom. Power 690 Wp
Number of PV modules 8568 units
Nominal (STC) 5912 kWp
Modules 306 Strings x 28 In series

At operating cond. (50°C)

Pmpp 5506 kWp
U mpp 1026 V
I mpp 5365 A

Inverter

Manufacturer SMA
Model Sunny Central 2930 UP

(Original PVsyst database)

Unit Nom. Power 2933 kWac
Number of inverters 2 units
Total power 5866 kWac
Operating voltage 962-1325 V
Pnom ratio (DC:AC) 1.01

Array #4 - G-H-O-R

PV module

Manufacturer CSI Solar
Model CS7N-690TB-AG

(Custom parameters definition)

Unit Nom. Power 690 Wp
Number of PV modules 14784 units
Nominal (STC) 10.20 MWp
Modules 528 Strings x 28 In series

At operating cond. (50°C)

Pmpp 9500 kWp
U mpp 1026 V
I mpp 9257 A

Inverter

Manufacturer SMA
Model Sunny Central 2660 UP

(Original PVsyst database)

Unit Nom. Power 2667 kWac
Number of inverters 4 units
Total power 10668 kWac
Operating voltage 880-1325 V
Pnom ratio (DC:AC) 0.96

Array #5 - L-M-N-Q

PV module

Manufacturer CSI Solar
Model CS7N-690TB-AG

(Custom parameters definition)

Unit Nom. Power 690 Wp
Number of PV modules 23240 units
Nominal (STC) 16.04 MWp
Modules 830 Strings x 28 In series

At operating cond. (50°C)

Pmpp 14.93 MWp
U mpp 1026 V
I mpp 14551 A

Inverter

Manufacturer SMA
Model Sunny Central 4000 UP

(Original PVsyst database)

Unit Nom. Power 4000 kWac
Number of inverters 4 units
Total power 16000 kWac
Operating voltage 880-1325 V
Pnom ratio (DC:AC) 1.00



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PV Array Characteristics

Total PV power

Nominal (STC) 68509 kWp
Total 99288 modules
Module area 308423 m²

Total inverter power

Total power 63134 kWac
Number of inverters 17 units
Pnom ratio 1.09

Array losses

Thermal Loss factor

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

LID - Light Induced Degradation

Loss Fraction 1.5 %

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.2 %

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.962	0.892	0.816	0.681	0.440	0.000

DC wiring losses

Global wiring resistance 0.27 mΩ
Loss Fraction 1.5 % at STC

Array #1 - A-B-C-E-F-I-K

Global array res. 0.57 mΩ
Loss Fraction 1.5 % at STC

Array #2 - J

Global array res. 4.4 mΩ
Loss Fraction 1.5 % at STC

Array #3 - D-P

Global array res. 3.1 mΩ
Loss Fraction 1.5 % at STC

Array #4 - G-H-O-R

Global array res. 1.8 mΩ
Loss Fraction 1.5 % at STC

Array #5 - L-M-N-Q

Global array res. 1.1 mΩ
Loss Fraction 1.5 % at STC

System losses

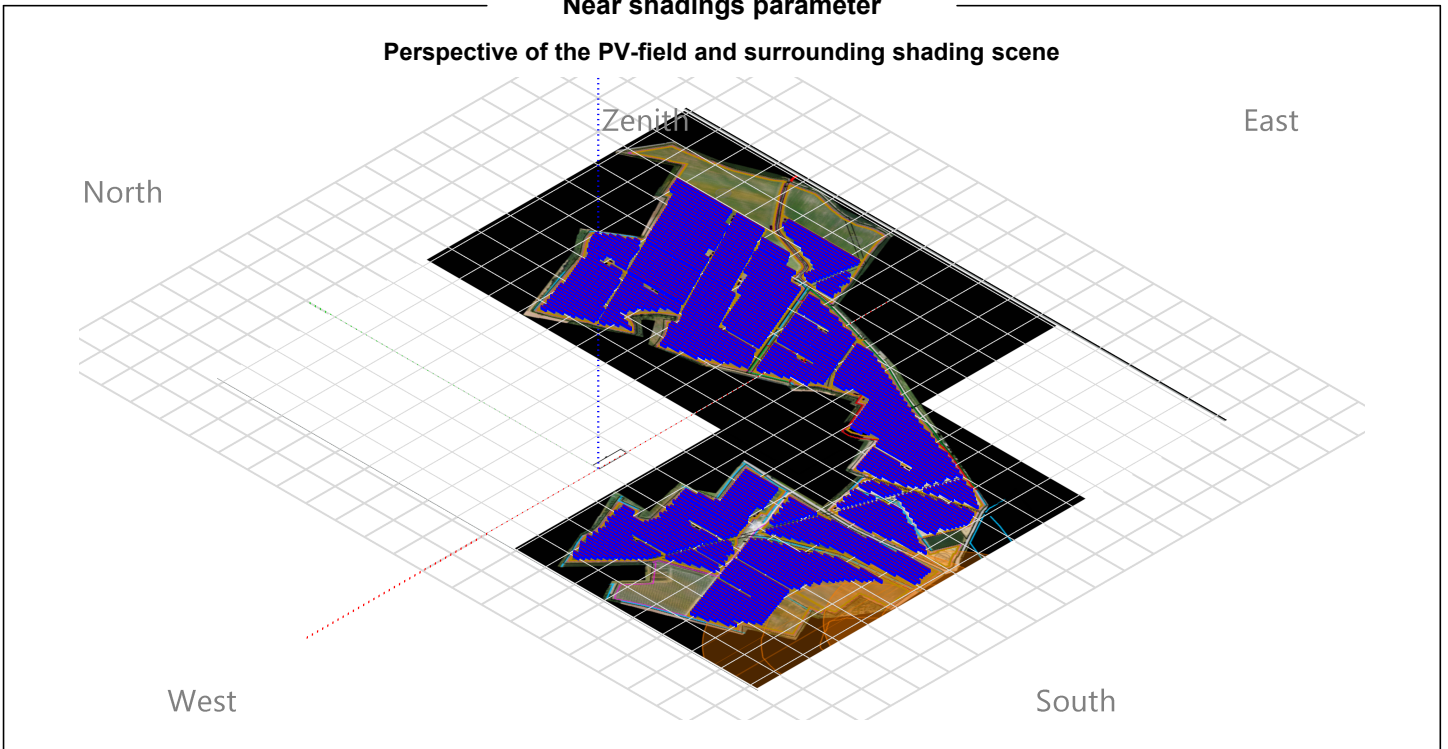
Auxiliaries loss

Proportionnal to Power 4.0 W/kW
0.0 kW from Power thresh.
Night aux. cons. 5.00 kW



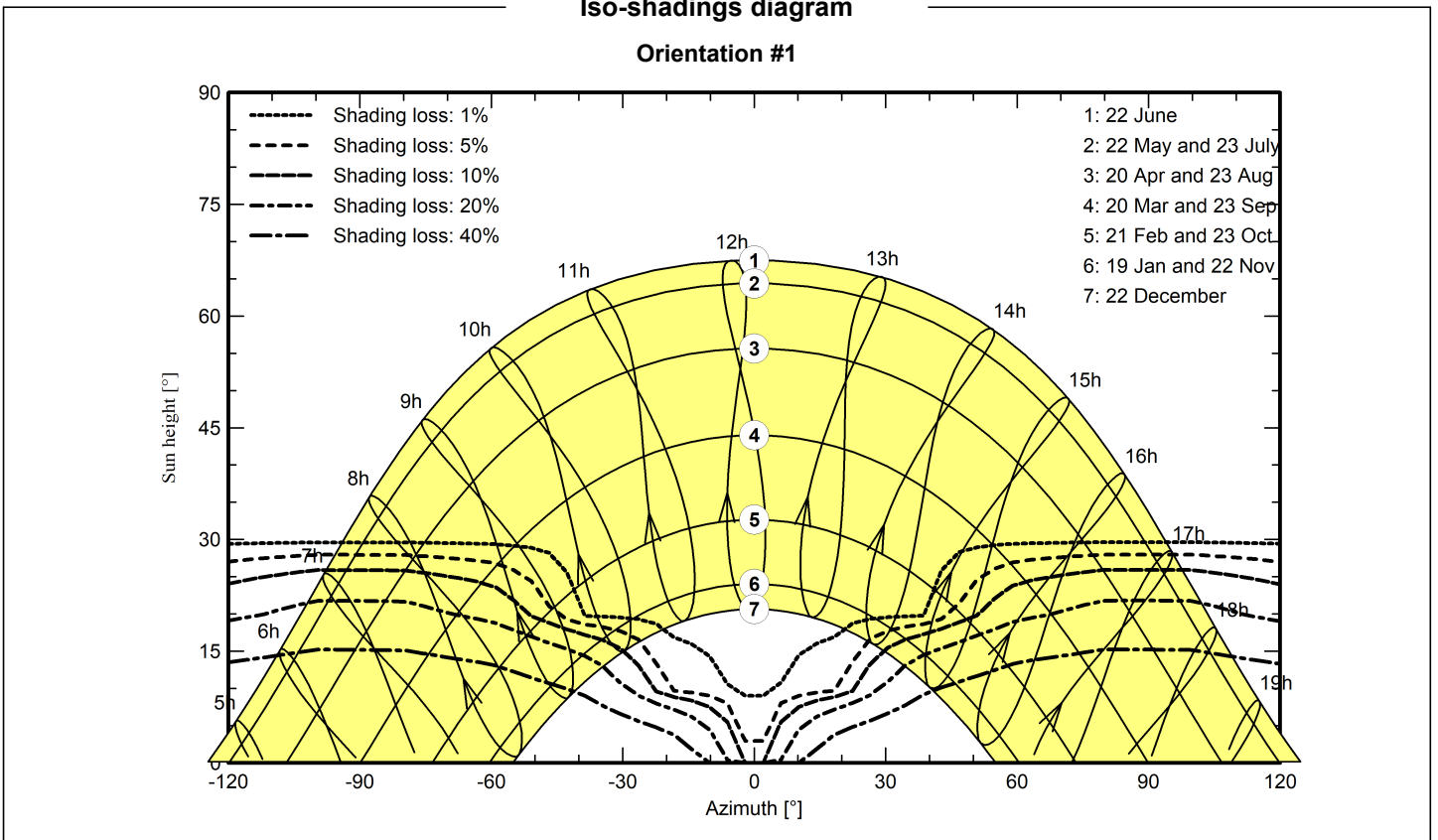
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





Main results

System Production

Produced Energy 106406465 kWh/year

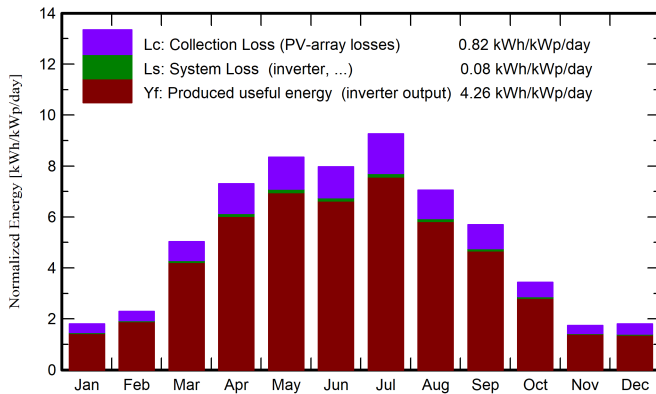
Specific production

1553 kWh/kWp/year

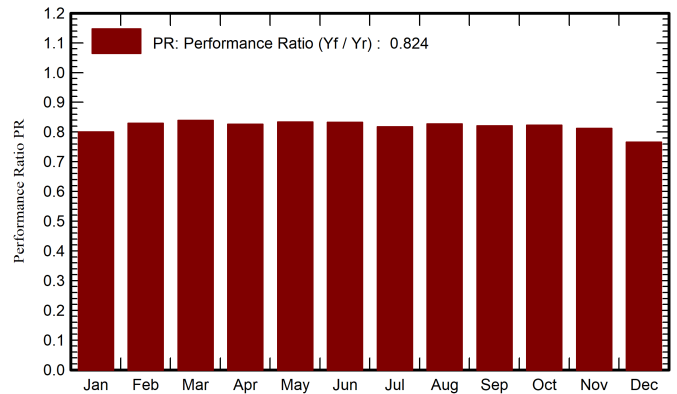
Perf. Ratio PR

82.44 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

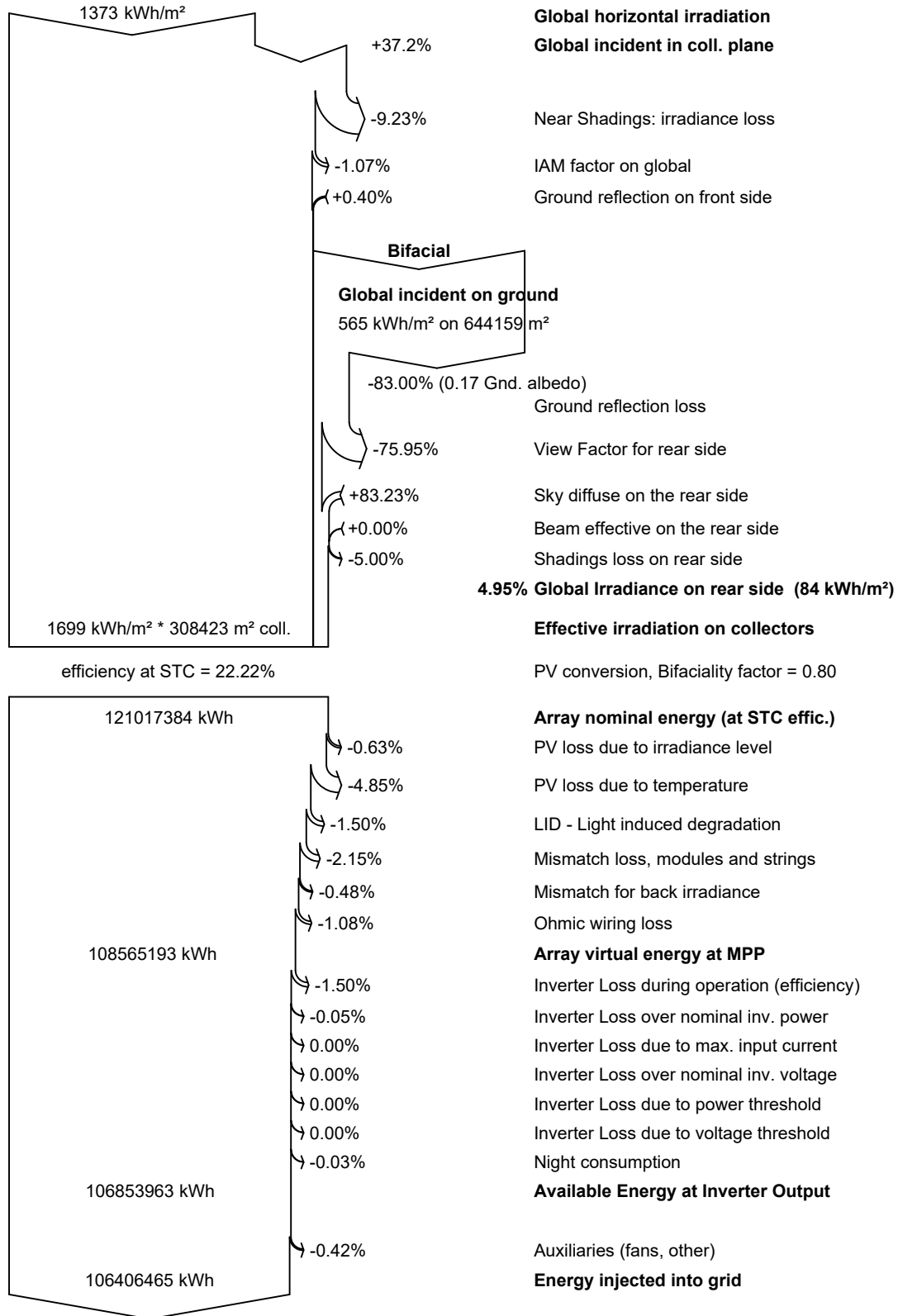
	GlobHor	DiffHor	T_Amb	GlobInc	GlobEff	EArray	E_Grid	PR
	kWh/m ²	kWh/m ²	°C	kWh/m ²	kWh/m ²	kWh	kWh	ratio
January	37.6	20.70	4.11	55.8	45.3	3126524	3059114	0.800
February	46.0	25.21	7.17	64.3	54.8	3729347	3652251	0.829
March	111.7	51.13	8.54	155.9	138.1	9141024	8965329	0.839
April	155.0	56.55	11.52	219.1	197.0	12646431	12400535	0.826
May	194.0	71.10	18.17	258.8	241.1	15076111	14785310	0.834
June	184.5	73.29	19.88	239.0	222.5	13903024	13635291	0.833
July	212.0	72.18	22.64	287.1	265.8	16401055	16089132	0.818
August	161.3	67.47	20.92	218.7	200.9	12628406	12389482	0.827
September	122.9	53.16	18.41	170.9	153.3	9792411	9607071	0.821
October	75.4	35.58	13.75	106.3	92.7	6112351	5993041	0.823
November	37.4	21.89	10.91	52.1	43.6	2963367	2900209	0.813
December	35.3	18.13	5.36	55.9	43.6	2993673	2929702	0.765
Year	1373.1	566.39	13.48	1884.1	1698.7	108513723	106406465	0.824

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



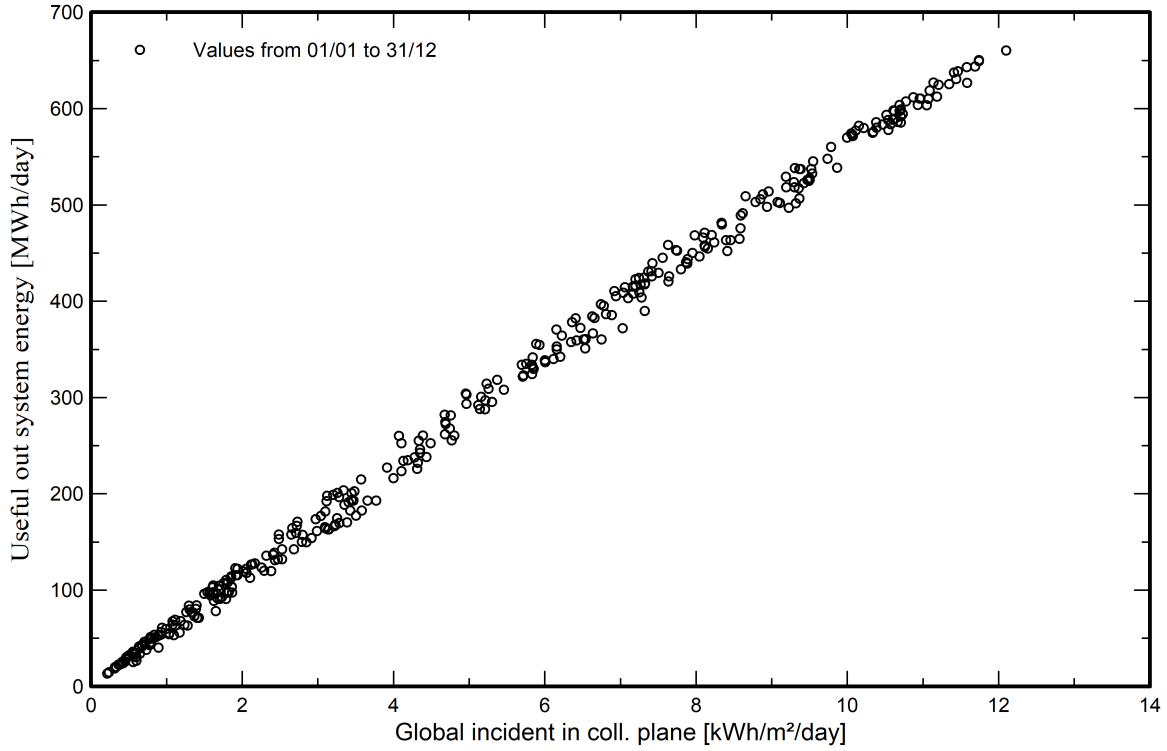
Loss diagram



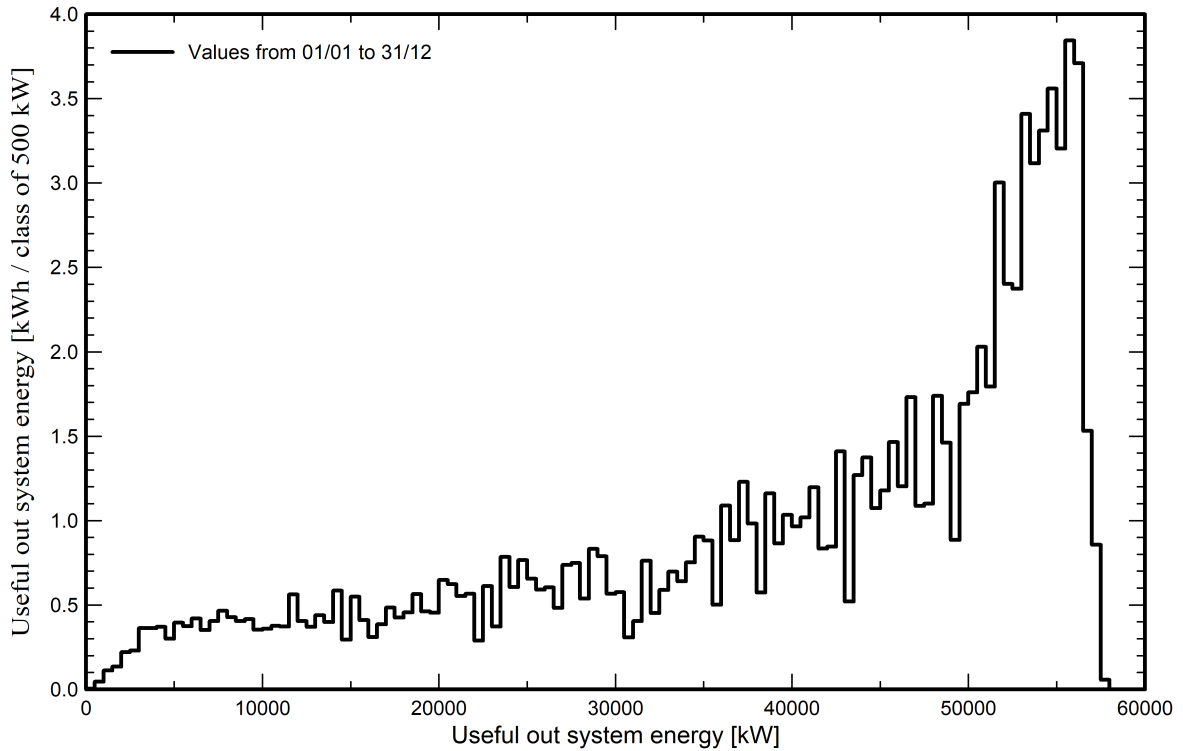


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution

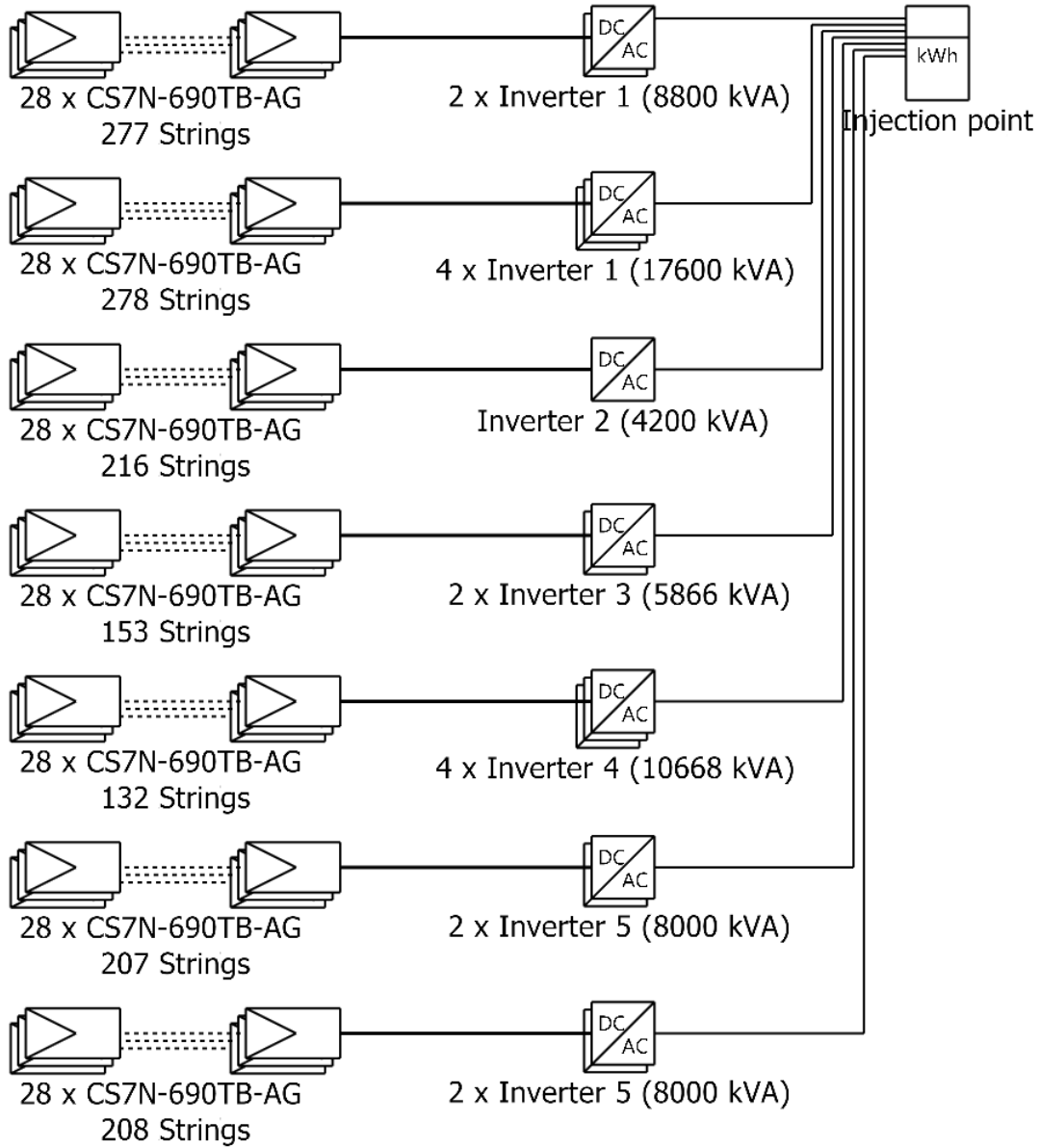




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Single-line diagram



PV module	CS7N-690TB-AG
Inverter 1	Sunny Central 4400 UP
Inverter 2	Sunny Central 4200 UP
Inverter 3	Sunny Central 2930 UP
Inverter 4	Sunny Central 2660 UP
Inverter 5	Sunny Central 4000 UP
String	28 x CS7N-690TB-AG

ALPENFRUT_55

ARTELIA Italia Spa
(Italy)

VDO : ALPENFRUT_68.51

04/10/23