



Progetto definitivo impianto fotovoltaico a terra di potenza pari 3,5 MWp Gulfa 1 Virgo Gamma S.r.l.

Contrada Gulfa Grande snc - 92018 Santa Margherita di Belice (AG)

Istanza di PAS art.6 D.Lgs 28/2011 e Regolamento di cui al D.P. Regione Sicilia n.48/2012

I professionisti

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Numero elaborato

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Commessa

G1588F

Scala

-

Nome file

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Proprietà

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Titolo

Calcolo di produzione fotovoltaica

<i>N.rev</i>	<i>Nota di revisione</i>	<i>Dis.</i>	<i>Contr.</i>	<i>Appr.</i>	<i>Data</i>
00	Prima emissione	-	-	-	Aprile 2024

PVsyst - Simulation report

Grid-Connected System

Project: GF_IT_02_Gulfa 3

Variant: FT_area available

Ground system (tables) on a hill

System power: 3522 kWp

Sambuca di Sicilia - Italy

Author

Obton Austria GmbH (Austria)

**PVsyst V7.4.3**

VC9, Simulation date:
11/11/23 11:53
with v7.4.3

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Obton Austria GmbH (Austria)

Project summary**Geographical Site**

Sambuca di Sicilia

Italy

Situation

Latitude 37.68 °N

Longitude 13.07 °E

Altitude 241 m

Time zone UTC+1

Project settings

Albedo 0.20

Meteo data

Santa Margherita di Belice

Solcast TMY

System summary**Grid-Connected System****PV Field Orientation**

Fixed plane

Tilt/Azimuth 28.1 / -12.2 °

Ground system (tables) on a hill**Near Shadings**

According to strings : Fast (table)

Electrical effect 100 %

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules

5068 units

Pnom total

3522 kWp

Inverters

Nb. of units

14 units

Pnom total

2725 kWac

Pnom ratio

1.293

Results summary

Produced Energy 5947340 kWh/year Specific production 1689 kWh/kWp/year Perf. Ratio PR 89.22 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed plane
Tilt/Azimuth 28.1 / -12.2 °

Horizon

Average Height 4.3 °

Bifacial system

Model 2D Calculation
unlimited sheds

Bifacial model geometry

Sheds spacing 10.00 m
Sheds width 4.79 m
Limit profile angle 21.3 °
GCR 47.9 %
Height above ground 0.50 m

Ground system (tables) on a hill

Sheds configuration

Nb. of sheds 100 units
Identical arrays

Sizes

Sheds spacing 10.0 m
Collector width 4.79 m
Ground Cov. Ratio (GCR) 47.9 %

Shading limit angle

Limit profile angle 21.3 °

Near Shadings

According to strings : Fast (table)
Electrical effect 100 %

Models used

Transposition Perez
Diffuse Imported
Circumsolar separate

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array

PV module

Manufacturer Risen Energy Co., Ltd
Model RSM132-8-695BHDG

(Custom parameters definition)

Unit Nom. Power 695 Wp
Number of PV modules 4088 units
Nominal (STC) 2841 kWp
Modules 146 string x 28 In series

At operating cond. (50°C)

Pmpp 2678 kWp
U mpp 1078 V
I mpp 2483 A

Inverter

Manufacturer Huawei Technologies
Model SUN2000-215KTL-H0

(Original PVsyst database)

Unit Nom. Power 200 kWac
Number of inverters 11 units
Total power 2200 kWac
Operating voltage 550-1500 V
Max. power (=>30°C) 215 kWac
Pnom ratio (DC:AC) 1.29
Power sharing within this inverter

Array #2 - Sub-array #2

PV module

Manufacturer Risen Energy Co., Ltd
Model RSM132-8-695BHDG

(Custom parameters definition)

Unit Nom. Power 695 Wp
Number of PV modules 980 units
Nominal (STC) 681 kWp
Modules 35 string x 28 In series

At operating cond. (50°C)

Pmpp 642 kWp
U mpp 1078 V
I mpp 595 A

Inverter

Manufacturer Huawei Technologies
Model SUN2000-185KTL-H1

(Original PVsyst database)

Unit Nom. Power 175 kWac
Number of inverters 3 units
Total power 525 kWac
Operating voltage 550-1500 V
Max. power (=>30°C) 185 kWac
Pnom ratio (DC:AC) 1.30
Power sharing within this inverter

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PV Array Characteristics**Total PV power**

Nominal (STC) 3522 kWp
Total 5068 modules
Module area 15743 m²
Cell area 14751 m²

Total inverter power

Total power 2725 kWac
Max. power 2920 kWac
Number of inverters 14 units
Pnom ratio 1.29

Array losses**Array Soiling Losses**

Loss Fraction 2.0 %

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 0.4 %

Module Quality Loss

Loss Fraction -0.4 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

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 2.6 mΩ
Loss Fraction 0.7 % at STC

Array #1 - PV Array

Global array res. 3.3 mΩ
Loss Fraction 0.7 % at STC

Array #2 - Sub-array #2

Global array res. 14 mΩ
Loss Fraction 0.7 % at STC

System losses**Auxiliaries loss**

Proportionnal to Power 4.0 W/kW
0.0 kW from Power thresh.

AC wiring losses**Inv. output line up to MV transfo**

Inverter voltage 800 Vac tri
Loss Fraction 2.00 % at STC

Inverters: SUN2000-215KTL-H0, SUN2000-185KTL-H1

Wire section (14 Inv.) Copper 14 x 3 x 95 mm²
Average wires length 261 m

MV line up to Injection

MV Voltage 20 kV
Wires Alu 3 x 185 mm²
Length 500 m
Loss Fraction 0.07 % at STC

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AC losses in transformers**MV transfo**

Medium voltage 20 kV

Transformer parameters

Nominal power at STC 3.48 MVA

Iron Loss (night disconnect) 3.45 kVA

Iron loss fraction 0.10 % at STC

Copper loss 34.82 kVA

Copper loss fraction 1.00 % at STC

Coils equivalent resistance 3 x 1.84 mΩ



Horizon definition

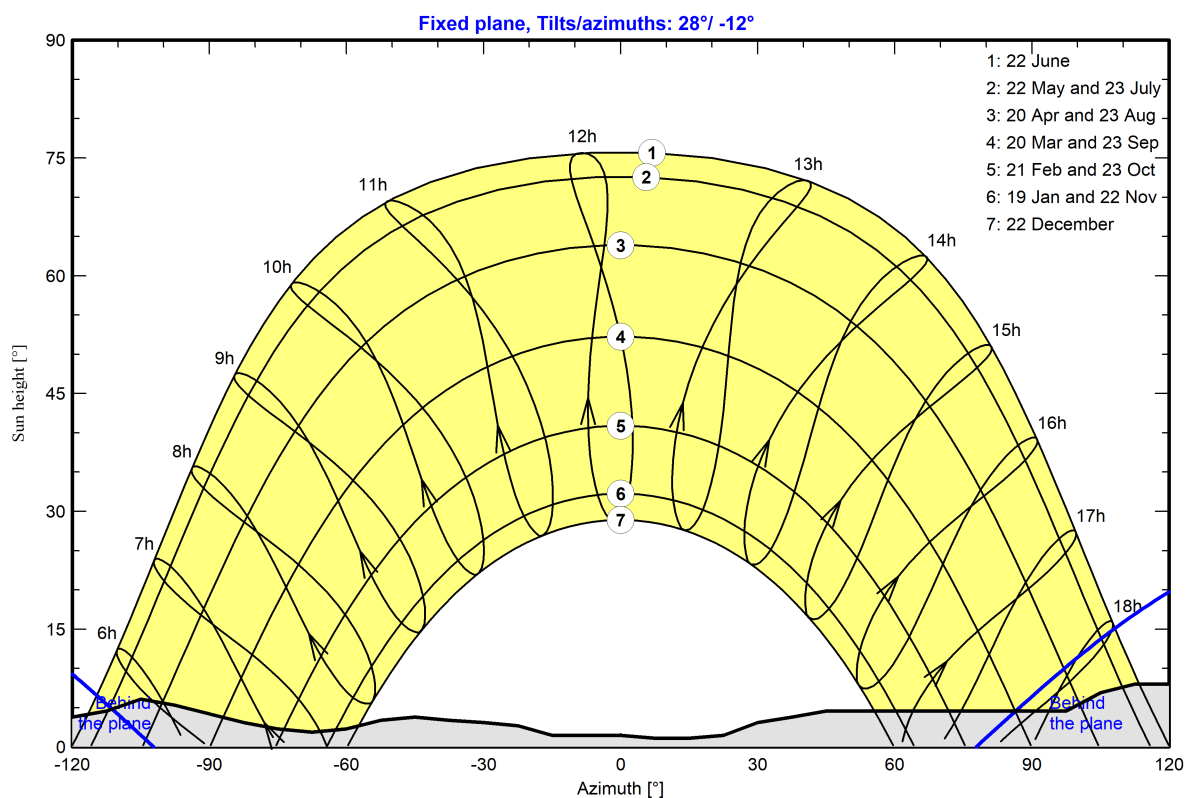
Horizon from PVGIS website API, Lat=37°40'31', Long=13°4'20', Alt=241m

Average Height	4.3 °	Albedo Factor	0.88
Diffuse Factor	0.98	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-143	-135	-128	-120	-113	-105	-98	-90	-83	-75	-68	-60
Height [°]	3.8	3.8	4.2	4.2	3.8	4.6	6.1	5.3	4.2	3.1	2.3	1.9	2.3
Azimuth [°]	-53	-45	-38	-30	-23	-15	0	8	15	23	30	38	45
Height [°]	3.4	3.8	3.4	3.1	2.7	1.5	1.5	1.1	1.1	1.5	3.1	3.8	4.6
Azimuth [°]	98	105	113	120	128	135	150	158	165	173	180		
Height [°]	4.6	6.9	8.0	8.0	8.4	8.8	8.8	7.3	5.3	4.6	3.8		

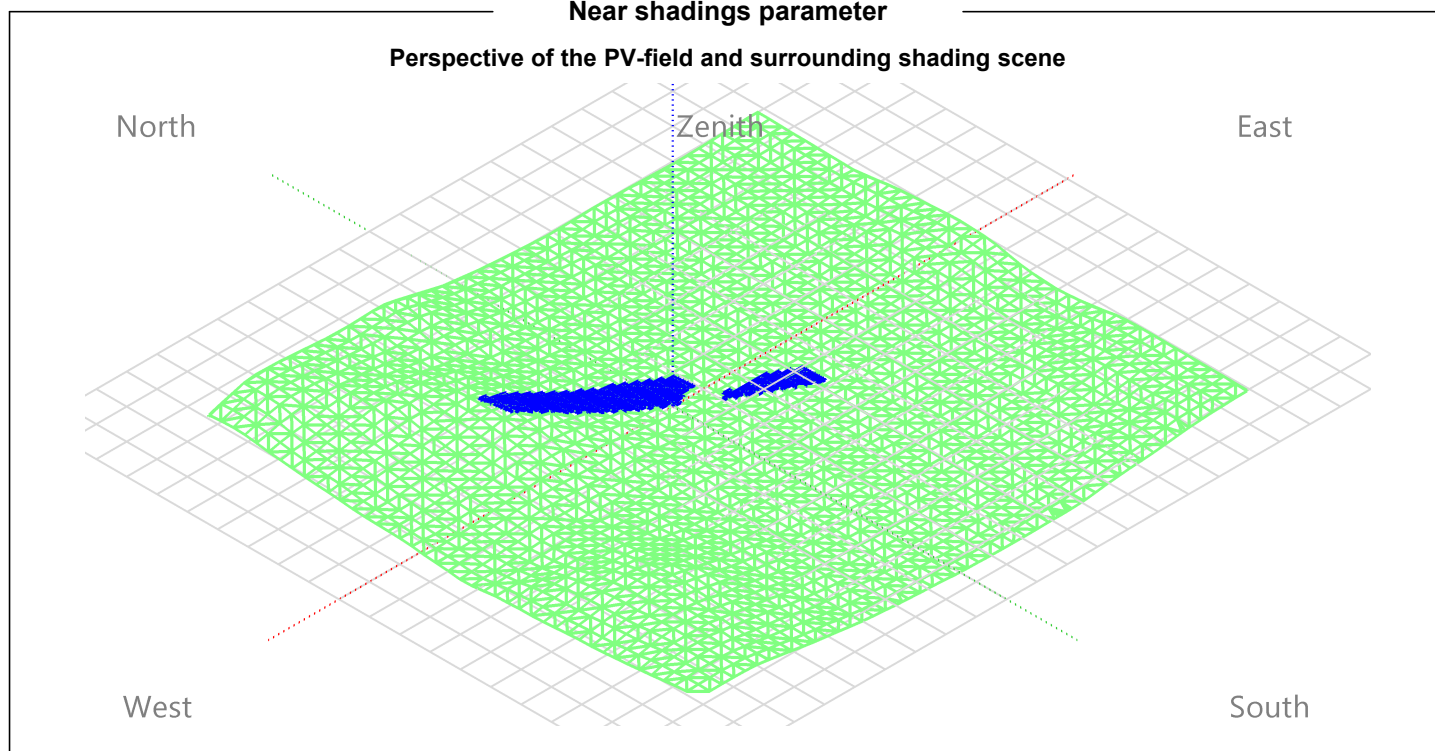
Sun Paths (Height / Azimuth diagram)





Near shadings parameter

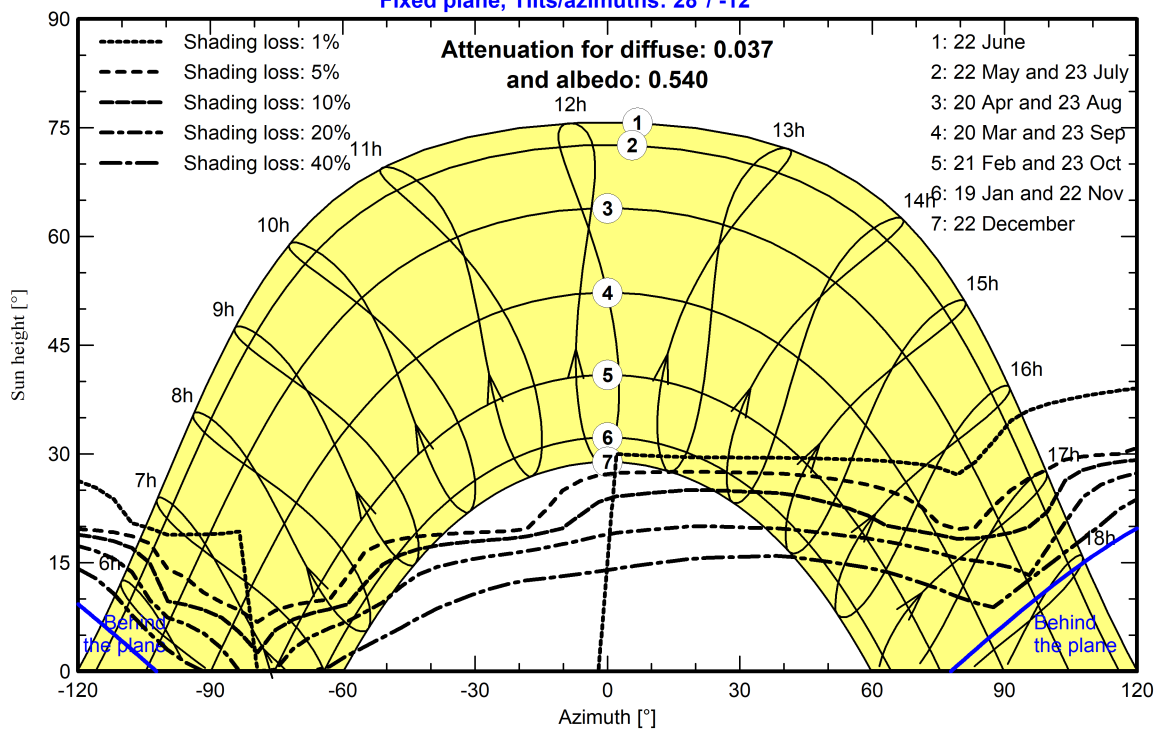
Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1

Fixed plane, Tilts/azimuths: 28°/-12°





Main results

System Production

Produced Energy 5947340 kWh/year

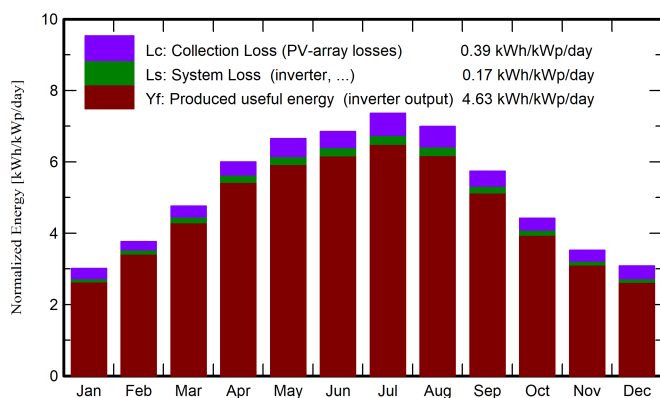
Specific production

1689 kWh/kWp/year

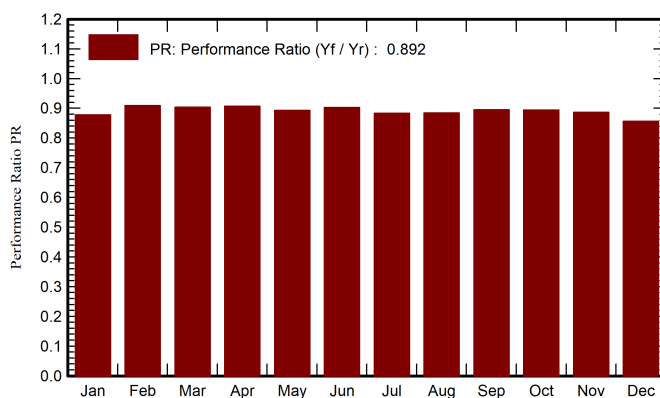
Perf. Ratio PR

89.22 %

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	60.9	30.24	10.80	93.2	85.3	298146	288325	0.878
February	77.4	37.76	11.79	105.4	98.4	349476	337589	0.909
March	124.3	56.15	12.35	147.7	139.0	487565	470148	0.904
April	166.7	64.74	14.89	179.8	170.0	595902	574263	0.907
May	209.4	74.25	18.59	206.1	194.6	672895	648260	0.893
June	216.1	56.20	22.77	205.4	194.6	677445	652543	0.902
July	235.7	58.01	24.86	228.1	216.4	737405	709765	0.883
August	206.1	52.11	25.13	216.8	205.9	701704	675190	0.884
September	147.8	60.50	23.29	172.1	162.4	562483	542580	0.895
October	105.2	48.75	18.50	136.9	128.3	446963	431273	0.894
November	71.0	33.48	15.80	105.6	97.7	340809	329605	0.887
December	59.6	27.95	11.99	95.5	86.7	297867	287797	0.856
Year	1680.1	600.14	17.59	1892.5	1779.3	6168661	5947340	0.892

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

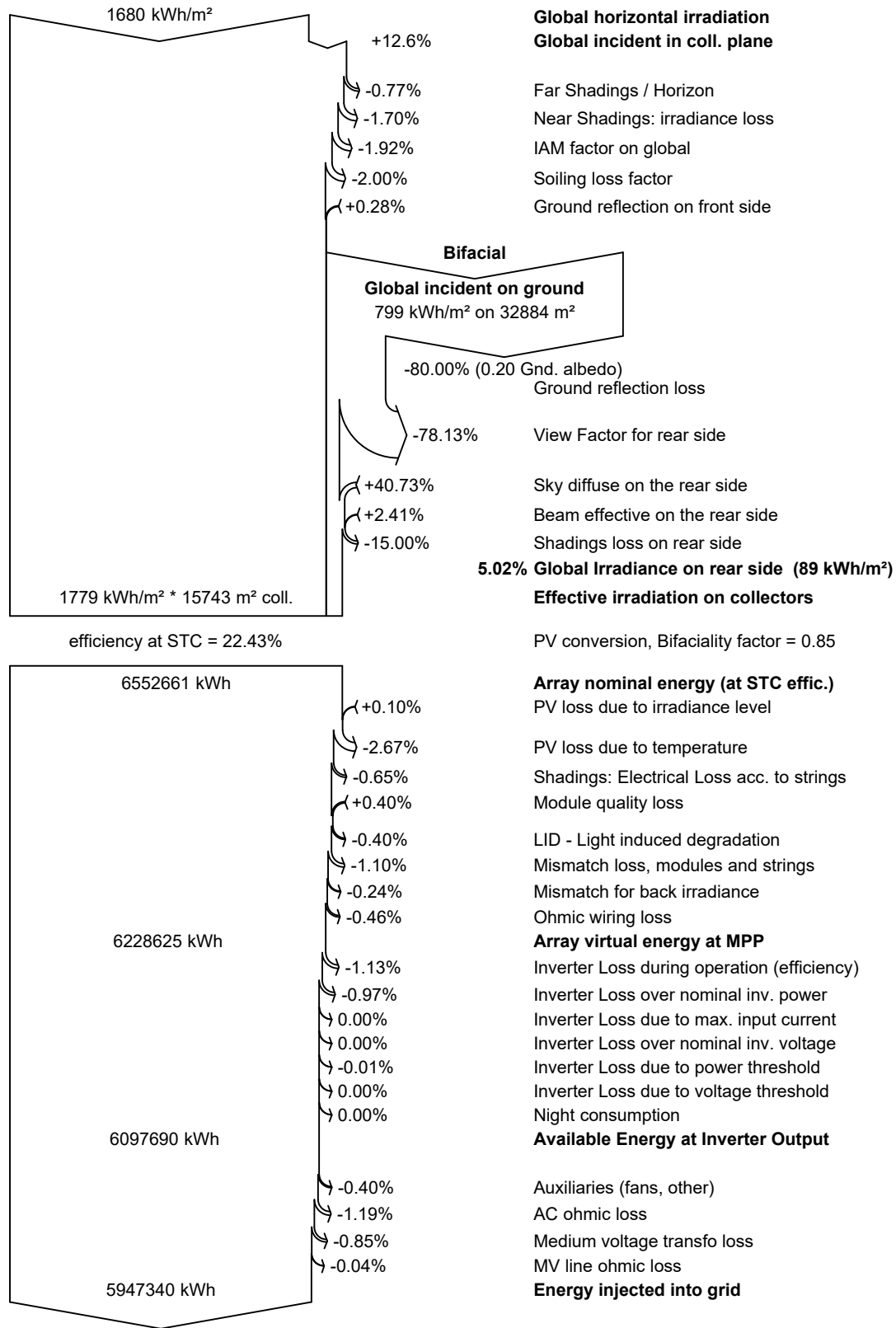
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



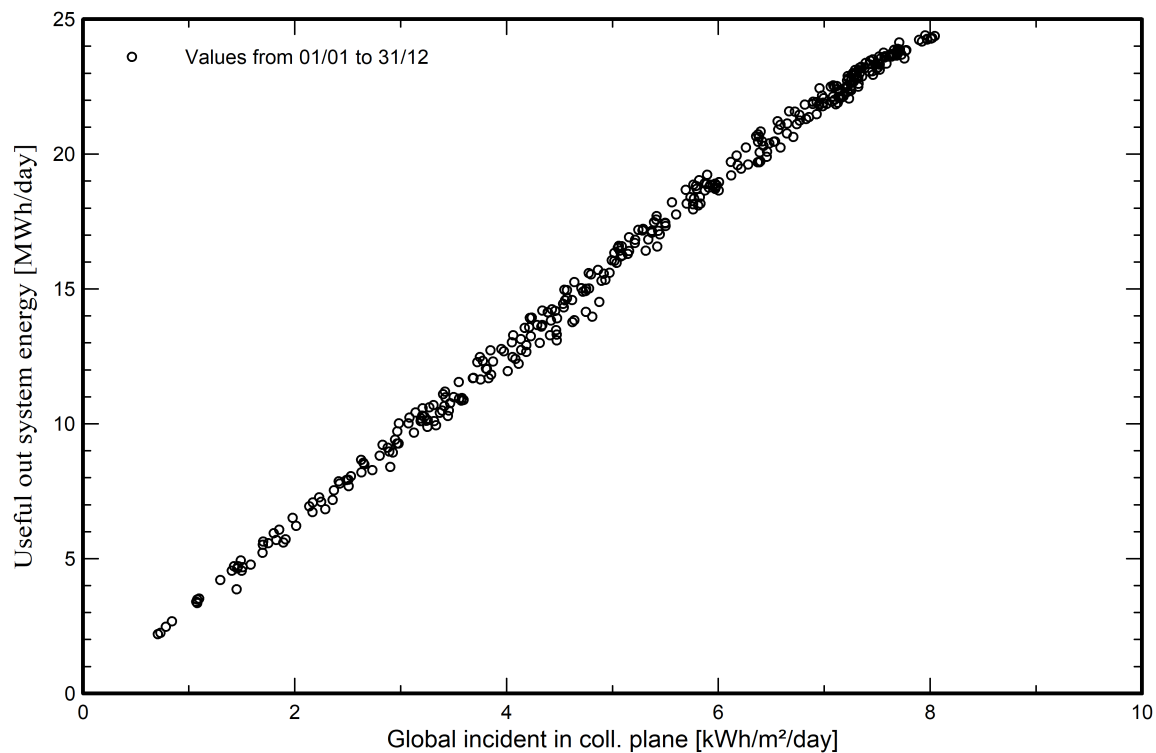
Loss diagram



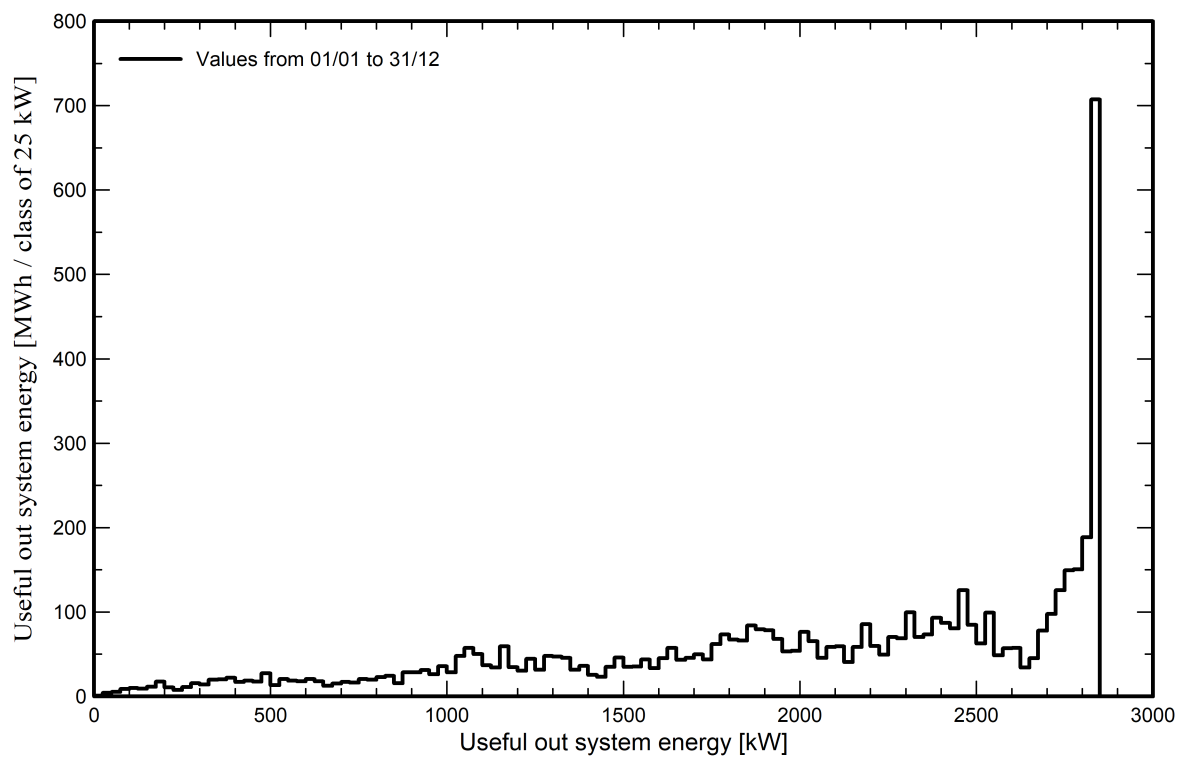


Predef. graphs

Daily Input/Output diagram



System Output Power Distribution





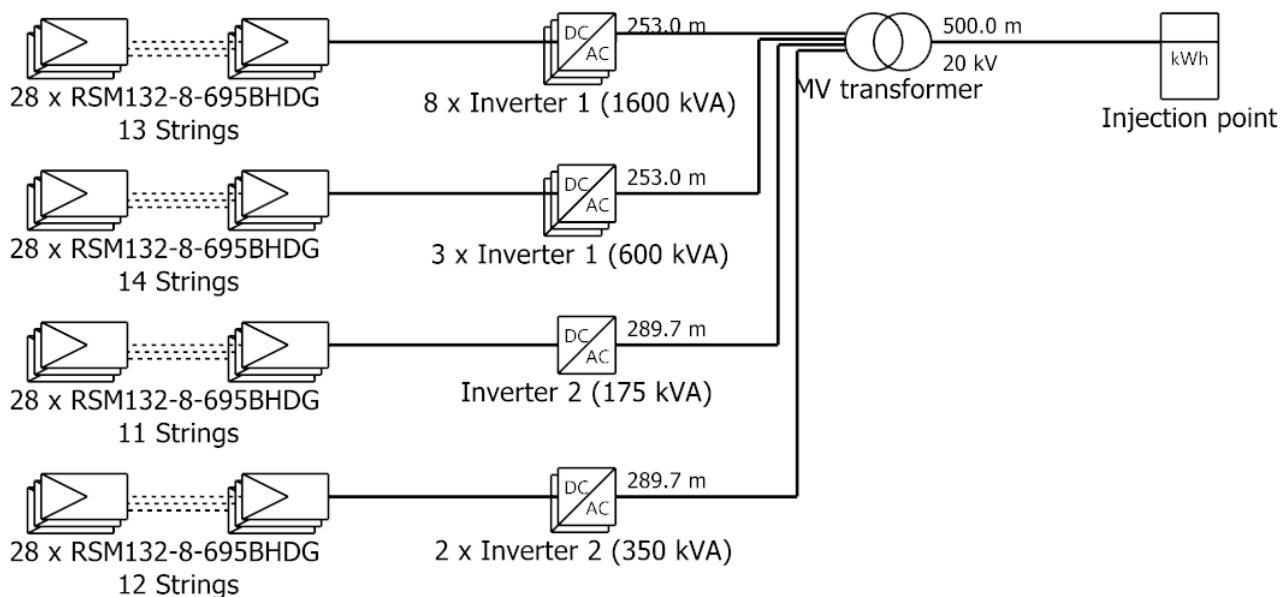
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Single-line diagram



PV module	RSM132-8-695BHDG
Inverter 1	SUN2000-215KTL-H0
Inverter 2	SUN2000-185KTL-H1
String	28 x RSM132-8-695BHDG

GF_IT_02_Gulfa 3

Obton Austria Gmb
H (Austria)

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