Version 7.2.8

PVsyst - Simulation report

Grid-Connected System

Project: Large Capacity-Large Megawatt with Bi-facial_1MW

Variant: 1*185KTL with Y connectors

Unlimited sheds

System power: 238 kWp

Girokomio - Greece

Author

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Project summary

Geographical Site
Girokomio
Greece

Situation

Latitude	40.29 °N
Longitude	21.78 °E
Altitude	697 m
Time zone	UTC+2

Project settings
Albedo 0.20

Meteo data
Girokomio
Meteonorm 8.0 (1994-2006), Sat=100% - Synthetic

System summary

Grid-Connected System
Simulation for year no 10

Unlimited sheds

PV Field Orientation
Sheds

tilt	34 °
azimuth	0 °

Near Shadings
Mutual shadings of sheds
Electrical effect

User's needs
Unlimited load (grid)

System information

PV Array

Nb. of modules	588 units
Pnom total	238 kWp

Inverters

Nb. of units	1 units
Pnom total	175 kWac
Pnom ratio	1.361

Results summary

Produced Energy	341.6 MWh/year	Specific production	1435 kWh/kWp/year	Perf. Ratio PR	80.17 %

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General parameters

Grid-Connected System

Unlimited sheds

PV Field Orientation

Orientation

Sheds	
tilt	34 °
azimuth	0 °

Sheds configuration

Nb. of sheds	44 units
Unlimited sheds	

Sizes

Sheds spacing	7.00 m
Collector width	3.00 m
Ground Cov. Ratio (GCR)	42.9 %
Top inactive band	0.02 m
Bottom inactive band	0.02 m

Shading limit angle

Limit profile angle	20.6 °

Shadings electrical effect

Cell size	15.6 cm
Strings in width	3 units

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

Horizon
Free Horizon

Near Shadings
Mutual shadings of sheds
Electrical effect

User's needs
Unlimited load (grid)

Bifacial system
Model 2D Calculation
unlimited sheds

Bifacial model geometry

Sheds spacing	7.00 m
Sheds width	3.04 m
Limit profile angle	20.8 °
GCR	43.4 %
Height above ground	1.50 m

Bifacial model definitions

Ground albedo	0.25
Bifaciality factor	85 %
Rear shading factor	5.0 %
Rear mismatch loss	10.0 %
Shed transparent fraction	0.0 %

PV Array Characteristics

PV module

Manufacturer	Talesun Solar (suzhou)
Model	TD6D72M-405(H)
(Original PVsyst database)	
Unit Nom. Power	405 Wp
Number of PV modules	588 units
Nominal (STC)	238 kWp

Inverter

Manufacturer	Huawei Technologies
Model	SUN2000-185KTL-H1
(Original PVsyst database)	
Unit Nom. Power	175 kWac
Number of inverters	1 Unit
Total power	175 kWac

Array #1 - PV Array

Number of PV modules	252 units	Number of inverters	3 * MPPT 14% 0.4 unit
Nominal (STC)	102 kWp	Total power	75.0 kWac
Modules	9 Strings x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	92.5 kWp	Max. power (=>30°C)	185 kWac
U mpp	965 V	Pnom ratio (DC:AC)	1.36
I mpp	96 A		

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PV Array Characteristics

Array #2 - Sub-array #2

Number of PV modules	336 units	Number of inverters	6 * MPPT 10% 0.6 unit
Nominal (STC)	136 kWp	Total power	100 kWac
Modules	12 Strings x 28 In series		
At operating cond. (50°C)		Operating voltage	550-1500 V
Pmpp	123 kWp	Max. power (=>30°C)	185 kWac
U mpp	965 V	Pnom ratio (DC:AC)	1.36
I mpp	128 A		

Total PV power		**Total inverter power**	
Nominal (STC)	238 kWp	Total power	175 kWac
Total	588 modules	Nb. of inverters	1 Unit
Module area	1151 m²	Pnom ratio	1.36
Cell area	1034 m²		

Array losses

Array Soiling Losses

Average loss Fraction 3.0 %

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%

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 2.5 %

Module Quality Loss

Loss Fraction -0.5 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

Module average degradation

Year no 10
Loss factor 0.4 %/year

Mismatch due to degradation

Imp RMS dispersion 0.4 %/year
Vmp RMS dispersion 0.4 %/year

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 10 mΩ
Loss Fraction 0.3 % at STC

Array #1 - PV Array

Global array res. 34 mΩ
Loss Fraction 0.3 % at STC

Array #2 - Sub-array #2

Global array res. 25 mΩ
Loss Fraction 0.3 % at STC

System losses

Unavailability of the system

Time fraction 0.5 %
1.8 days,
3 periods

Auxiliaries loss

constant (fans) 2.00 kW
0.0 kW from Power thresh.

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 0.36 % at STC

Inverter: SUN2000-185KTL-H1

Wire section (1 Inv.) Copper 1 x 3 x 500 mm²
Wires length 260 m

AC losses in transformers

MV transfo	
Grid voltage	20 kV
Operating losses at STC	
Nominal power at STC	234 kVA
Iron loss (24/24 Connexion)	0.23 kW
Loss Fraction	0.10 % at STC
Coils equivalent resistance	3 x 27.33 mΩ
Loss Fraction	1.00 % at STC

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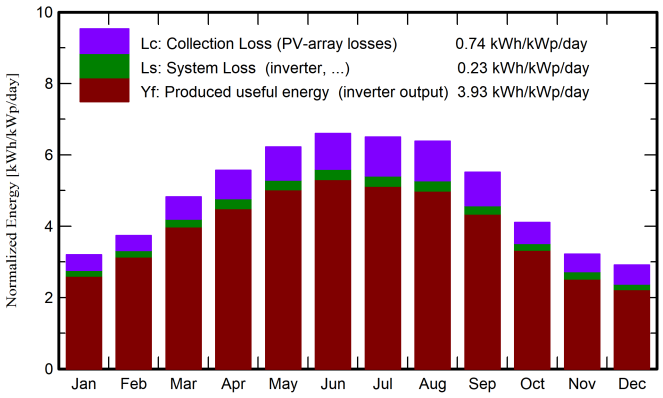
Main results

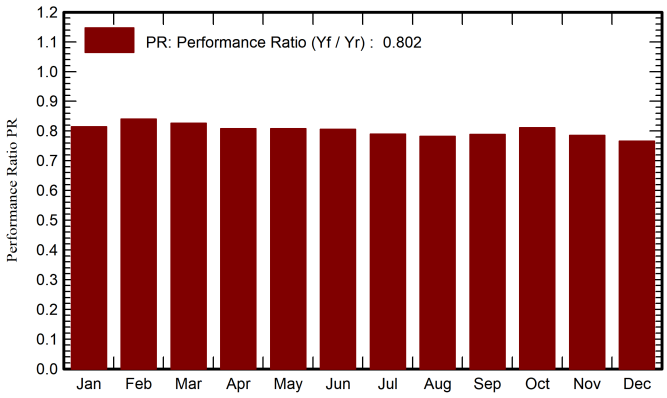
System Production

Produced Energy	341.6 MWh/year	Specific production	1435 kWh/kWp/year
		Performance Ratio PR	80.17 %

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
January	59.5	27.50	3.07	99.2	91.4	20.44	19.25	0.815
February	74.5	37.69	4.86	104.6	97.4	22.15	20.94	0.841
March	120.4	52.17	8.89	149.6	139.3	31.06	29.45	0.827
April	154.1	67.64	12.85	166.9	154.9	34.15	32.12	0.808
May	198.5	75.53	17.76	193.0	178.5	39.09	37.11	0.807
June	212.8	75.17	21.96	197.9	182.8	40.05	37.97	0.806
July	212.6	73.34	25.37	201.3	186.4	39.95	37.87	0.790
August	190.4	64.13	25.05	197.8	183.9	38.99	36.84	0.782
September	137.3	50.63	19.50	165.3	153.9	32.75	31.04	0.789
October	94.7	45.95	14.34	127.2	118.4	26.01	24.57	0.811
November	59.6	25.91	8.94	96.4	89.0	19.50	18.02	0.785
December	51.3	24.17	4.35	90.2	80.9	17.57	16.45	0.766
Year	1565.8	619.82	13.96	1789.5	1656.9	361.71	341.64	0.802

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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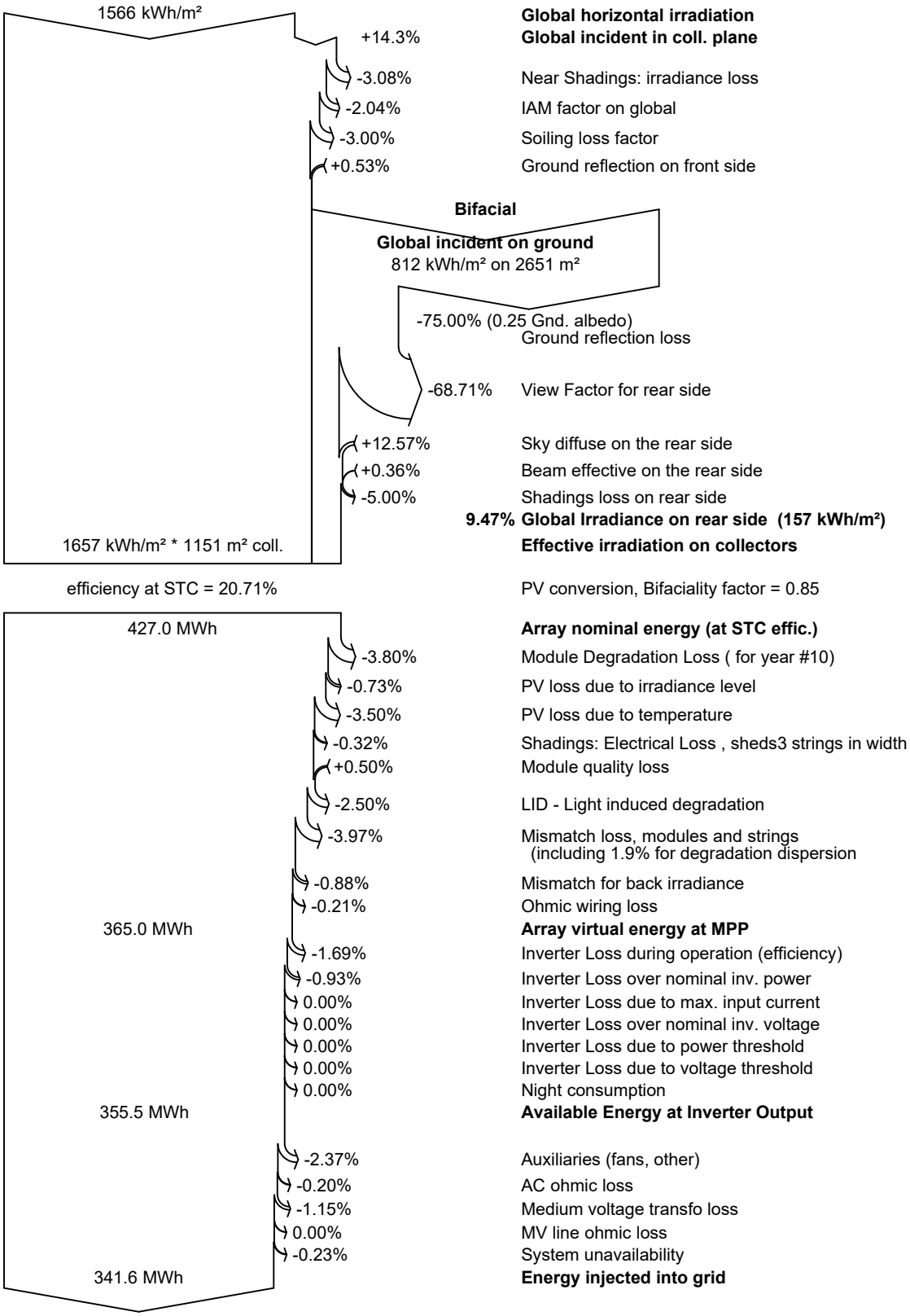
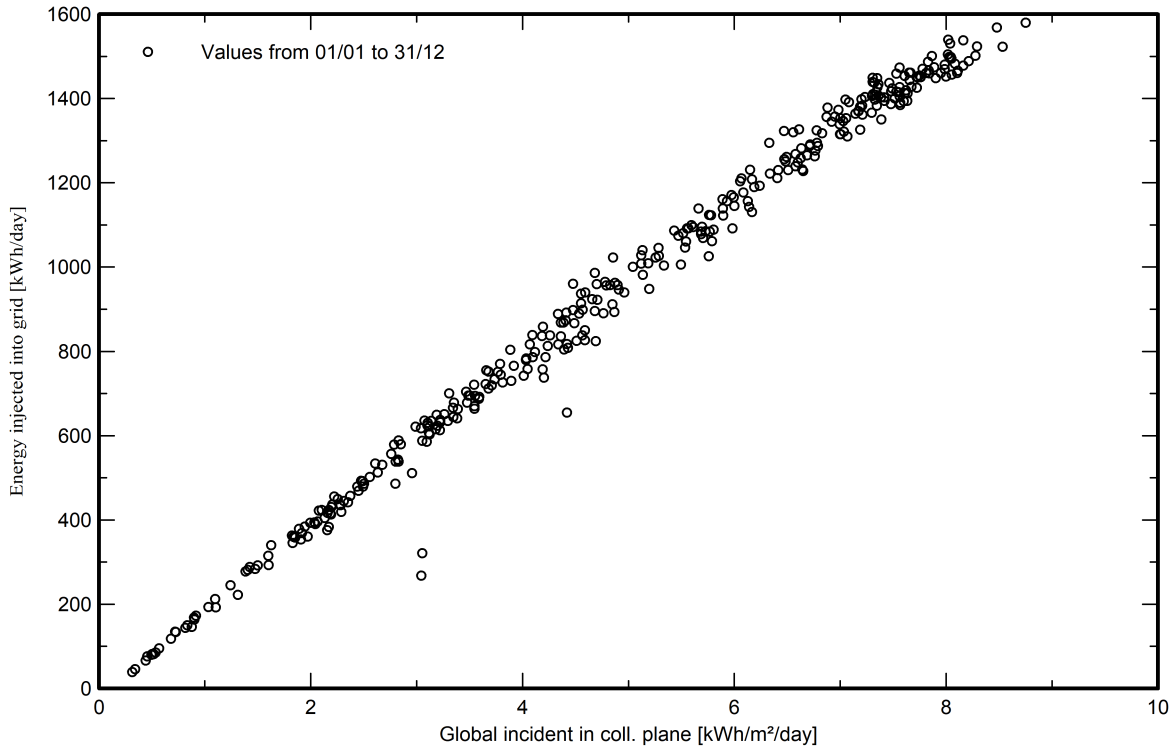
Loss diagram



Special graphs

Daily Input/Output diagram



System Output Power Distribution