

PVsyst - Simulation report

Grid-Connected System

Project: Kopellis_ Fixed

Variant: 500 kW Fixed

Sheds on ground

System power: 501 kWp

Thessaloniki/Livadákion - Greece

**PVsyst V7.2.15**

VC1, Simulation date:
07/06/22 15:05
with v7.2.15

Project summary**Geographical Site**

Thessaloniki/Livadákion
Greece

Situation

Latitude 40.52 °N
Longitude 22.97 °E
Altitude 4 m
Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

Thessaloniki/Livadákion
Meteonorm 8.0 (1994-2006), Sat=14% - Synthetic

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

horizontal plane

Sheds on ground**Near Shadings**

Linear shadings

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules
Pnom total

945 units
501 kWp

Inverters

Nb. of units
Pnom total
Pnom ratio

2 units
450 kWac
1.113

Results summary

Produced Energy 695.0 MWh/year Specific production 1388 kWh/kWp/year Perf. Ratio PR 89.05 %

Table of contents

Project and results summary	2
General parameters, PV Array Characteristics, System losses	3
Horizon definition	5
Near shading definition - Iso-shadings diagram	6
Main results	7
Loss diagram	8
Special graphs	9



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General parameters

Grid-Connected System

PV Field Orientation

Orientation

horizontal plane

Sheds on ground

Sheds configuration

Nb. of sheds 935 units

Sizes

Sheds spacing 1.16 m

Collector width 1.13 m

Ground Cov. Ratio (GCR) 97.9 %

Shading limit angle

Limit profile angle 0.0 °

Models used

Transposition Perez

Diffuse Perez, Meteonorm

Circumsolar separate

Horizon

Average Height 7.4 °

Near Shadings

Linear shadings

User's needs

Unlimited load (grid)

PV Array Characteristics

PV module

Manufacturer

Generic

Model

JKM530M-72HL4-BDVP

(Custom parameters definition)

Unit Nom. Power

530 Wp

Number of PV modules

945 units

Nominal (STC)

501 kWp

Modules

35 Strings x 27 In series

At operating cond. (50°C)

Pmpp

457 kWp

U mpp

995 V

I mpp

460 A

Total PV power

Nominal (STC)

501 kWp

Total

945 modules

Module area

2437 m²

Cell area

2247 m²

Inverter

Manufacturer

Generic

Model

SG250HX

(Custom parameters definition)

Unit Nom. Power

225 kWac

Number of inverters

2 units

Total power

450 kWac

Operating voltage

500-1500 V

Max. power (=>30°C)

250 kWac

Pnom ratio (DC:AC)

1.11

Total inverter power

Total power

450 kWac

Number of inverters

2 units

Pnom ratio

1.11

Array losses

Array Soiling Losses

Loss Fraction 1.5 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²K

Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 24 mΩ

Loss Fraction 1.0 % at STC

Module Quality Loss

Loss Fraction 0.0 %

Module mismatch losses

Loss Fraction 0.6 % at MPP

IAM loss factor

Incidence effect (IAM): User defined profile

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	1.000	0.989	0.967	0.924	0.729	0.000

System losses

Auxiliaries loss

Proportionnal to Power 4.0 W/kW

0.0 kW from Power thresh.

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

Inverter voltage 800 Vac tri
Loss Fraction 0.21 % at STC

Inverter: SG250HX

Wire section (2 Inv.) Copper 2 x 3 x 240 mm²
Average wires length 70 m

AC losses in transformers**MV transfo**

Grid voltage 20 kV

Operating losses at STC

Nominal power at STC 493 kVA
Iron loss (24/24 Connexion) 0.49 kW
Loss Fraction 0.10 % at STC
Coils equivalent resistance 3 x 12.98 mΩ
Loss Fraction 1.00 % at STC



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Horizon definition

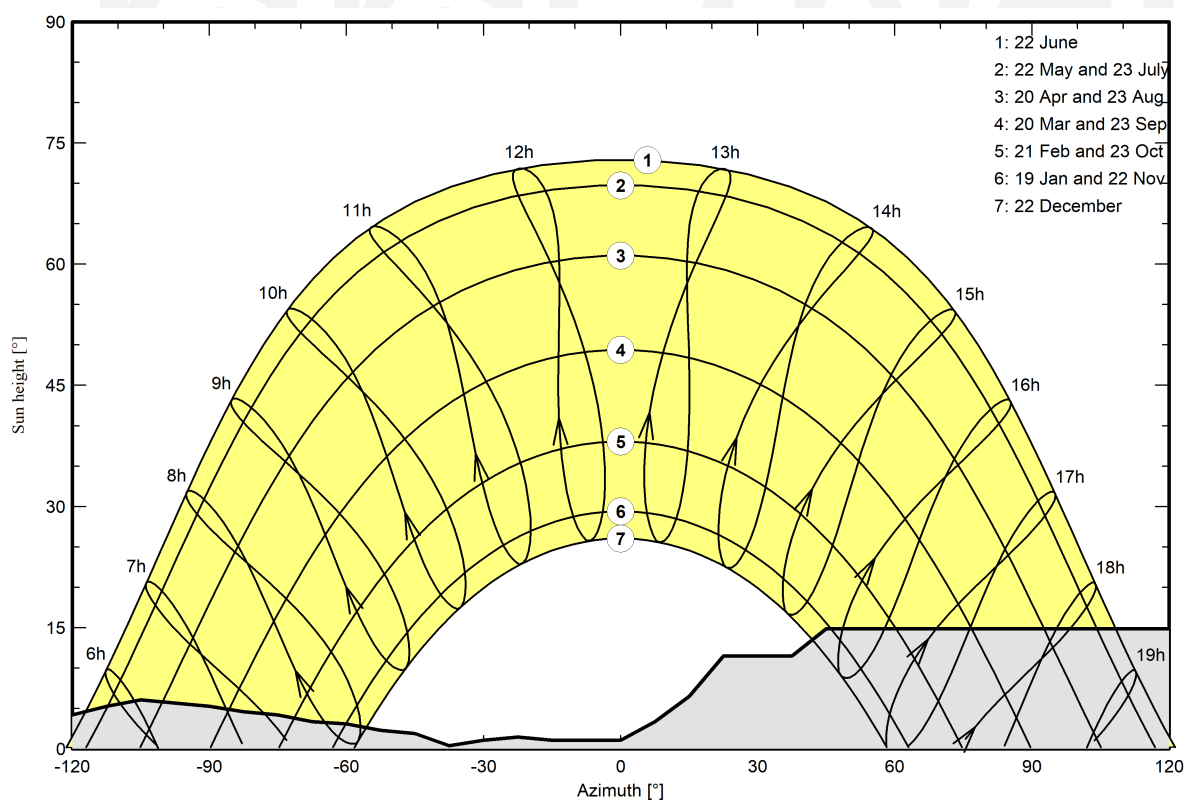
Horizon from PVGIS website API, Lat=39°37'58", Long=22°13'41", Alt=153m

Average Height	7.4 °	Albedo Factor	0.00
Diffuse Factor	0.97	Albedo Fraction	100 %

Horizon profile

Azimuth [°]	-180	-173	-165	-158	-143	-135	-128	-120	-113	-105	-98	-90
Height [°]	1.9	3.4	4.6	5.7	7.3	6.5	4.6	4.2	5.3	6.1	5.7	5.3
Azimuth [°]	-83	-75	-68	-60	-53	-45	-38	-30	-23	-15	0	8
Height [°]	4.6	4.2	3.4	3.1	2.3	1.9	0.4	1.1	1.5	1.1	1.1	3.4
Azimuth [°]	15	23	38	45	135	143	150	158	165	173	180	
Height [°]	6.5	11.5	11.5	14.9	14.9	8.0	8.0	5.3	1.9	1.5	1.9	

Sun Paths (Height / Azimuth diagram)



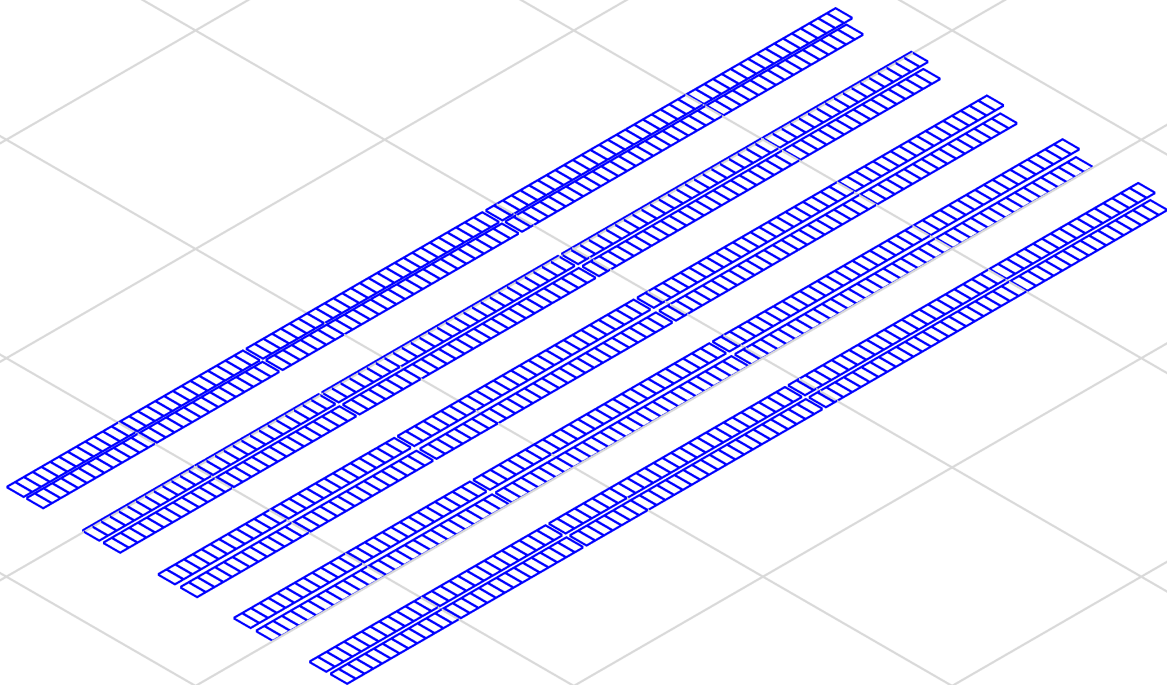


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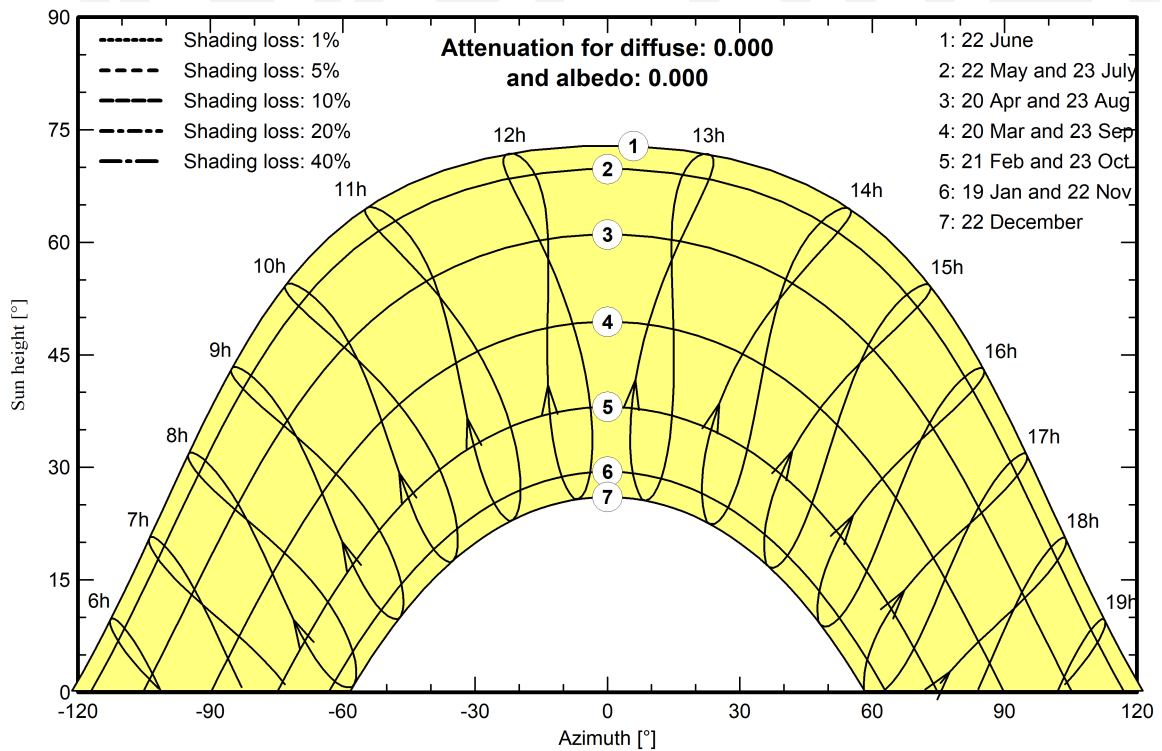
Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Orientation #1





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Main results

System Production

Produced Energy 695.0 MWh/year

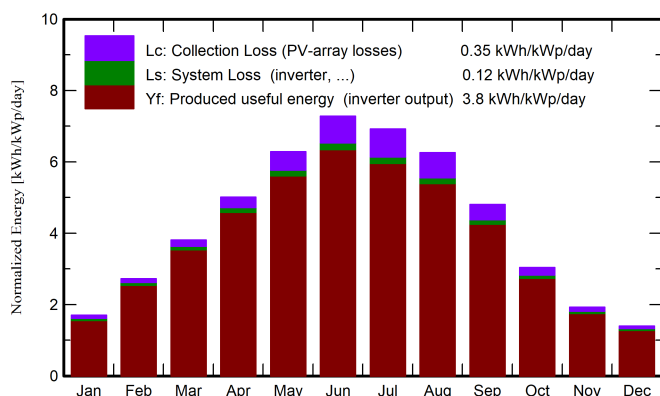
Specific production

1388 kWh/kWp/year

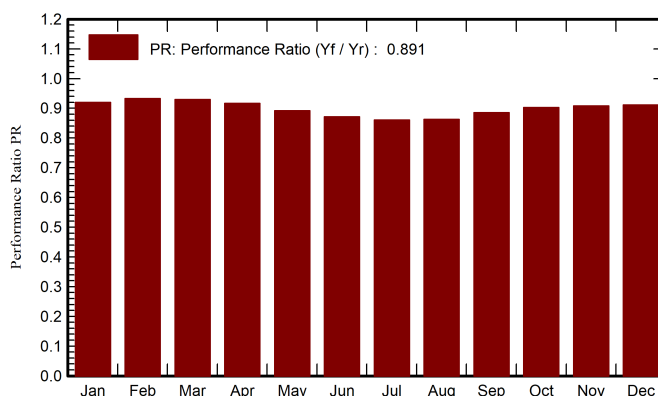
Performance Ratio PR

89.05 %

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	MWh	MWh	ratio
January	52.6	29.21	4.95	52.6	49.1	25.16	24.22	0.919
February	76.4	39.36	6.71	76.3	72.6	36.80	35.66	0.933
March	118.0	57.36	9.91	117.9	113.4	56.52	54.89	0.929
April	150.3	77.02	13.73	150.3	145.3	71.04	69.00	0.917
May	195.0	84.41	19.52	194.9	188.7	89.63	87.06	0.892
June	218.4	75.24	24.54	218.4	212.2	98.20	95.32	0.871
July	214.7	82.15	27.83	214.7	208.1	95.29	92.50	0.860
August	194.0	76.29	27.71	193.9	187.6	86.28	83.82	0.863
September	144.2	53.93	21.67	144.1	138.9	65.88	63.94	0.886
October	94.1	43.87	16.53	94.1	89.6	43.89	42.53	0.903
November	57.9	29.79	11.46	57.8	54.6	27.29	26.29	0.908
December	43.4	24.96	6.66	43.3	40.6	20.68	19.79	0.912
Year	1559.1	673.58	15.99	1558.3	1500.7	716.67	695.02	0.891

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

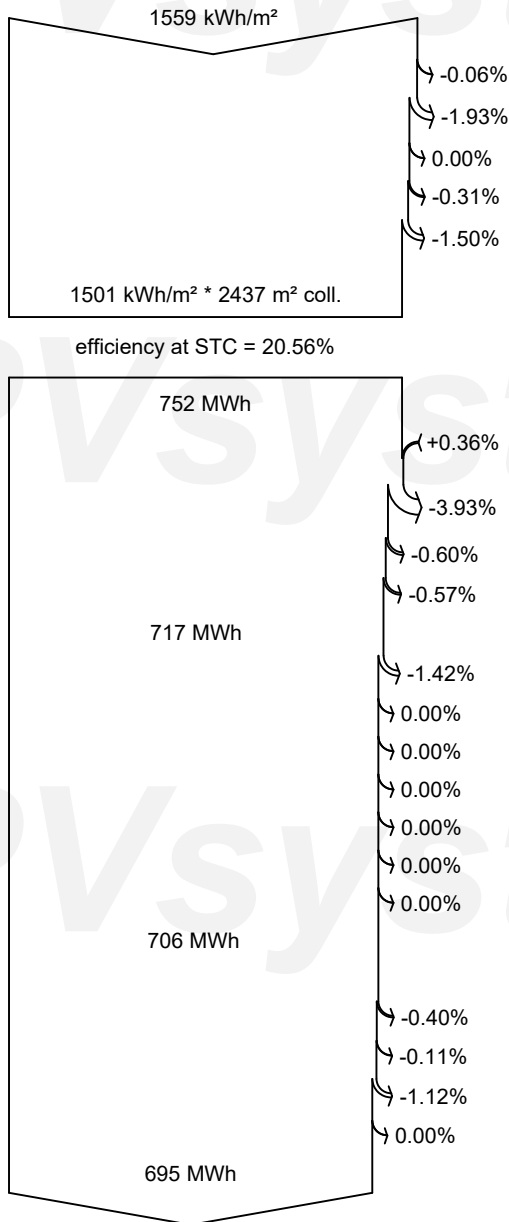
PR Performance Ratio



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

Near Shadings: irradiance loss

IAM factor on global

Soiling loss factor

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module array mismatch loss

Ohmic wiring loss

Array virtual energy at MPP

Inverter Loss during operation (efficiency)

Inverter Loss over nominal inv. power

Inverter Loss due to max. input current

Inverter Loss over nominal inv. voltage

Inverter Loss due to power threshold

Inverter Loss due to voltage threshold

Night consumption

Available Energy at Inverter Output

Auxiliaries (fans, other)

AC ohmic loss

Medium voltage transfo loss

MV line ohmic loss

Energy injected into grid

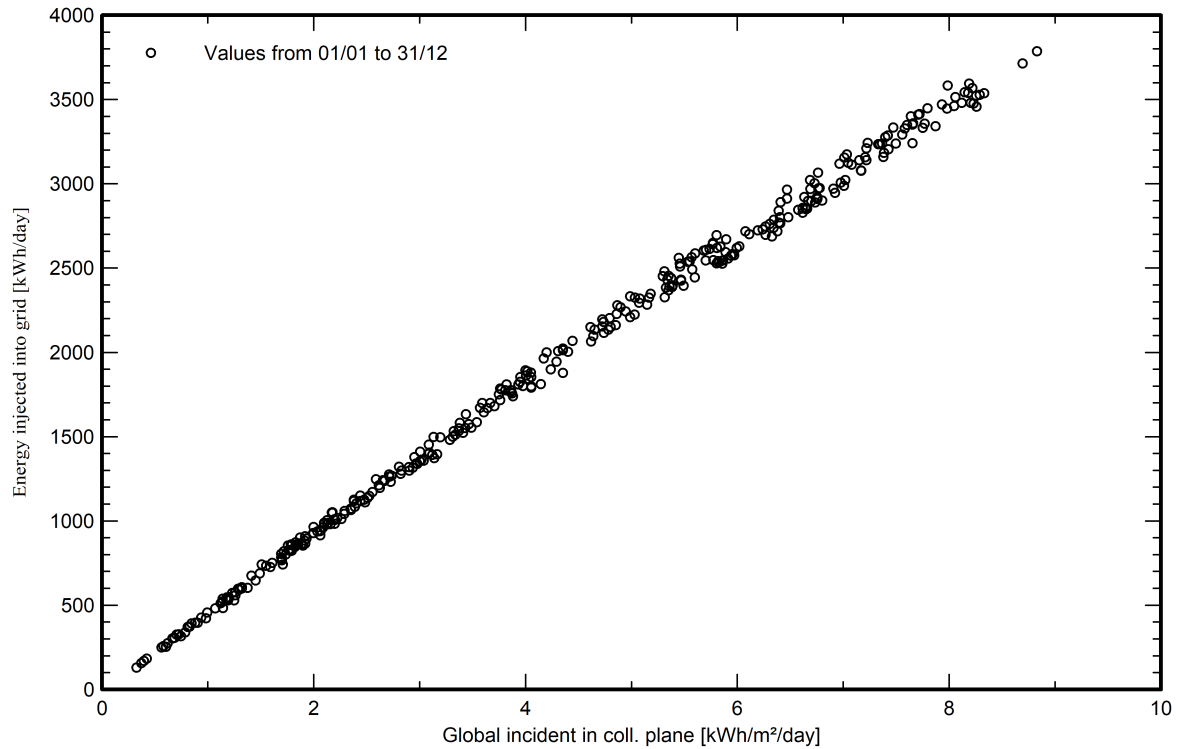


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Special graphs

Daily Input/Output diagram



System Output Power Distribution

