

PVsyst - Simulation report

Grid-Connected System

Project: AYFANTIS

Variant: AYFANTIS v1

Sheds, single array

System power: 399 kWp

AYFANTIS_VOREIA EVOIA - Greece

Author

MES ENRGY SA (Greece)

**Project summary****Geographical Site**

AYFANTIS_VOREIA EVOIA

Greece

Situation

Latitude 38.98 °N

Longitude 23.13 °E

Altitude 4 m

Time zone UTC+2

Project settings

Albedo 0.20

Meteo data

AYFANTIS_VOREIA EVOIA

Meteonorm 7.3 (1994-2006), Sat=100% - Synthetic

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

Fixed plane

Tilt/Azimuth 25 / 0 °

Sheds, single array**Near Shadings**

Linear shadings

User's needs

Unlimited load (grid)

System information**PV Array**

Nb. of modules

878 units

Pnom total

399 kWp

Inverters

Nb. of units

2.9 units

Pnom total

366 kWac

Pnom ratio

1.093

Results summary

Produced Energy 626.8 MWh/year Specific production 1569 kWh/kWp/year Perf. Ratio PR 85.70 %

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General parameters

Grid-Connected System

PV Field Orientation

Orientation

Fixed plane

Tilt/Azimuth 25 / 0 °

Horizon

Free Horizon

Sheds, single array

Sheds configuration

Nb. of sheds

9 units

Single array

Sizes

Sheds spacing

8.50 m

Collector width

4.42 m

Ground Cov. Ratio (GCR) 52.0 %

Top inactive band

0.02 m

Bottom inactive band

0.02 m

Shading limit angle

Limit profile angle

22.7 °

Near Shadings

Linear shadings

Models used

Transposition

Perez

Diffuse

Perez, Meteonorm

Circumsolar

separate

User's needs

Unlimited load (grid)

PV Array Characteristics

Array #1 - PV Array

PV module

Manufacturer

Jinkosolar

Model

JKM455M-7RL3-TV

(Original PVsyst database)

Unit Nom. Power

455 Wp

Number of PV modules

468 units

Nominal (STC)

213 kWp

Modules

18 Strings x 26 In series

At operating cond. (50°C)

Pmpp

195 kWp

U mpp

1006 V

I mpp

194 A

PV module

Manufacturer

Jinkosolar

Model

JKM455M-7RL3-TV

(Original PVsyst database)

Unit Nom. Power

455 Wp

Number of PV modules

410 units

Nominal (STC)

187 kWp

Array #2 - Sub-array #2

Number of PV modules

260 units

Nominal (STC)

118 kWp

Modules

10 Strings x 26 In series

At operating cond. (50°C)

Pmpp

108 kWp

U mpp

1006 V

I mpp

108 A

Inverter

Manufacturer

Huawei Technologies

Model

SUN2000-105KTL-H1

(Original PVsyst database)

Unit Nom. Power

105 kWac

Number of inverters

2 units

Total power

210 kWac

Operating voltage

600-1450 V

Pnom ratio (DC:AC)

1.01

Inverter

Manufacturer

Huawei Technologies

Model

SUN2000-185KTL-H1

(Original PVsyst database)

Unit Nom. Power

175 kWac

Number of inverters

0.9 Unit

Total power

156 kWac

Number of inverters

5 * MPPT 11% 0.6 units

Total power

97.2 kWac

Operating voltage

550-1500 V

Max. power (=>30°C)

185 kWac

Pnom ratio (DC:AC)

1.22



PVsyst V7.1.8

VC0, Simulation date:
14/04/21 17:23
with v7.1.8

MES ENRGY SA (Greece)

PV Array Characteristics

Array #3 - Sub-array #3

Number of PV modules 150 units
Nominal (STC) 68.3 kWp
Modules 6 Strings x 25 In series

At operating cond. (50°C)

Pmpp 62.5 kWp
U mpp 967 V
I mpp 65 A

Total PV power

Nominal (STC) 399 kWp
Total 878 modules
Module area 1998 m²
Cell area 1822 m²

Number of inverters 3 * MPPT 11% 0.3 units
Total power 58.3 kWac

Operating voltage 550-1500 V
Max. power (=>30°C) 185 kWac
Pnom ratio (DC:AC) 1.17

Total inverter power

Total power 366 kWac
Nb. of inverters 3 units
Pnom ratio 0.1 unused
1.09



Array losses

Array Soiling Losses

Loss Fraction 1.0 %

Thermal Loss factor

Module temperature according to irradiance

Uc (const) 29.0 W/m²KUv (wind) 0.0 W/m²K/m/s

LID - Light Induced Degradation

Loss Fraction 2.0 %

Module Quality Loss

Loss Fraction -0.8 %

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°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	1.000	0.998	0.995	0.983	0.953	0.879	0.698	0.000

DC wiring losses

Global wiring resistance 10 mΩ
Loss Fraction 1.2 % at STC

Array #1 - PV Array

Global array res. 57 mΩ
Loss Fraction 1.0 % at STC

Array #2 - Sub-array #2

Global array res. 154 mΩ
Loss Fraction 1.5 % at STC

Array #3 - Sub-array #3

Global array res. 247 mΩ
Loss Fraction 1.5 % at STC

AC wiring losses

Inv. output line up to MV transfo

Inverter voltage 800 Vac tri
Loss Fraction 1.0 % at STC

Global System

Wire section Copper 3 x 150 mm²
Wires length 130 m

MV line up to Injection

MV Voltage 20 kV
Wires Copper 3 x 70 mm²
Length 30 m
Loss Fraction 0.0 % at STC

AC losses in transformers

MV transfo

Grid Voltage 20 kV

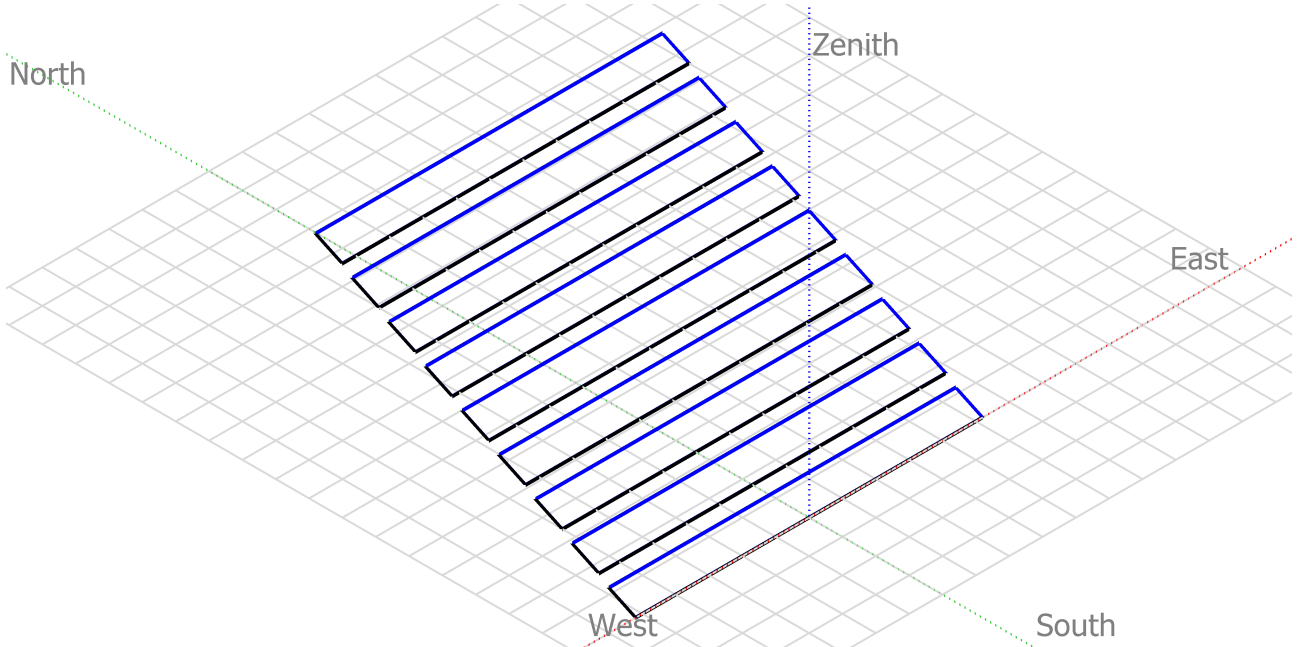
Operating losses at STC

Nominal power at STC (PNomac) 394 kVA
Iron loss (24/24 Connexion) 0.39 kW
Loss Fraction 0.1 % at STC
Coils equivalent resistance 3 x 16.24 mΩ
Loss Fraction 1.0 % at STC

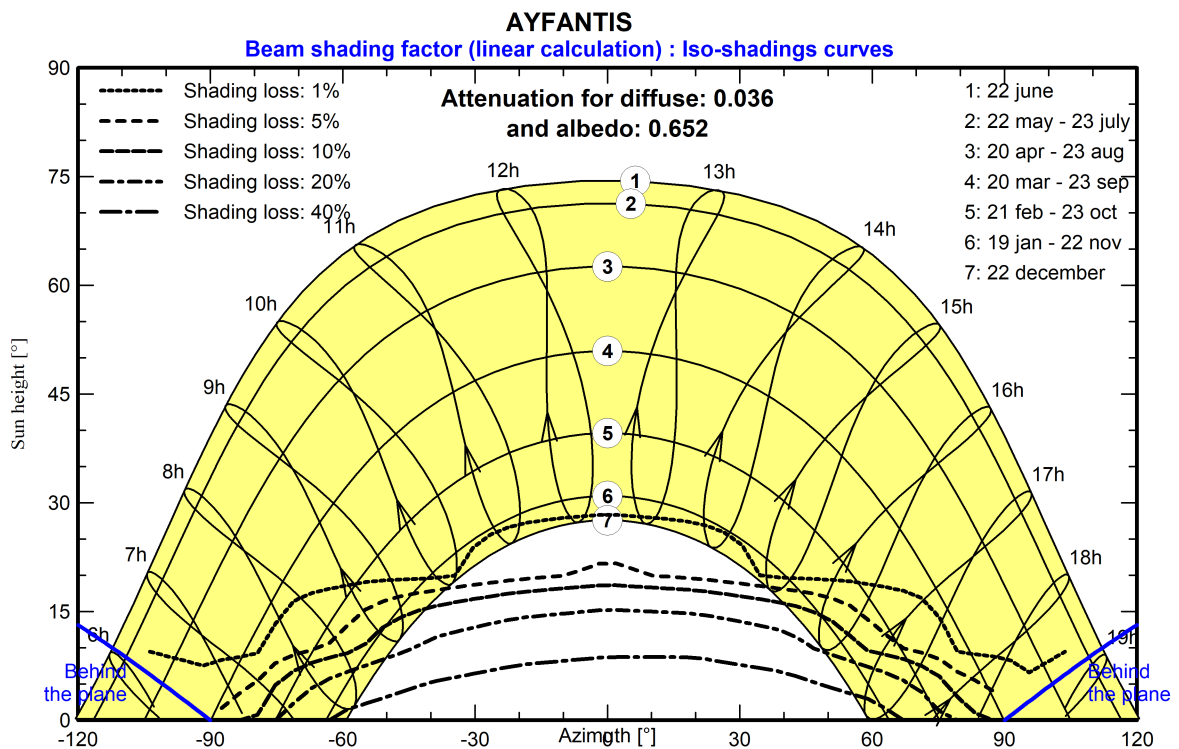


Near shadings parameter

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram





Main results

System Production

Produced Energy

626.8 MWh/year

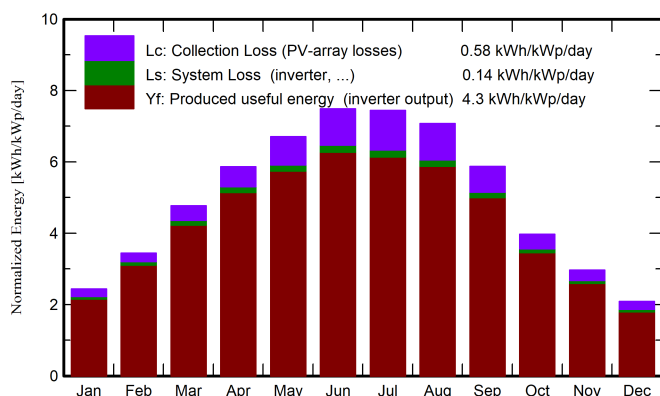
Specific production

1569 kWh/kWp/year

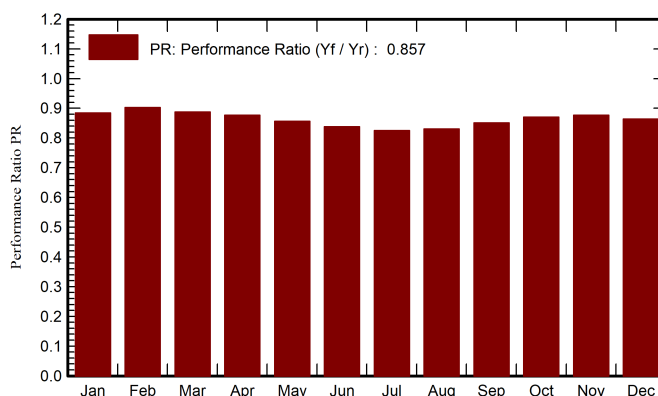
Performance Ratio PR

85.70 %

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	52.0	27.09	9.81	75.5	71.7	27.61	26.68	0.884
February	74.2	41.46	9.90	96.3	93.1	35.83	34.75	0.903
March	123.3	58.24	13.17	147.9	143.5	54.03	52.42	0.887
April	161.8	74.47	15.33	176.0	170.8	63.54	61.65	0.877
May	206.0	86.04	20.79	208.0	201.7	73.32	71.16	0.856
June	230.3	73.35	25.28	224.5	218.2	77.53	75.17	0.838
July	233.6	66.08	28.26	230.6	224.2	78.46	76.05	0.826
August	206.1	69.55	27.91	219.4	213.4	75.04	72.80	0.831
September	150.3	54.01	22.95	176.2	171.6	61.76	59.89	0.851
October	96.6	50.75	19.45	123.1	119.1	44.13	42.81	0.870
November	64.0	34.25	14.73	88.9	85.1	32.14	31.13	0.877
December	44.4	25.76	10.88	64.6	60.3	23.13	22.30	0.864
Year	1642.6	661.06	18.26	1830.9	1772.8	646.53	626.81	0.857

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

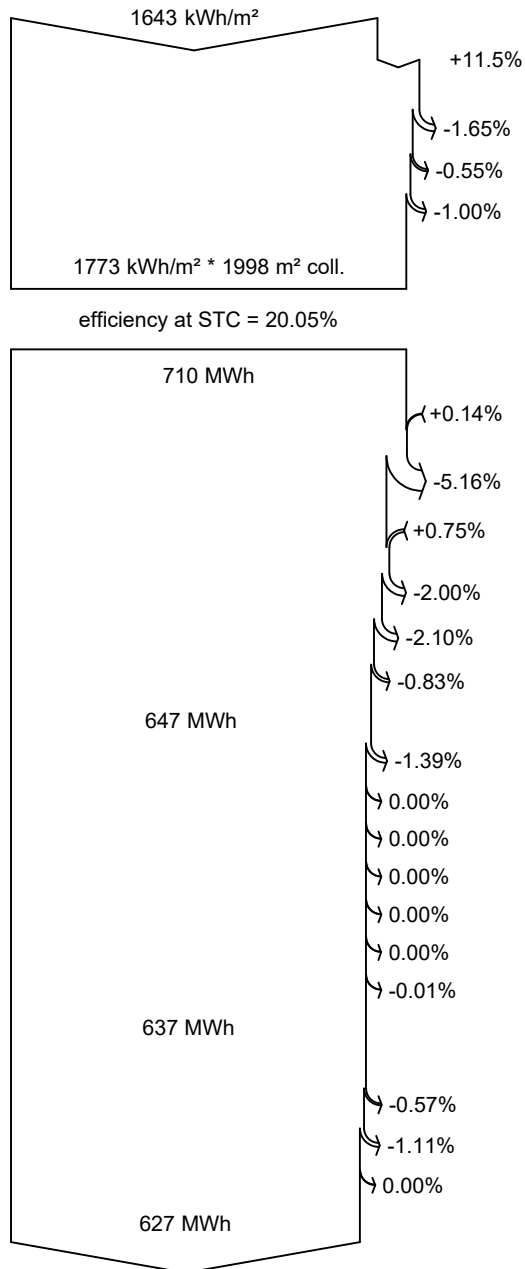
EArray Effective energy at the output of the array

E_Grid Energy injected into grid

PR Performance Ratio



Loss diagram



Global horizontal irradiation

Global incident in coll. plane

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 quality loss

LID - Light induced degradation

Mismatch loss, modules and strings

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

AC ohmic loss

Medium voltage transfo loss

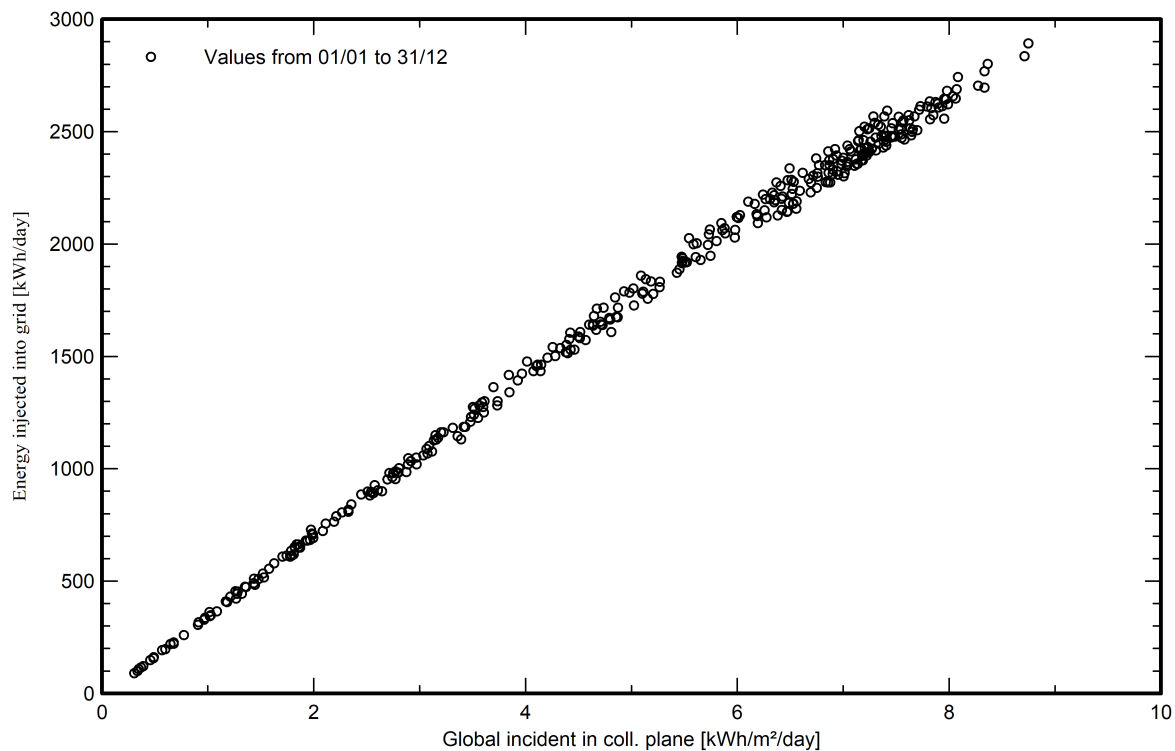
MV line ohmic loss

Energy injected into grid



Special graphs

Daily Input/Output diagram



System Output Power Distribution

