Version 7.2.15

# PVsyst - Simulation report

## Grid-Connected System

Project: Kopellis_ 2 Axis

Variant: 500KW|JKM525-545M-72HL4-BDVP-F3.1-EN|SG250HX-IN-20

No 3D scene defined, no shadings

System power: 501 kWp

Thessaloniki/Livadákion - Greece

**Author**

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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**
**No 3D scene defined, no shadings**

**PV Field Orientation**
**Orientation**
Tracking two axis, frame N-S

**Tracking algorithm**
Astronomic calculation

**Near Shadings**
No Shadings

**System information**

**PV Array**

| | |
|---|---|
| Nb. of modules | 945 units |
| Pnom total | 501 kWp |

**Inverters**

| | |
|---|---|
| Nb. of units | 2 units |
| Pnom total | 450 kWac |
| Pnom ratio | 1.113 |

**User's needs**
Unlimited load (grid)

## Results summary

| | | | | | |
|---|---|---|---|---|---|
| Produced Energy | 987.0 MWh/year | Specific production | 1971 kWh/kWp/year | Perf. Ratio PR | 84.55 % |

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## General parameters

**Grid-Connected System** — **No 3D scene defined, no shadings**

**PV Field Orientation**

| Orientation | Tracking algorithm | Trackers configuration |
|---|---|---|
| Tracking two axis, frame N-S | Astronomic calculation | |

**Models used**

| | |
|---|---|
| Transposition | Perez |
| Diffuse | Perez, Meteonorm |
| Circumsolar | separate |

| Horizon | Near Shadings | User's needs |
|---|---|---|
| Average Height 7.4 ° | No Shadings | 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 |

**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 PV power**

| | |
|---|---|
| Nominal (STC) | 501 kWp |
| Total | 945 modules |
| Module area | 2437 m² |
| Cell area | 2247 m² |

**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

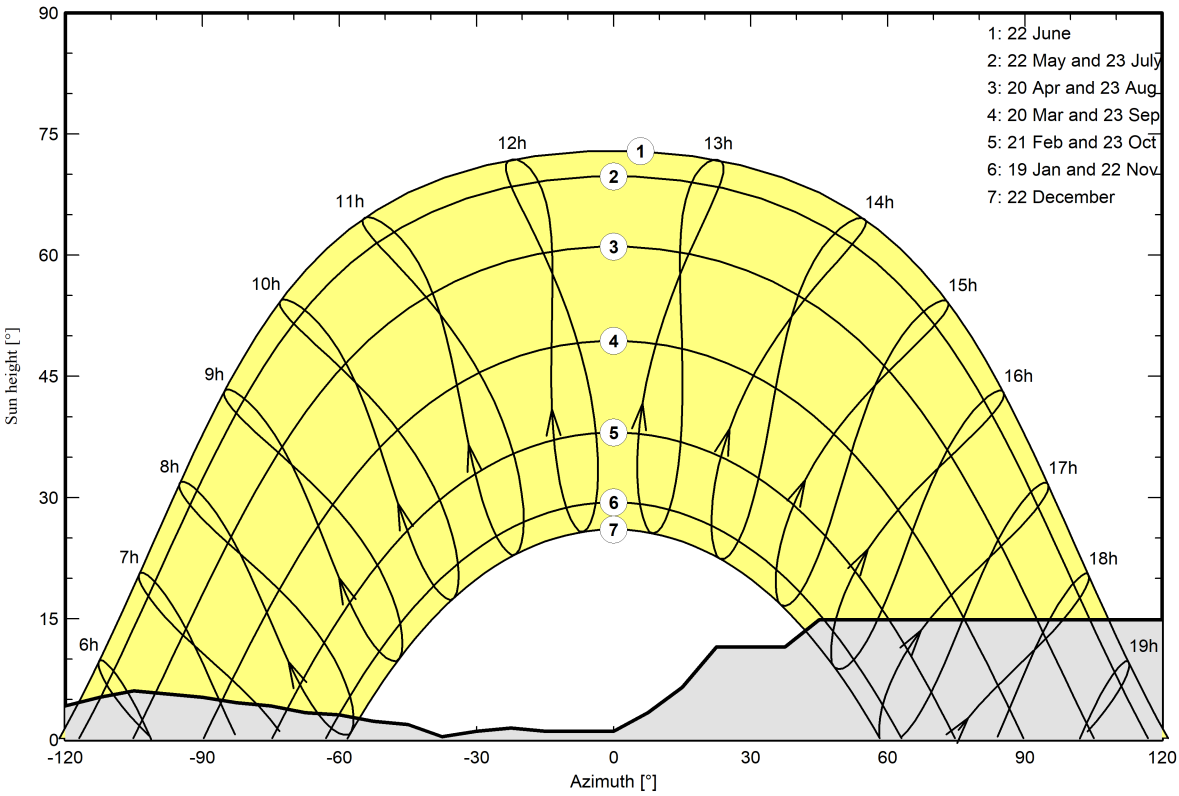
**Horizon from PVGIS website API, Lat=39°37"58', Long=22°13"41', Alt=153m**

| | | | |
|---|---|---|---|
| Average Height | 7.4 ° | Albedo Factor | 0.30 |
| Diffuse Factor | 0.86 | 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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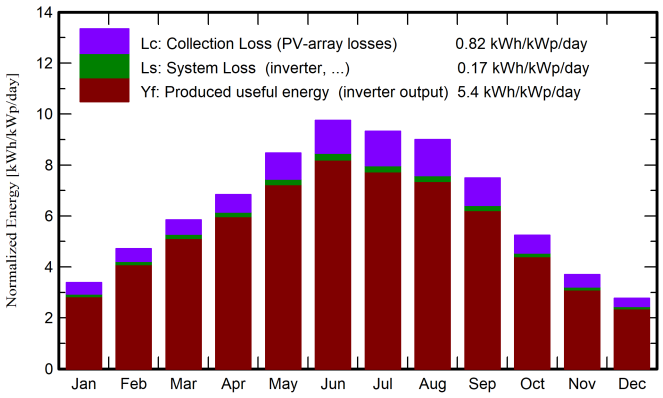
## Main results

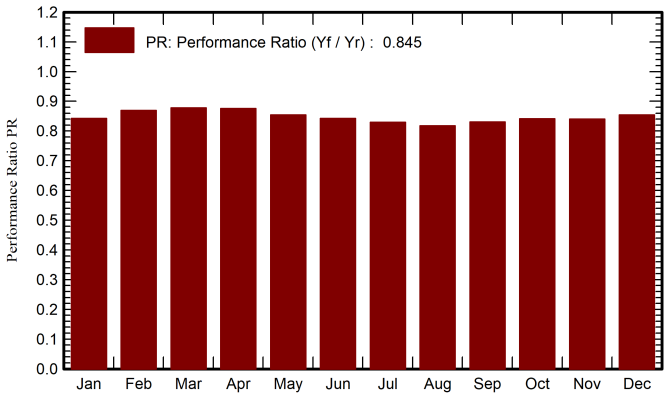
### System Production

| | | | |
|---|---|---|---|
| Produced Energy | 987.0 MWh/year | Specific production | 1971 kWh/kWp/year |
| | | Performance Ratio PR | 84.55 % |

**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** | 52.6 | 29.21 | 4.95 | 104.8 | 91.2 | 45.7 | 44.2 | 0.842 |
| **February** | 76.4 | 39.36 | 6.71 | 132.1 | 119.5 | 59.3 | 57.5 | 0.869 |
| **March** | 118.0 | 57.36 | 9.91 | 181.4 | 168.2 | 82.1 | 79.7 | 0.877 |
| **April** | 150.3 | 77.02 | 13.73 | 205.1 | 192.3 | 92.6 | 89.9 | 0.876 |
| **May** | 195.0 | 84.41 | 19.52 | 262.5 | 247.3 | 115.7 | 112.4 | 0.854 |
| **June** | 218.4 | 75.24 | 24.54 | 292.5 | 278.9 | 127.2 | 123.4 | 0.842 |
| **July** | 214.7 | 82.15 | 27.83 | 289.2 | 274.3 | 123.8 | 120.2 | 0.829 |
| **August** | 194.0 | 76.29 | 27.71 | 279.0 | 260.3 | 117.8 | 114.3 | 0.818 |
| **September** | 144.2 | 53.93 | 21.67 | 224.8 | 208.8 | 96.5 | 93.5 | 0.831 |
| **October** | 94.1 | 43.87 | 16.53 | 162.6 | 148.0 | 70.7 | 68.5 | 0.841 |
| **November** | 57.9 | 29.79 | 11.46 | 111.0 | 99.1 | 48.3 | 46.7 | 0.841 |
| **December** | 43.4 | 24.96 | 6.66 | 85.9 | 76.4 | 38.1 | 36.8 | 0.855 |
| **Year** | 1559.1 | 673.58 | 15.99 | 2330.9 | 2164.3 | 1017.9 | 987.0 | 0.845 |

### 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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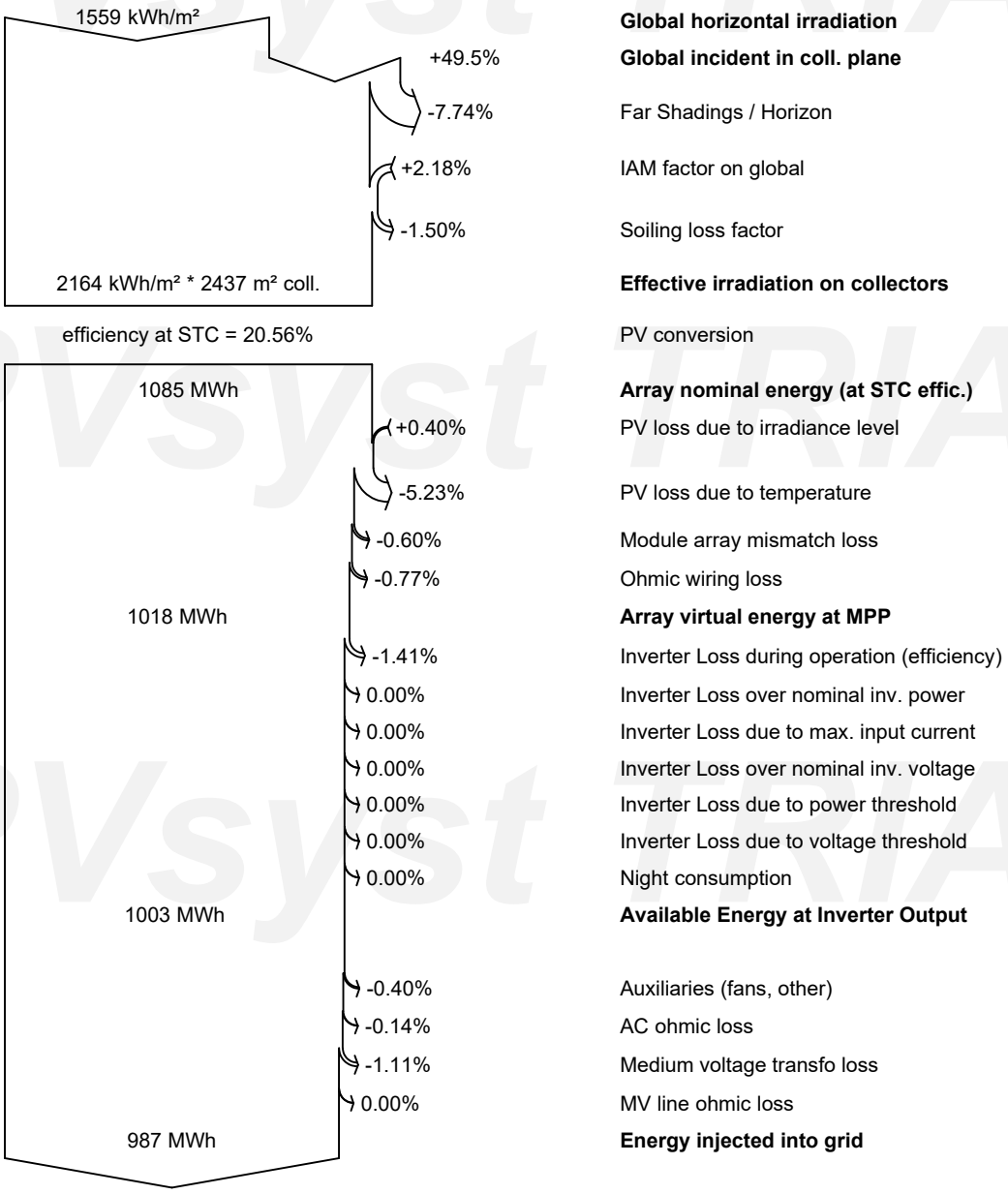
## Loss diagram



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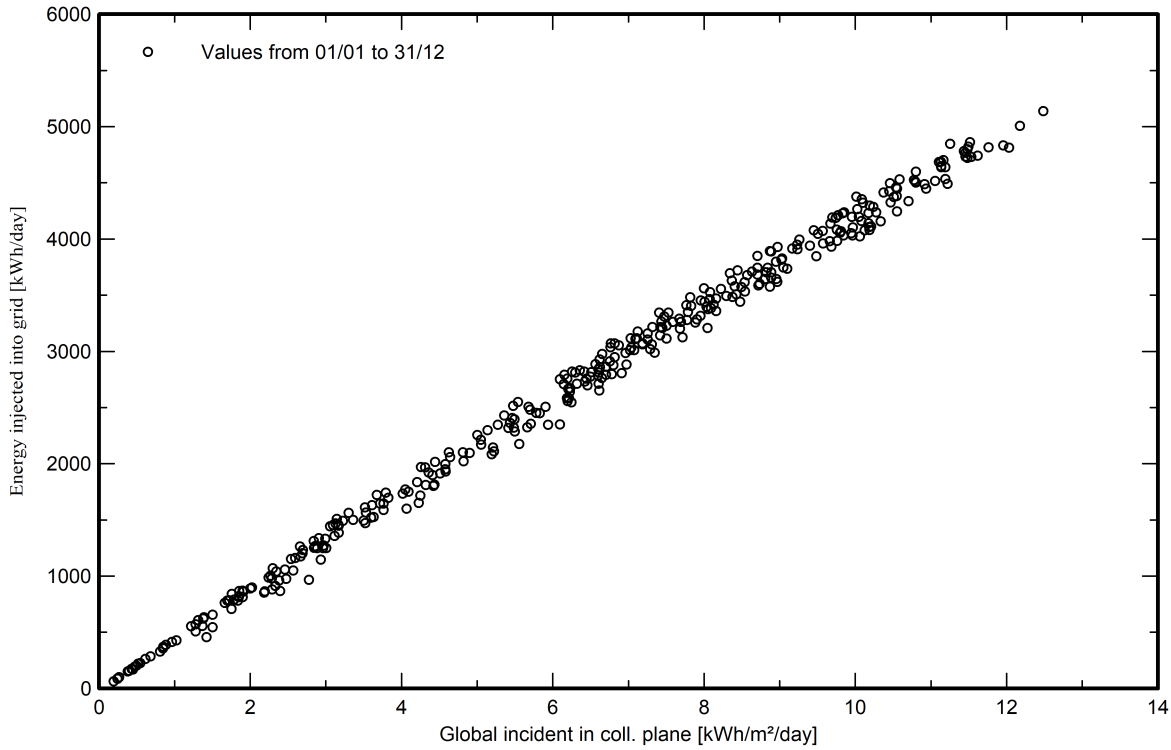
## Special graphs

### Daily Input/Output diagram




### System Output Power Distribution