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|--|--|---------------------------------|-------------------------|--------------------|------------------------------|----------|
| PVSYST V5.74 | | | | | 29/01/20 | Page 1/4 |
| Grid-Connected System: Simulation parameters | | | | | | |
| Project : Budynek Administracji RWiK Białogard | | | | | | |
| Geographical Site | | Koszalin | | Country | Poland | |
| Situation | | Latitude | 54.2°N | Longitude | 16.2°E | |
| Time defined as | | Legal Time | Time zone UT+1 | Altitude | 32 m | |
| | | Albedo | 0.20 | | | |
| Meteo data : | | Koszalin, Synthetic Hourly data | | | | |
| Simulation variant : Wariant 31,68 kWp | | | | | | |
| | | Simulation date | 29/01/20 11h07 | | | |
| Simulation parameters | | | | | | |
| Collector Plane Orientation | | Tilt | 15° | Azimuth | -20° | |
| Horizon | | Average Height | 14.3° | | | |
| Near Shadings | | No Shadings | | | | |
| PV Array Characteristics | | | | | | |
| PV module | | Si-mono | Model | 330 MS-HC | | |
| | | | Manufacturer | | | |
| Number of PV modules | | In series | 16 modules | In parallel | 6 strings | |
| Total number of PV modules | | Nb. modules | 96 | Unit Nom. Power | 330 Wp | |
| Array global power | | Nominal (STC) | 31.7 kWp | At operating cond. | 30.4 kWp (50°C) | |
| Array operating characteristics (50°C) | | U mpp | 508 V | I mpp | 60 A | |
| Total area | | Module area | 186 m _l | Cell area | 273 m _l | |
| Inverter | | Model | 15.0 kW | | | |
| | | Manufacturer | | | | |
| Characteristics | | Operating Voltage | 200-800 V | Unit Nom. Power | 15.0 kW AC | |
| Inverter pack | | Number of Inverter | 2 units | Total Power | 30.0 kW AC | |
| PV Array loss factors | | | | | | |
| Thermal Loss factor | | Uc (const) | 20.0 W/m _l K | Uv (wind) | 0.0 W/m _l K / m/s | |
| => Nominal Oper. Coll. Temp. (G=800 W/m _l , Tamb=20°C, Wind=1 m/s.) | | | | NOCT | 56 °C | |
| Wiring Ohmic Loss | | Global array res. | 136 mOhm | Loss Fraction | 1.5 % at STC | |
| Module Quality Loss | | | | Loss Fraction | 1.5 % | |
| Module Mismatch Losses | | | | Loss Fraction | 2.0 % at MPP | |
| Incidence effect, ASHRAE parametrization | | IAM = | 1 - bo (1/cos i - 1) | bo Parameter | 0.05 | |
| User's needs : Unlimited load (grid) | | | | | | |

Grid-Connected System: Horizon definition

Project : Budynek Administracji RWiK Białogard

Simulation variant : Wariant 31,68 kWp

Main system parameters

| | | | | |
|----------------------|-----------------------|-----------------------|------------|-------------------|
| Horizon | System type | Grid-Connected | | |
| PV Field Orientation | Average Height | 14.3° | tilt | 15° |
| PV modules | Model | 330 MS-HC | azimuth | -20° |
| PV Array | Nb. of modules | 96 | Pnom | 330 Wp |
| Inverter | Model | 15.0 kW | Pnom total | 31.7 kWp |
| Inverter pack | Nb. of units | 2.0 | Pnom | 15.00 kW ac |
| User's needs | Unlimited load (grid) | | Pnom total | 30.0 kW ac |

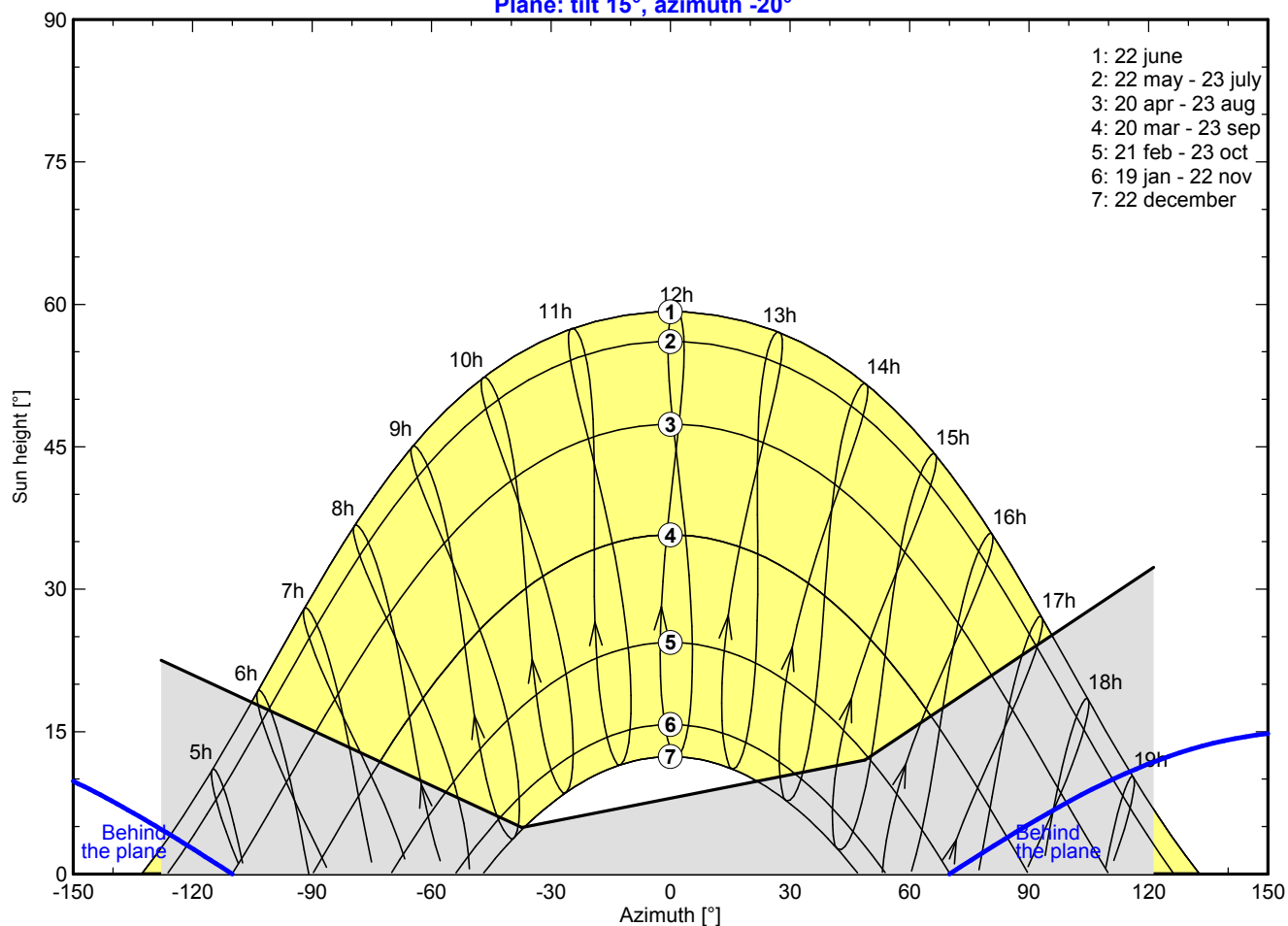
Horizon

| | | | |
|----------------|-------|-----------------|------|
| Average Height | 14.3° | Diffuse Factor | 0.94 |
| Albedo Factor | 100 % | Albedo Fraction | 0.59 |

| | | | | |
|-------------|------|-----|------|------|
| Height [°] | 22.5 | 4.9 | 12.0 | 32.3 |
| Azimuth [°] | -128 | -37 | 49 | 121 |

Horizon line at Koszalin

Plane: tilt 15°, azimuth -20°



Grid-Connected System: Main results

Project : Budynek Administracji RWiK Białogard

Simulation variant : Wariant 31,68 kWp

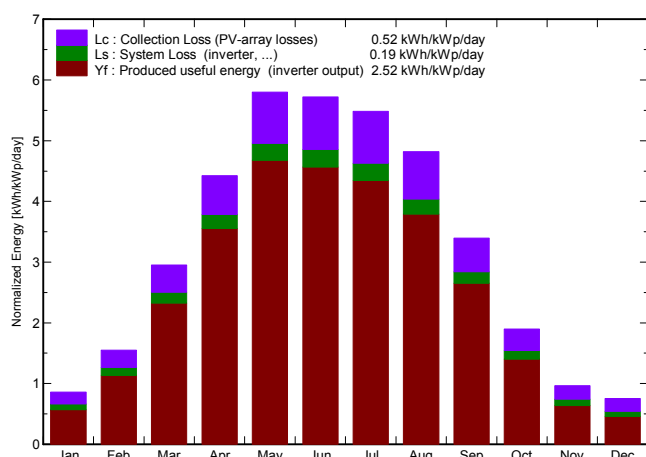
Main system parameters

| | | | |
|----------------------|-----------------------|-----------------------|------------------------------|
| Horizon | System type | Grid-Connected | |
| PV Field Orientation | Average Height | 14.3° | |
| PV modules | tilt | 15° | azimuth -20° |
| PV Array | Model | 330 MS-HC | Pnom 330 Wp |
| Inverter | Nb. of modules | 96 | Pnom total 31.7 kWp |
| Inverter pack | Model | 15.0kW | Pnom 15.00 kW ac |
| User's needs | Nb. of units | 2.0 | Pnom total 30.0 kW ac |
| | Unlimited load (grid) | | |

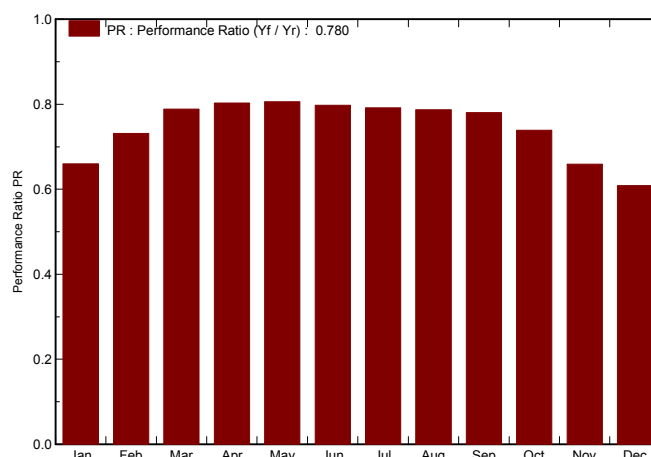
Main simulation results

| | | | | |
|-------------------|------------------------|-----------------------|----------------|------------------|
| System Production | Produced Energy | 29099 kWh/year | Specific prod. | 919 kWh/kWp/year |
| | Performance Ratio PR | 78.0 % | | |

Normalized productions (per installed kWp): Nominal power 31.7 kWp



Performance Ratio PR



Wariant 31,68 kWp Balances and main results

| | GlobHor kWh/m _i | T Amb °C | GlobInc kWh/m _i | GlobEff kWh/m _i | EArray kWh | E_Grid kWh | EffArrR % | EffSysR % |
|-----------|-------------------------------|-------------|-------------------------------|-------------------------------|---------------|---------------|--------------|--------------|
| January | 19.5 | 1.00 | 26.7 | 23.0 | 651 | 558 | 13.09 | 11.23 |
| February | 34.7 | 1.10 | 43.4 | 38.6 | 1120 | 1007 | 13.84 | 12.44 |
| March | 78.7 | 3.00 | 91.5 | 83.5 | 2459 | 2286 | 14.43 | 13.41 |
| April | 121.8 | 7.00 | 132.8 | 122.4 | 3599 | 3378 | 14.55 | 13.66 |
| May | 172.0 | 11.50 | 179.7 | 166.3 | 4870 | 4591 | 14.55 | 13.71 |
| June | 168.3 | 14.90 | 171.6 | 158.7 | 4615 | 4338 | 14.44 | 13.57 |
| July | 164.6 | 17.70 | 170.1 | 157.4 | 4547 | 4267 | 14.35 | 13.47 |
| August | 140.1 | 18.20 | 149.4 | 137.2 | 3965 | 3725 | 14.24 | 13.38 |
| September | 88.8 | 14.40 | 101.9 | 93.1 | 2702 | 2519 | 14.24 | 13.27 |
| October | 47.7 | 10.30 | 58.8 | 52.8 | 1519 | 1376 | 13.87 | 12.56 |
| November | 21.9 | 5.00 | 29.0 | 24.9 | 704 | 605 | 13.05 | 11.21 |
| December | 16.1 | 2.00 | 23.3 | 19.0 | 533 | 450 | 12.27 | 10.35 |
| Year | 1074.3 | 8.89 | 1178.2 | 1076.8 | 31286 | 29099 | 14.25 | 13.26 |

| | | | | |
|----------|---------|--|---------|---|
| Legends: | GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| | T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| | GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| | GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

Grid-Connected System: Loss diagram

Project : Budynek Administracji RWiK Białogard

Simulation variant : Wariant 31,68 kWp

| | | | |
|-------------------------------|-----------------------|-----------------------|------------------------------|
| Main system parameters | System type | Grid-Connected | |
| Horizon | Average Height | 14.3° | |
| PV Field Orientation | tilt | 15° | azimuth -20° |
| PV modules | Model | 330 MS-HC | Pnom 330 Wp |
| PV Array | Nb. of modules | 96 | Pnom total 31.7 kWp |
| Inverter | Model | 15.0 kW | Pnom 15.00 kW ac |
| Inverter pack | Nb. of units | 2.0 | Pnom total 30.0 kW ac |
| User's needs | Unlimited load (grid) | | |

Loss diagram over the whole year

