

PVSYST V5.74					11/01/20	Page 1/4
Grid-Connected System: Simulation parameters						
Project : Oczyszczalnia Ścieków Karlino						
Geographical Site		Kołobrzeg		Country	Poland	
Situation		Latitude	54.1°N	Longitude	15.4°E	
Time defined as		Legal Time	Time zone UT+1	Altitude	5 m	
		Albedo	0.20			
Meteo data :		Kołobrzeg, Synthetic Hourly data				
Simulation variant : Wariant 48,84 kWp						
		Simulation date	11/01/20 17h05			
Simulation parameters						
Collector Plane Orientation		Tilt	30°	Azimuth	0°	
Horizon		Average Height	16.9°			
Near Shadings		No Shadings				
PV Arrays Characteristics (2 kinds of array defined)						
PV module		Si-mono	Model	330 MS-HC		
		Manufacturer	IBC Solar			
Array#1: Number of PV modules		In series	19 modules	In parallel	4 strings	
Total number of PV modules		Nb. modules	76	Unit Nom. Power	330 Wp	
Array global power		Nominal (STC)	25.08 kWp	At operating cond.	24.08 kWp (50°C)	
Array operating characteristics (50°C)		U mpp	604 V	I mpp	40 A	
Array#2: Number of PV modules		In series	18 modules	In parallel	4 strings	
Total number of PV modules		Nb. modules	72	Unit Nom. Power	330 Wp	
Array global power		Nominal (STC)	23.76 kWp	At operating cond.	22.81 kWp (50°C)	
Array operating characteristics (50°C)		U mpp	572 V	I mpp	40 A	
Total Arrays global power		Nominal (STC)	49 kWp	Total	148 modules	
		Module area	287 m _e	Cell area	422 m _e	
Inverter		Model	Symo 20.0-3-M			
		Manufacturer	Fronius			
		Operating Voltage	420-800 V	Unit Nom. Power	20.0 kW AC	
Array#1:		Number of Inverter	1	Total Power	20 kW AC	
Array#2:		Number of Inverter	1	Total Power	20 kW AC	
Total		Number of Inverter	2	Total Power	40 kW AC	
PV Array loss factors						
Thermal Loss factor		Uc (const)	20.0 W/m _e K	Uv (wind)	0.0 W/m _e K / m/s	
=> Nominal Oper. Coll. Temp. (G=800 W/m _e , Tamb=20°C, Wind=1 m/s.)				NOCT	56 °C	
Wiring Ohmic Loss		Array#1	242 mOhm	Loss Fraction	1.5 % at STC	
		Array#2	229 mOhm	Loss Fraction	1.5 % at STC	
		Global		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 : Oczyszczalnia Ścieków Karlino

Simulation variant : Wariant 48,84 kWp

Main system parameters

Horizon	System type	Grid-Connected		
PV Field Orientation	Average Height	16.9°	tilt	30°
PV modules	Model	330 MS-HC	azimuth	0°
PV Array	Nb. of modules	148	Pnom	330 Wp
Inverter	Model	Symo 20.0-3-M	Pnom total	48.8 kWp
Inverter pack	Nb. of units	2.0	Pnom	20.00 kW ac
User's needs	Unlimited load (grid)		Pnom total	40.0 kW ac

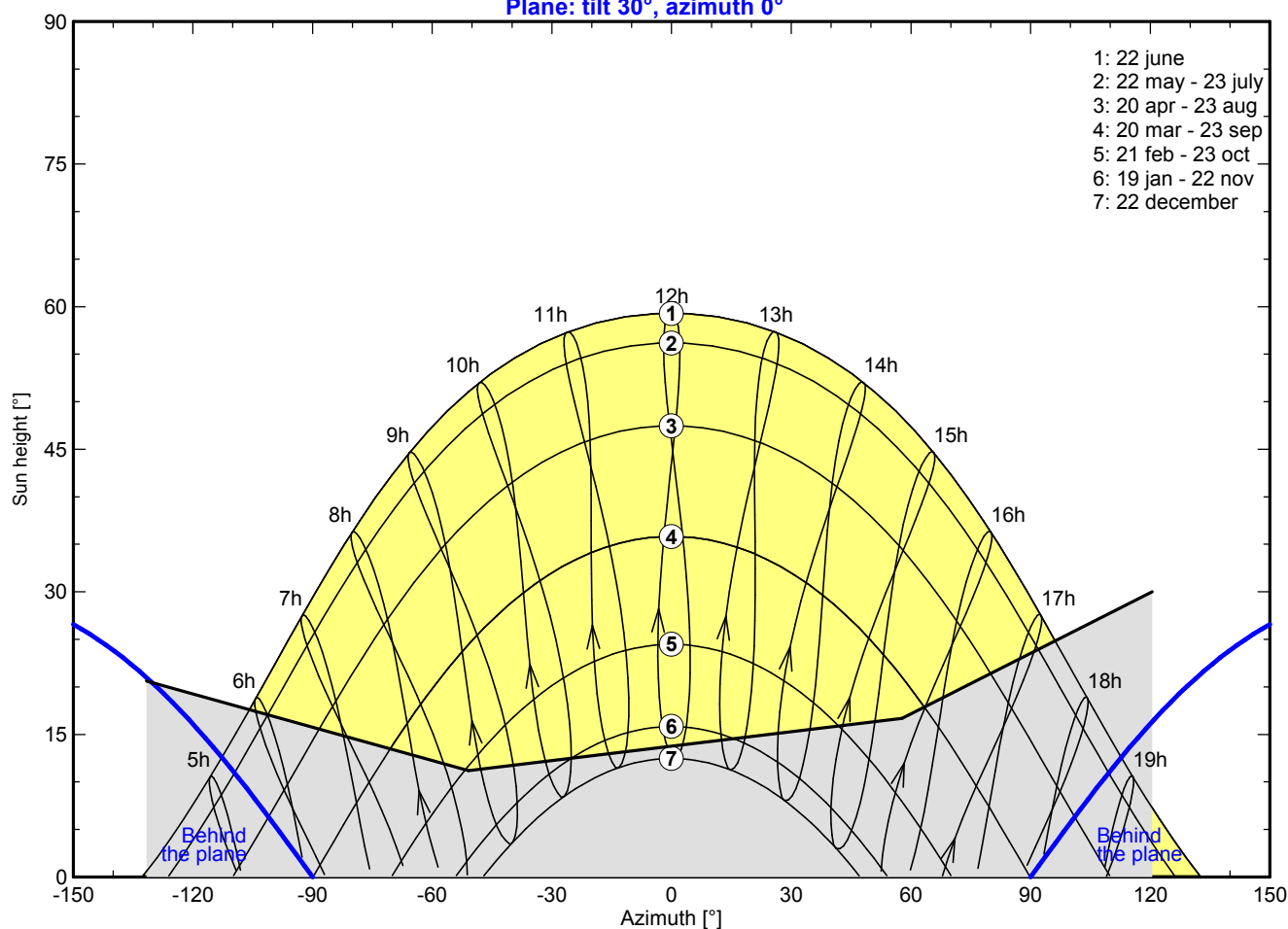
Horizon

Average Height	16.9°	Diffuse Factor	0.88
Albedo Factor	100 %	Albedo Fraction	0.30

Height [°]	20.6	11.2	16.7	30.0
Azimuth [°]	-132	-51	58	121

Horizon line at Kołobrzeg

Plane: tilt 30°, azimuth 0°



Grid-Connected System: Main results

Project : Oczyszczalnia Ścieków Karlino

Simulation variant : Wariant 48,84 kWp

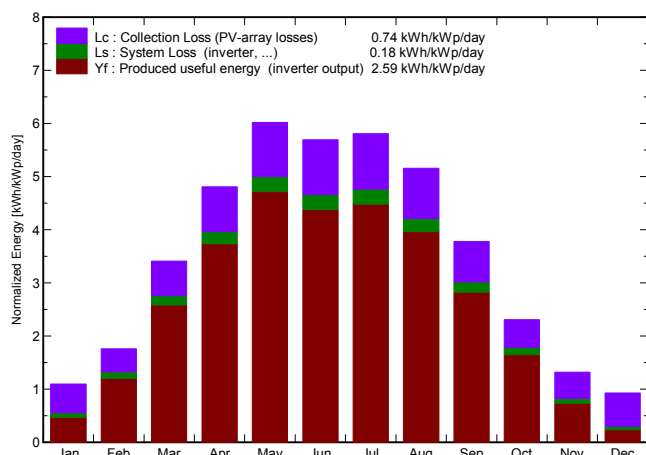
Main system parameters

Horizon	System type	Grid-Connected	
PV Field Orientation	Average Height	16.9°	
PV modules	tilt	30°	azimuth 0°
PV Array	Model	330 MS-HC	Pnom 330 Wp
Inverter	Nb. of modules	148	Pnom total 48.8 kWp
Inverter pack	Model	Symo 20.0-3-M	Pnom 20.00 kW ac
User's needs	Nb. of units	2.0	Pnom total 40.0 kW ac
	Unlimited load (grid)		

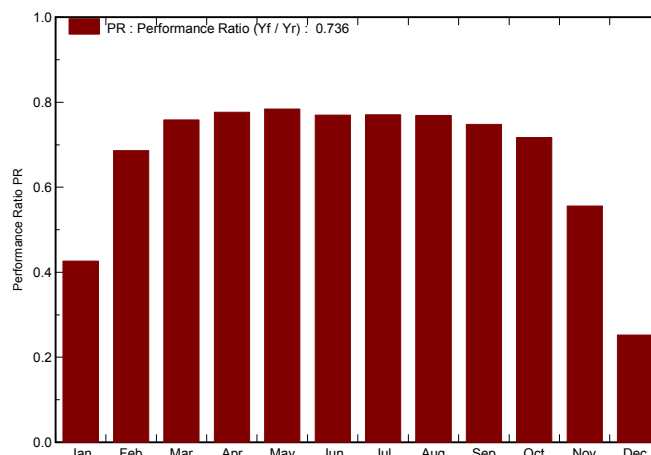
Main simulation results

System Production	Produced Energy	46179 kWh/year	Specific prod.	946 kWh/kWp/year
	Performance Ratio PR	73.6 %		

Normalized productions (per installed kWp): Nominal power 48.8 kWp



Performance Ratio PR



Wariant 48,84 kWp Balances and main results

	GlobHor kWh/m _t	T Amb °C	GlobInc kWh/m _t	GlobEff kWh/m _t	EArray kWh	E_Grid kWh	EffArrR %	EffSysR %
January	19.2	1.10	34.1	19.4	836	710	8.55	7.25
February	35.8	1.30	49.2	40.5	1813	1649	12.83	11.67
March	82.5	3.10	105.7	92.0	4182	3917	13.78	12.90
April	126.6	7.00	144.3	128.2	5812	5472	14.02	13.20
May	176.4	11.60	186.5	168.3	7575	7144	14.14	13.34
June	171.0	15.00	170.8	152.8	6830	6423	13.93	13.10
July	174.8	17.80	180.2	162.6	7220	6783	13.96	13.11
August	146.0	18.20	159.8	143.4	6381	6007	13.90	13.09
September	93.3	14.40	113.4	99.0	4424	4142	13.58	12.72
October	50.9	10.30	71.5	60.8	2714	2504	13.22	12.19
November	23.1	5.10	39.6	27.5	1210	1075	10.64	9.46
December	15.2	2.10	28.7	11.2	460	354	5.58	4.29
Year	1114.8	8.96	1283.9	1105.8	49457	46179	13.41	12.53

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 : Oczyszczalnia Ścieków Karlino

Simulation variant : Wariant 48,84 kWp

Main system parameters

Horizon

PV Field Orientation

PV modules

PV Array

Inverter

Inverter pack

User's needs

System type **Grid-Connected**

Average Height 16.9°

tilt 30°

Model 330 MS-HC

Nb. of modules 148

Model Symo 20.0-3-M

Nb. of units 2.0

Unlimited load (grid)

azimuth 0°

Pnom 330 Wp

Pnom total **48.8 kWp**

Pnom 20.00 kW ac

Pnom total **40.0 kW ac**

Loss diagram over the whole year

