Grid-Connected System: Simulation parameters

Project :   **8.5 kW**

Geographical Site		**Kaunas**	Country	**Lithuania**
Situation	Latitude	54.88° N	Longitude	23.88° E
Time defined as	Legal Time	Time zone UT+2	Altitude	69 m
	Albedo	0.20		
Meteo data:	**Kaunas**	MeteoNorm 7.1 station - Synthetic		

Simulation variant :   **New simulation variant**

Simulation date   23/06/20 12h22

Simulation parameters

Collector Plane Orientation	Tilt	35°	Azimuth	0°
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	No Shadings			

PV Array Characteristics

PV module	Si-mono	Model	**Solid Pro 320 W M60**		
Custom parameters definition		Manufacturer	SoliTek		
Number of PV modules	In series	15 modules	In parallel	2 strings
Total number of PV modules	Nb. modules	30	Unit Nom. Power	320 Wp
Array global power	Nominal (STC)	**9.60 kWp**	At operating cond.	8.80 kWp (50°C)
Array operating characteristics (50°C)	U mpp	460 V	I mpp	19 A
Total area	Module area	**49.7 m²**	Cell area	44.2 m²

Inverter	Model	**SUN2000-8KTL-M1**		
Custom parameters definition	Manufacturer	Huawei Technologies		
Characteristics	Operating Voltage	140-980 V	Unit Nom. Power	8.00 kWac
			Max. power (=>60°C)	8.80 kWac
Inverter pack	Nb. of inverters	2 * MPPT 50 %	Total Power	8.0 kWac

PV Array loss factors

Thermal Loss factor	Uc (const)	20.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	394 mOhm	Loss Fraction	1.5 % at STC
LID - Light Induced Degradation			Loss Fraction	0.5 %
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Incidence effect, ASHRAE parametrization	IAM =	$1 - bo (1/\cos i - 1)$	bo Param.	0.05

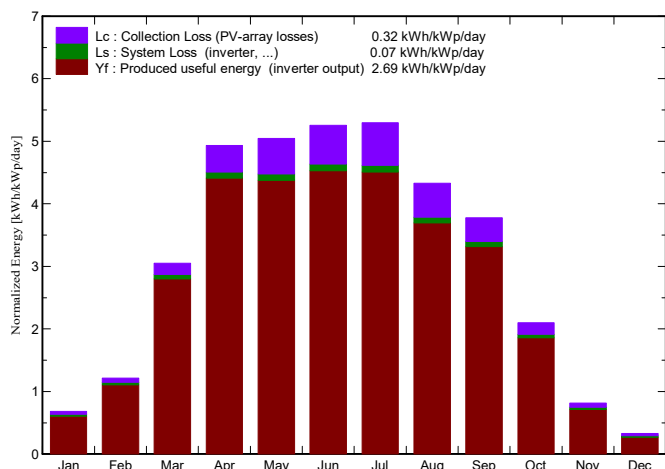**User's needs :**   Unlimited load (grid)

Grid-Connected System: Main results

Project : **8.5 kW**

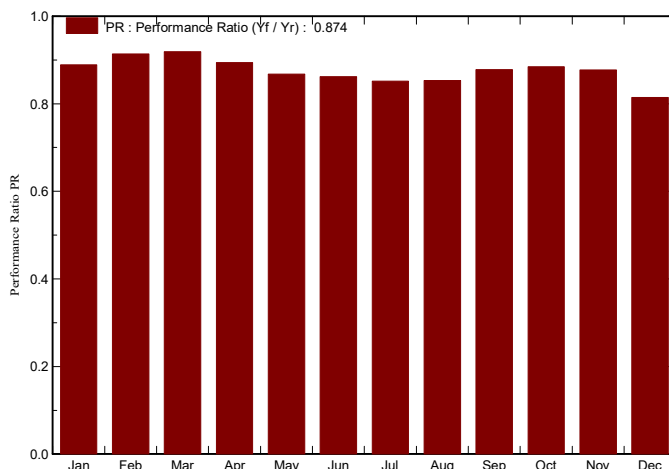**Simulation variant :** **New simulation variant**

Main system parameters

	System type	**Grid-Connected**		
PV Field Orientation	tilt	35°	azimuth	0°
PV modules	Model	Solid Pro 320 W M60	Pnom	320 Wp
PV Array	Nb. of modules	30	Pnom total	**9.60 kWp**
Inverter	Model	SUN2000-8KTL-M1	Pnom	8.00 kW ac
User's needs	Unlimited load (grid)			

Main simulation results

System Production

Produced Energy **9426 kWh/year**   Specific prod. 982 kWh/kWp/year

Performance Ratio PR 87.41 %

Normalized productions (per installed kWp): Nominal power 9.60 kWp

Lc : Collection Loss (PV-array losses) 0.32 kWh/kWp/day
Ls : System Loss (inverter, ...) 0.07 kWh/kWp/day
Yf : Produced useful energy (inverter output) 2.69 kWh/kWp/day

Performance Ratio PR

PR : Performance Ratio (Yf / Yr) : 0.874

New simulation variant

Balances and main results

	GlobHor	T Amb	GlobInc	GlobEff	EArray	E_Grid	EffArrR	EffSysR
	kWh/m²	°C	kWh/m²	kWh/m²	kWh	kWh	%	%
January	11.9	-2.76	21.2	20.3	190	181	18.04	17.17
February	23.5	-2.98	34.0	32.7	309	298	18.32	17.65
March	68.3	0.85	94.5	91.6	854	833	18.18	17.74
April	124.5	7.70	148.0	143.2	1299	1271	17.66	17.27
May	150.9	13.01	156.4	151.0	1333	1303	17.15	16.76
June	158.3	15.38	157.7	152.3	1335	1304	17.04	16.65
July	161.4	18.80	164.1	158.6	1374	1341	16.84	16.45
August	122.8	17.72	134.2	129.9	1127	1100	16.90	16.48
September	87.1	12.61	113.4	109.9	979	955	17.37	16.95
October	42.4	7.46	65.1	63.1	570	553	17.60	17.09
November	15.1	2.87	24.4	23.5	216	206	17.78	16.94
December	7.4	-0.88	10.3	9.7	88	80	17.26	15.73
Year	973.6	7.54	1123.3	1085.8	9674	9426	17.33	16.88

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

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PV modules	Model	Solid Pro 320 W M60	Pnom	320 Wp
PV Array	Nb. of modules	30	Pnom total	**9.60 kWp**
Inverter	Model	SUN2000-8KTL-M1	Pnom	8.00 kW ac
User's needs	Unlimited load (grid)			

Loss diagram over the whole year

974 kWh/m²   **Horizontal global irradiation**

+15.4%   **Global incident in coll. plane**

-3.3%   IAM factor on global

1086 kWh/m² * 50 m² coll.   **Effective irradiance on collectors**

efficiency at STC = 19.35%   PV conversion

10440 kWh   **Array nominal energy (at STC effic.)**

-3.1%   PV loss due to irradiance level

-2.9%   PV loss due to temperature

+0.7%   Module quality loss

-0.5%   LID - Light induced degradation

-1.0%   Module array mismatch loss

-0.8%   Ohmic wiring loss

9674 kWh   **Array virtual energy at MPP**

-2.3%   Inverter Loss during operation (efficiency)

0.0%   Inverter Loss over nominal inv. power

0.0%   Inverter Loss due to power threshold

0.0%   Inverter Loss over nominal inv. voltage

0.0%   Inverter Loss due to voltage threshold

-0.3%   Night consumption

9426 kWh   **Available Energy at Inverter Output**

9426 kWh   **Energy injected into grid**