

## Stand Alone System: Simulation parameters

**Project :** **stacja ladowania rowerów**

**Geographical Site** **Warsaw** Country **Poland**

**Situation** Latitude 52.27° N Longitude 20.98° E  
Time defined as Legal Time Time zone UT+1 Altitude 96 m

Albedo 0.20

**Meteo data:** **Warsaw** MeteoNorm 7.1 station - Synthetic

**Simulation variant :** **stacja ladowania rowerów v2**

Simulation date 13/03/18 09h08

**Simulation parameters** System type **Stand-alone system**

**Collector Plane Orientation** Tilt 47° Azimuth 0°

**Models used** Transposition Perez Diffuse Perez, Meteonorm

### PV Array Characteristics

<b>PV module</b>	Si-poly	Model	<b>SV60P 4-270</b>
Original PVsyst database		Manufacturer	Selfa GE S.A.
Number of PV modules		In series	2 modules
Total number of PV modules		Nb. modules	2
Array global power		Nominal (STC)	<b>540 Wp</b>
Array operating characteristics (50°C)		U mpp	56 V
Total area		Module area	<b>3.3 m<sup>2</sup></b>
		In parallel	1 strings
		Unit Nom. Power	270 Wp
		At operating cond.	486 Wp (50°C)
		I mpp	8.6 A

### PV Array loss factors

Thermal Loss factor	Uc (const)	20.0 W/m <sup>2</sup> K	Uv (wind)	0.0 W/m <sup>2</sup> K / m/s
Wiring Ohmic Loss	Global array res.	110 mOhm	Loss Fraction	1.5 % at STC
Serie Diode Loss	Voltage Drop	0.7 V	Loss Fraction	1.1 % at STC
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

**System Parameter** System type **Stand Alone System**

**Battery** Model **6Y112 - Starting**

Battery Pack Characteristics	Manufacturer	Electrona	Nominal Capacity	130 Ah
	Voltage	24 V		
	Nb. of units	2 in series		
	Temperature	Fixed (20°C)		

**Controller** Model Solarix MPPT 2010 / 24V

Converter	Manufacturer	Steca Solarix	Temp coeff.	-5.0 mV/°C/elem.
	Technology	MPPT converter		
	Maxi and EURO efficiencies	98.3 / 97.3 %		

Battery Management control	Threshold commands as	Battery voltage		
	Charging	26.8 / 25.1 V	Corresp. SOC	0.90 / 0.75
	Discharging	23.6 / 24.4 V	Corresp. SOC	0.20 / 0.45

**User's needs :** Daily household consumers average Constant over the year  
1.4 kWh/Day

## Stand Alone System: Detailed User's needs

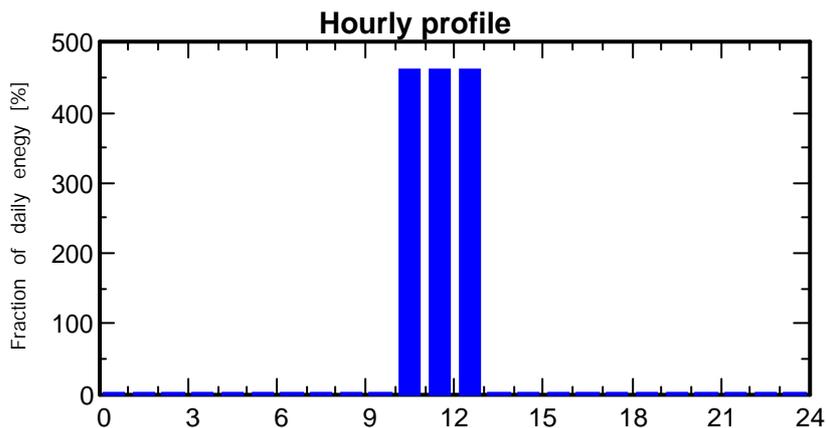
**Project :** stacja ladowania rowerów  
**Simulation variant :** stacja ladowania rowerów v2

<b>Main system parameters</b>	System type	<b>Stand alone</b>		
PV Field Orientation	tilt	47°	azimuth	0°
PV modules	Model	SV60P 4-270	Pnom	270 Wp
PV Array	Nb. of modules	2	Pnom total	<b>540 Wp</b>
Battery	Model	6Y112 - Starting	Technology	Lead-acid, vented, vehicle sta
Battery Pack	Nb. of units	2	Voltage / Capacity	<b>24 V / 130 Ah</b>
User's needs	Daily household consumers	Constant over the year	Global	512 kWh/year

**Daily household consumers, Constant over the year, average = 1.4 kWh/day**

### Annual values

	Number	Power	Use	Energy
Other uses	2	460 W tot	2 h/day	1380 Wh/day
Stand-by consumers			24 h/day	24 Wh/day
Total daily energy				1404 Wh/day



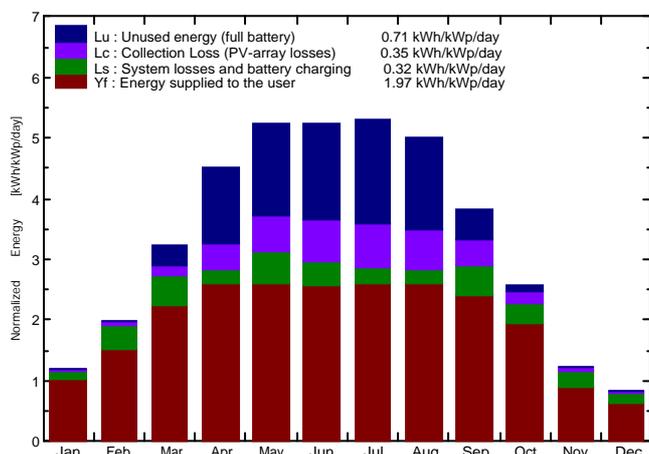
## Stand Alone System: Main results

**Project :** stacja ladowania rowerów  
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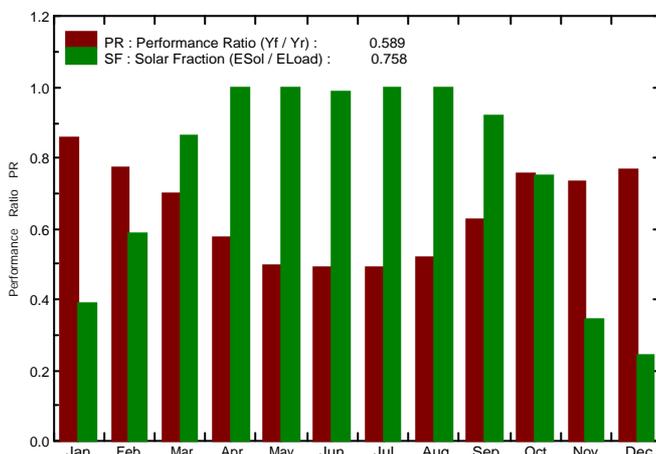
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<b>Main simulation results</b>				
System Production	<b>Available Energy</b>	<b>577.0 kWh/year</b>	Specific prod.	1069 kWh/kWp/year
	Used Energy	388.5 kWh/year	Excess (unused)	139.4 kWh/year
	Performance Ratio PR	58.87 %	Solar Fraction SF	75.82 %
Loss of Load	Time Fraction	27.0 %	Missing Energy	123.9 kWh/year

Normalized productions (per installed kWp): Nominal power 540 Wp



Performance Ratio PR and Solar Fraction SF



### stacja ladowania rowerów v2 Balances and main results

	<b>GlobHor</b> kWh/m <sup>2</sup>	<b>GlobEff</b> kWh/m <sup>2</sup>	<b>E Avail</b> kWh	<b>EUnused</b> kWh	<b>E Miss</b> kWh	<b>E User</b> kWh	<b>E Load</b> kWh	<b>SolFrac</b>
<b>January</b>	20.2	35.4	18.27	0.00	26.65	16.88	43.52	0.388
<b>February</b>	33.9	53.7	27.64	0.00	16.33	22.98	39.31	0.585
<b>March</b>	75.8	96.9	49.56	5.14	5.84	37.68	43.52	0.866
<b>April</b>	116.7	131.3	64.74	20.08	0.00	42.12	42.12	1.000
<b>May</b>	162.3	157.1	75.85	25.03	0.00	43.52	43.52	1.000
<b>June</b>	167.1	152.1	71.84	25.38	0.50	41.62	42.12	0.988
<b>July</b>	169.0	159.6	75.25	28.87	0.00	43.52	43.52	1.000
<b>August</b>	142.4	150.7	71.15	25.23	0.00	43.52	43.52	1.000
<b>September</b>	91.5	111.1	53.71	8.04	3.36	38.76	42.12	0.920
<b>October</b>	53.0	77.5	38.42	1.68	10.88	32.65	43.52	0.750
<b>November</b>	22.0	35.6	17.91	0.00	27.53	14.59	42.12	0.346
<b>December</b>	14.4	24.9	12.68	0.00	32.83	10.69	43.52	0.246
<b>Year</b>	<b>1068.3</b>	<b>1185.8</b>	<b>577.01</b>	<b>139.45</b>	<b>123.92</b>	<b>388.54</b>	<b>512.46</b>	<b>0.758</b>

Legends: GlobHor Horizontal global irradiation  
 GlobEff Effective Global, corr. for IAM and shadings  
 E Avail Available Solar Energy  
 EUnused Unused energy (full battery) loss  
 E Miss Missing energy  
 E User Energy supplied to the user  
 E Load Energy need of the user (Load)  
 SolFrac Solar fraction (EUsed / ELoad)

## Stand Alone System: Loss diagram

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User's needs	Daily household consumers	Constant over the year	Global 512 kWh/year

### Loss diagram over the whole year

