

Starobesheve
12 MW (1)

Grid-Connected System: Simulation parameters

Project : Starobesheve 12 MW

Geographical Site	Starobeshevo	Country	Ukrainia
Situation	Latitude 47.8°N	Longitude	38.0°E
Time defined as	Legal Time Time zone UT+2	Altitude	118 m
	Albedo 0.20		

Meteo data : Starobeshevo from PVGIS, Synthetic Hourly data

Simulation variant : New simulation variant

Simulation date 31/05/12 15h33

Simulation parameters

Collector Plane Orientation	Tilt 32°	Azimuth 0°
5Sheds	Pitch 7.70 m	Collector width 3.35 m
Inactive band	Top 0.00 m	Bottom 0.00 m
Shading limit angle	Gamma 20.07 °	Occupation Ratio 43.5 %

Horizon Free Horizon

Near Shadings No Shadings

PV Arrays Characteristics (2 kinds of array defined)

PV module	Si-poly	Model	SF 220-30-P240
	Manufacturer		Hanwha SolarOne
Array#1:	Number of PV modules	In series	20 modules
	Total number of PV modules	Nb. modules	47040
	Array global power	Nominal (STC)	11290 kWp
	Array operating characteristics (50°C)	U mpp	549 V
		In parallel	2352 strings
		Unit Nom. Power	240 Wp
		At operating cond.	10165 kWp (50°C)
		I mpp	18513 A
Array#2:	Number of PV modules	In series	20 modules
	Total number of PV modules	Nb. modules	2960
	Array global power	Nominal (STC)	710 kWp
	Array operating characteristics (50°C)	U mpp	549 V
		In parallel	148 strings
		Unit Nom. Power	240 Wp
		At operating cond.	640 kWp (50°C)
		I mpp	1165 A
Total	Arrays global power	Nominal (STC)	12000 kWp
		Module area	82600 ml
		Total	50000 modules

Inverter	Model	Protect PV 630
	Manufacturer	AEG Power Solutions GmbH
	Operating Voltage	550-820 V
	Unit Nom. Power	630 kW AC

Array#1:	Number of Inverter	16.0	Total Power	10080 kW AC
Array#2:	Number of Inverter	1	Total Power	630 kW AC
Total	Number of Inverter	17	Total Power	10710 kW AC

PV Array loss factors

Thermal Loss factor	Uc (const)	20.0 W/mIK	Uv (wind)	0.0 W/mIK / m/s
=> Nominal Oper. Coll. Temp. (G=800 W/ml, Tamb=20°C, Wind=1 m/s.)			NOCT	56 °C
Wiring Ohmic Loss	Array#1	0.49 mOhm	Loss Fraction	1.5 % at STC
	Array#2	7.8 mOhm	Loss Fraction	1.5 % at STC
	Global		Loss Fraction	1.5 % at STC

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Module Quality Loss		Loss Fraction	2.5 %
Module Mismatch Losses		Loss Fraction	2.0 % at MPP
Incidence effect, ASHRAE parametrization	IAM = $1 - b_o (1/\cos i - 1)$	b_o Parameter	0.05

User's needs : Unlimited load (grid)

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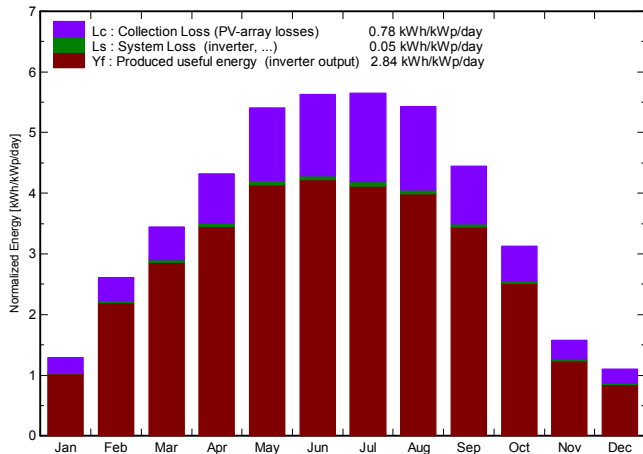
Grid-Connected System: Main results

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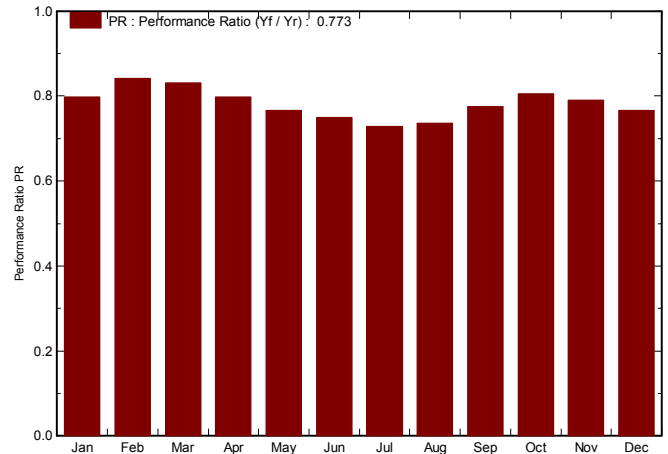
Main system parameters	System type	Grid-Connected		
PV Field Orientation	Sheds disposition, tilt	32°	azimuth	0°
PV modules	Model	SF 220-30-P240	Pnom	240 Wp
PV Array	Nb. of modules	50000	Pnom total	12000 kWp
Inverter	Model	Protect PV 630	Pnom	630 kW ac
Inverter pack	Nb. of units	17.0	Pnom total	10710 kW ac
User's needs	Unlimited load (grid)			

Main simulation results
System Production **Produced Energy 12438 MWh/year** Specific prod. 1037 kWh/kWp/year
Performance Ratio PR **77.3 %**

Normalized productions (per installed kWp): Nominal power 12000 kWp



Performance Ratio PR



New simulation variant
Balances and main results

	GlobHor	T Amb	GlobInc	GlobEff	EArray	E_Grid	EffArrR	EffSysR
	kWh/ml	°C	kWh/ml	kWh/ml	MWh	MWh	%	%
January	27.1	-3.50	39.9	36.4	392	382	11.89	11.60
February	49.3	-2.50	73.1	68.5	750	738	12.43	12.22
March	86.2	2.30	106.6	100.7	1080	1063	12.27	12.07
April	117.9	10.10	129.7	121.9	1263	1242	11.79	11.60
May	165.2	16.00	167.5	157.6	1566	1540	11.32	11.13
June	174.6	20.00	168.9	158.7	1545	1519	11.07	10.89
July	177.6	22.90	175.1	164.7	1558	1530	10.77	10.58
August	157.8	21.80	168.2	158.3	1509	1486	10.86	10.69
September	111.6	16.00	133.3	126.1	1260	1239	11.45	11.26
October	68.5	9.50	97.0	91.4	952	936	11.89	11.69
November	31.8	3.10	47.2	43.1	457	447	11.73	11.48
December	22.0	-2.00	34.2	30.2	324	315	11.45	11.14
Year	1189.6	9.54	1340.6	1257.5	12656	12438	11.43	11.23

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

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Grid-Connected System: Loss diagram

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Main system parameters	System type	Grid-Connected	
PV Field Orientation	Sheds disposition, tilt	32°	azimuth 0°
PV modules	Model	SF 220-30-P240	Pnom 240 Wp
PV Array	Nb. of modules	50000	Pnom total 12000 kWp
Inverter	Model	Protect PV 630	Pnom 630 kW ac
Inverter pack	Nb. of units	17.0	Pnom total 10710 kW ac
User's needs	Unlimited load (grid)		

Loss diagram over the whole year

