Grid-Connected System: Simulation parameters

Project : **Plewen**

Geographical Site **Pleven** **Country** **Bulgaria**

Situation Latitude 43.2°N Longitude 25.4°E
Time defined as Legal Time Time zone UT+1 Altitude 118 m
Monthly albedo values

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Albedo	0.75	0.50	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.50

Meteo data : Михалци, Synthetic Hourly data

Simulation variant : **New simulation variant**
Simulation date 29/08/11 10h58

Simulation parameters

Collector Plane Orientation Tilt 25° Azimuth 0°

Horizon Free Horizon

Near Shadings Linear shadings

PV Array Characteristics

PV module Si-mono Model **Chaori 190S-Mono**
Manufacturer Chaori Solar

Number of PV modules	In series	18 modules	In parallel	144 strings
Total number of PV modules	Nb. modules	2592	Unit Nom. Power	190 Wp
Array global power	Nominal (STC)	**492 kWp**	At operating cond.	443 kWp (50°C)
Array operating characteristics (50°C)	U mpp	601 V	I mpp	737 A
Total area	Module area	**3309 ml**		

Inverter Model **RefuSol 20K**
Manufacturer REFU Elektronik GmbH

Characteristics	Operating Voltage	480-800 V	Unit Nom. Power	19.2 kW AC
Inverter pack	Number of Inverter	24 units	Total Power	460.8 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 velocity = 1m/s.) NOCT 56 °C

Wiring Ohmic Loss	Global array res.	14 mOhm	Loss Fraction	1.5 % at STC
Module Quality Loss			Loss Fraction	0.2 %
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)

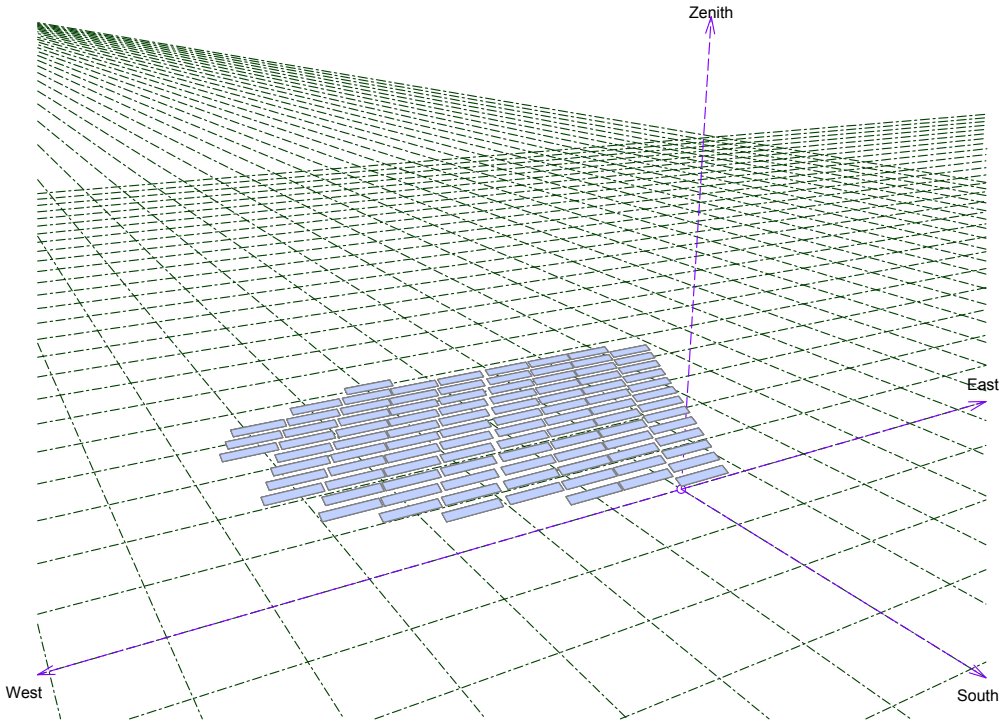
Grid-Connected System: Near shading definition

Project : **Plewen**

Simulation variant : **New simulation variant**

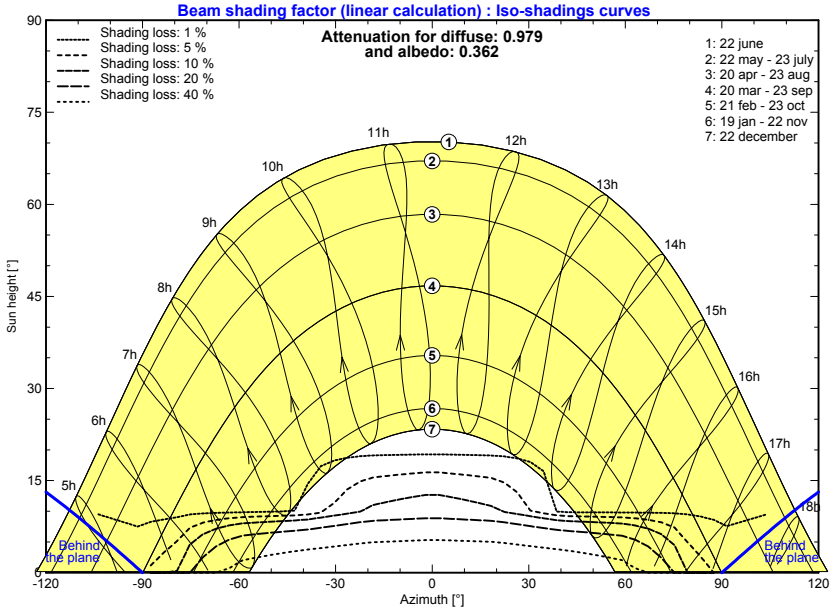
Main system parameters	System type	**Grid-Connected**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	25°	azimuth	0°
PV modules	Model	Chaori 190S-Mono	Pnom	190 Wp
PV Array	Nb. of modules	2592	Pnom total	**492 kWp**
Inverter	Model	RefuSol 20K	Pnom	19 kW ac
Inverter pack	Nb. of units	24.0	Pnom total	**461 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

Plewen: 500 kW Mihalci



Grid-Connected System: Main results

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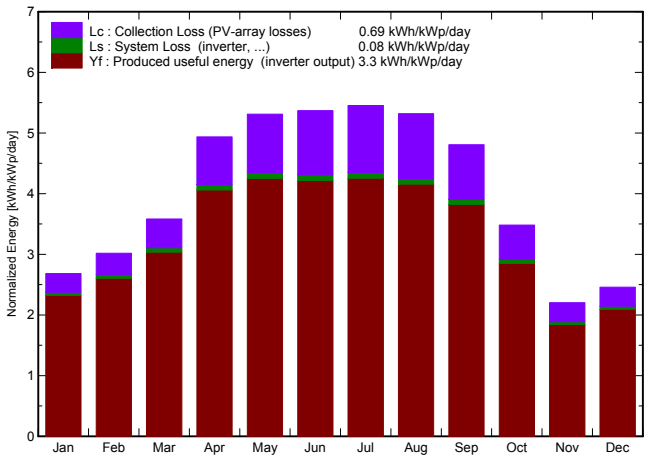
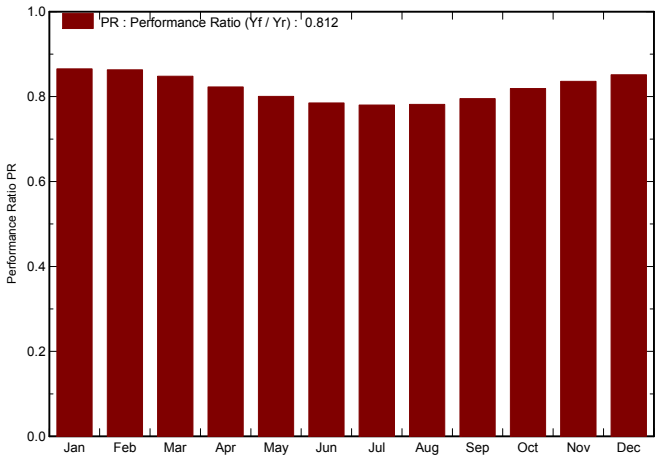
Main simulation results

System Production	**Produced Energy**	**593 MWh/year**	Specific prod.	1203 kWh/kWp/year
	Performance Ratio PR	81.2 %		

Normalized productions (per installed kWp): Nominal power 492 kWp



Performance Ratio PR



New simulation variant

Balances and main results

	GlobHor kWh/ml	T Amb °C	GlobInc kWh/ml	GlobEff kWh/ml	EArray kWh	E_Grid kWh	EffArrR %	EffSysR %
January	54.1	-2.10	83.1	77.6	36245	35431	13.17	12.88
February	64.3	-0.80	84.5	79.9	36755	35925	13.14	12.85
March	95.9	5.30	111.1	105.5	47443	46377	12.91	12.62
April	138.8	10.80	148.1	140.8	61331	59977	12.52	12.24
May	164.3	16.50	164.7	156.5	66389	64924	12.18	11.92
June	164.7	20.80	161.1	152.8	63704	62279	11.95	11.69
July	170.2	23.00	169.1	160.9	66430	64956	11.87	11.61
August	157.5	23.20	164.9	157.1	64871	63474	11.89	11.63
September	125.0	19.80	144.2	137.6	57734	56481	12.10	11.84
October	85.3	13.80	107.9	102.8	44533	43541	12.47	12.19
November	48.9	6.40	66.1	62.3	27907	27216	12.76	12.44
December	46.0	1.30	76.2	71.0	32730	31961	12.97	12.67
Year	1315.0	11.57	1480.9	1404.8	606072	592542	12.37	12.09

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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Loss diagram over the whole year