Grid-Connected System: Simulation parameters

Project : **CESUMAR**

Geographical Site	**Maringá**		**Country**	**Brazil**
Situation	Latitude	23.4°S	Longitude	51.9°W
Time defined as	Legal Time	Time zone UT-3	Altitude	555 m
	Albedo	0.20		
Meteo data :	Maringá, Synthetic Hourly data			

Simulation variant : **Solar 2500**

Simulation date 25/11/14 16h16

Simulation parameters

Collector Plane Orientation	Tilt	18°	Azimuth	-38°
Horizon	Free Horizon			
Near Shadings	Linear shadings			

PV Array Characteristics

PV module Si-poly	Model	**YL240P-29b**		
	Manufacturer	Yingli Green Energy Holding Co. Ltd.		
Number of PV modules	In series	7 modules	In parallel	12 strings
Total number of PV modules	Nb. modules	84	Unit Nom. Power	240 Wp
Array global power	Nominal (STC)	**20.16 kWp**	At operating cond.	17.92 kWp (50°C)
Array operating characteristics (50°C)	U mpp	187 V	I mpp	96 A
Total area	Module area	**137 m²**		

Inverter	Model	**SE-TL3KA**		
	Manufacturer	Solar Energy do Brasil		
Characteristics	Operating Voltage	125-440 V	Unit Nom. Power	3.00 kW AC
Inverter pack	Number of Inverter	6 units	Total Power	18.00 kW AC

PV Array loss factors

Thermal Loss factor	Uc (const)	35.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
=> Nominal Oper. Coll. Temp. (G=800 W/m², Tamb=20°C, Wind=1 m/s.)			NOCT	41 °C
Wiring Ohmic Loss	Global array res.	2.2 mOhm	Loss Fraction	0.1 % at STC
Array Soiling Losses			Loss Fraction	0.5 %
Module Quality Loss			Loss Fraction	0.5 %
Module Mismatch Losses			Loss Fraction	0.5 % at MPP
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Parameter	0.05

User's needs : Unlimited load (grid)

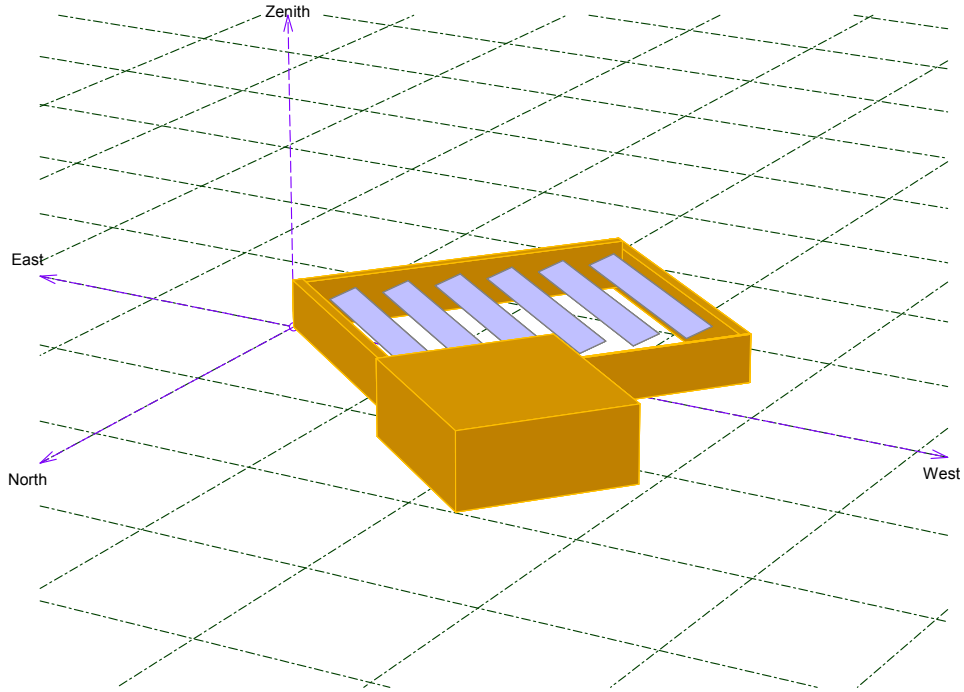
Grid-Connected System: Near shading definition

Project : **CESUMAR**

Simulation variant : **Solar 2500**

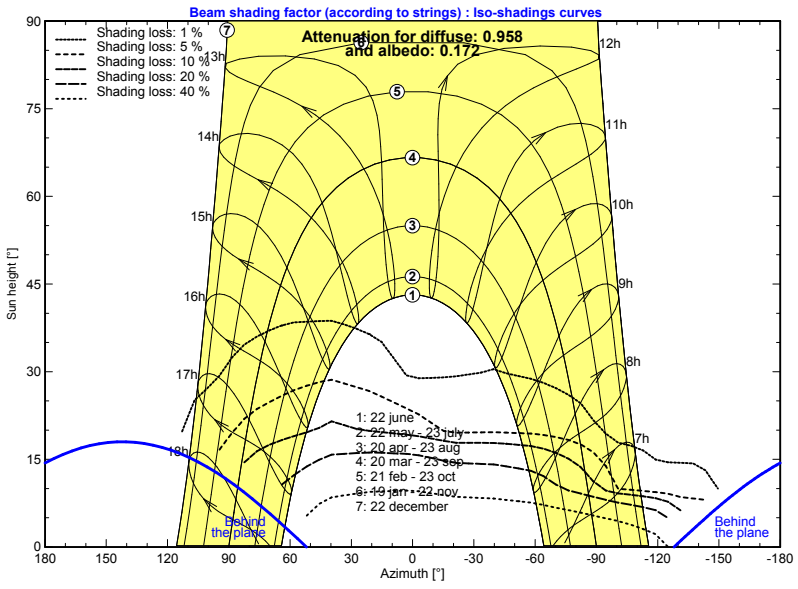
Main system parameters	System type	**Grid-Connected**		
Near Shadings	Linear shadings			
PV Field Orientation	tilt	18°	azimuth	-38°
PV modules	Model	YL240P-29b	Pnom	240 Wp
PV Array	Nb. of modules	84	Pnom total	**20.16 kWp**
Inverter	Model	SE-TL3KA	Pnom	3000 W ac
Inverter pack	Nb. of units	6.0	Pnom total	**18.00 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram

CESUMAR: CESUMAR



Grid-Connected System: Main results

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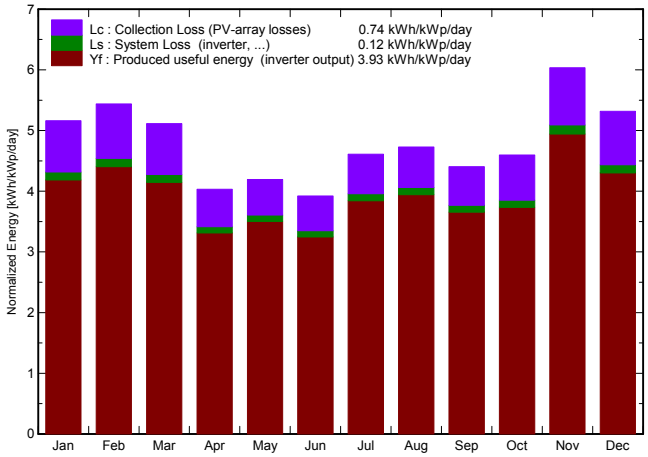
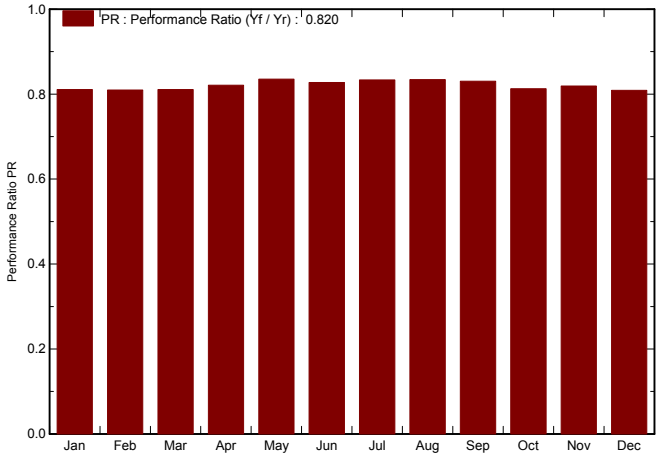
Main simulation results

System Production	**Produced Energy**	**28.94 MWh/year**	Specific prod.	1435 kWh/kWp/year
	Performance Ratio PR	82.0 %		

Normalized productions (per installed kWp): Nominal power 20.16 kWp



Performance Ratio PR



Solar 2500

Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	EffArrR %	EffSysR %
January	166.7	24.70	160.0	151.4	2.698	2.616	12.29	11.91
February	154.6	24.70	152.3	144.1	2.563	2.486	12.27	11.90
March	154.0	24.60	158.5	150.2	2.672	2.591	12.28	11.91
April	113.8	23.10	121.0	114.2	2.066	2.003	12.44	12.06
May	113.1	19.20	130.0	121.6	2.255	2.188	12.64	12.27
June	98.6	18.30	117.7	109.1	2.025	1.963	12.54	12.16
July	119.0	17.90	142.9	132.6	2.474	2.401	12.61	12.24
August	130.9	20.10	146.6	138.1	2.538	2.465	12.62	12.26
September	126.7	21.20	132.1	124.7	2.279	2.211	12.57	12.20
October	143.6	23.00	142.5	133.9	2.408	2.334	12.32	11.94
November	189.4	23.60	181.0	172.1	3.080	2.989	12.40	12.04
December	175.6	24.60	164.8	155.5	2.772	2.688	12.26	11.89
Year	1686.0	22.07	1749.4	1647.5	29.830	28.936	12.43	12.05

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