Grid-Connected System: Simulation parameters

Project : **WBREDA_School Project**

Geographical Site	**Maharaja cowsim bazzar polytechnic institute**		Country	**India**
Situation	Latitude	22.60° N	Longitude	88.37° E
Time defined as	Legal Time	Time zone UT+5.5	Altitude	14 m
	Albedo	0.20		
Meteo data	**Maharaja cowsim bazzar polytechnic institute**	Meteonorm 7.1 (1981-1990) - Synthetic		

Simulation variant : **Maharaja cowsim bazzar polytechnic institute**

Simulation date	12/09/19 20h34
Simulation for the	**first year of operation**

Simulation parameters	System type	**Unlimited sheds**		
Collector Plane Orientation	Tilt	23°	Azimuth	0°
Sheds configuration	Nb. of sheds	3	Unlimited sheds	
	Sheds spacing	3.50 m	Collector width	1.96 m
Inactive band	Top	0.02 m	Bottom	0.02 m
Shading limit angle	Limit profile angle	24.8°	Ground cov. Ratio (GCR)	56.0 %
Shadings electrical effect	Cell size	15.6 cm	Strings in width	1
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	Mutual shadings of sheds	Electrical effect		

PV Arrays Characteristics (2 kinds of array defined)

PV module	Si-poly	Model	**ASP 7 325 - 5BB**	
Custom parameters definition		Manufacturer	Adani Solar(MSPVL)	
Sub-array "Sub-array #1"				
Number of PV modules		In series	16 modules	In parallel 1 strings
Total number of PV modules		Nb. modules	16	Unit Nom. Power 325 Wp
Array global power		Nominal (STC)	**5.20 kWp**	At operating cond. 4680 Wp (50°C)
Array operating characteristics (50°C)		U mpp	532 V	I mpp 8.8 A
Sub-array "Sub-array #2"				
Number of PV modules		In series	15 modules	In parallel 1 strings
Total number of PV modules		Nb. modules	15	Unit Nom. Power 325 Wp
Array global power		Nominal (STC)	**4875 Wp**	At operating cond. 4387 Wp (50°C)
Array operating characteristics (50°C)		U mpp	499 V	I mpp 8.8 A
Total	Arrays global power	Nominal (STC)	**10 kWp**	Total 31 modules
		Module area	**60.3 m²**	Cell area 54.8 m²

Inverter	Model	**SGTU-103**		
Custom parameters definition	Manufacturer	Powerone		
Characteristics	Operating Voltage	250-950 V	Unit Nom. Power	10.0 kWac
			Max. power (=>35°C)	11.0 kWac
Sub-array "Sub-array #1"	Nb. of inverters	1 * MPPT 50 %	Total Power	5.0 kWac
			Pnom ratio	1.04
Sub-array "Sub-array #2"	Nb. of inverters	1 * MPPT 50 %	Total Power	5.0 kWac
			Pnom ratio	0.97
Total	Nb. of inverters	1	Total Power	10 kWac

PV Array loss factors

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Array Soiling Losses			Loss Fraction	3.0 %
Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Array#1	1026 mOhm	Loss Fraction	1.5 % at STC
	Array#2	962 mOhm	Loss Fraction	1.5 % at STC
	Global		Loss Fraction	1.5 % at STC
LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	0.0 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Module average degradation	Year no	1	Loss factor	0.4 %/year
Mismatch due to degradation	Imp RMS dispersion	0.4 %/year	Vmp RMS dispersion	0.4 %/year
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

System loss factors

	Wires: 3x6.0 mm²	103 m	Loss Fraction	2.0 % at STC
Unavailability of the system	3.6 days, 3 periods		Time fraction	1.0 %

User's needs : Unlimited load (grid)

Auxiliaries loss	constant (fans)	0 W	... from Power thresh.	0.0 kW
	Night consumption	2 W		

Grid-Connected System: Main results

Project : **WBREDA_School Project**

Simulation variant : **Maharaja cowsim bazzar polytechnic institute**

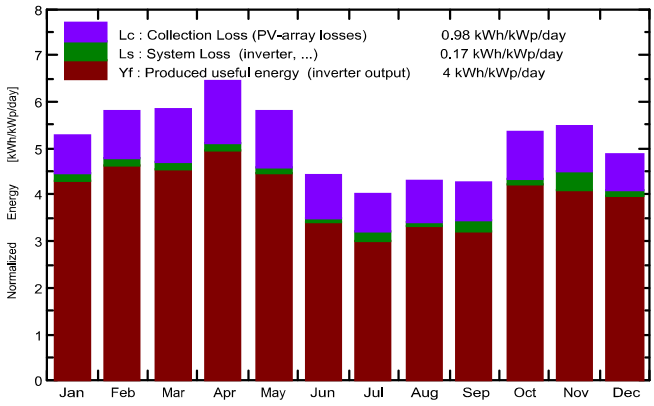
Simulation for the first year of operation

Main system parameters	System type	**Grid-Connected**			
PV Field Orientation	Sheds disposition, tilt	23°		azimuth	0°
PV modules	Model	ASP 7 325 - 5BB		Pnom	325 Wp
PV Array	Nb. of modules	31		Pnom total	**10.07 kWp**
Inverter	Model	SGTU-103		Pnom	10.00 kW ac
User's needs	Unlimited load (grid)				

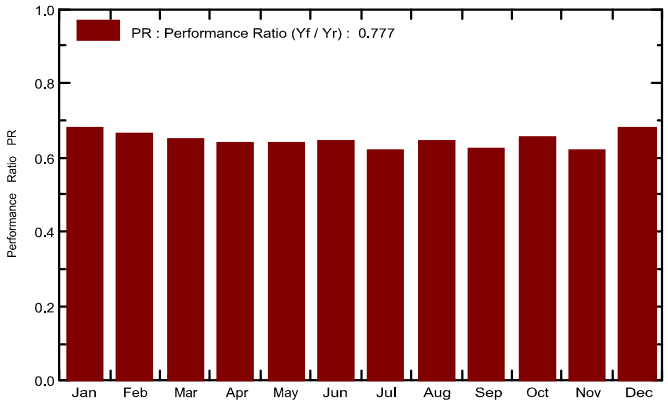
Main simulation results

System Production	**Produced Energy**	**14.72 MWh/year**	Specific prod.	1461 kWh/kWp/year
	Performance Ratio PR	77.67 %		

Normalized productions (per installed kWp): Nominal power 10.07 kWp



Performance Ratio PR



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Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR
January	128.9	55.27	17.71	164.0	152.4	1.388	1.346	0.815
February	136.8	59.09	22.10	162.2	150.8	1.347	1.305	0.799
March	167.3	82.39	27.02	181.2	167.6	1.468	1.423	0.780
April	191.9	84.14	29.78	192.9	178.5	1.541	1.493	0.768
May	192.2	96.75	31.11	180.3	165.9	1.434	1.390	0.765
June	144.2	92.00	30.18	132.2	120.6	1.060	1.027	0.771
July	134.5	85.44	29.51	125.0	114.0	1.004	0.939	0.745
August	138.0	90.64	29.21	133.0	121.4	1.073	1.039	0.775
September	125.3	82.69	27.98	128.1	117.3	1.039	0.965	0.748
October	146.3	71.07	27.01	166.1	153.8	1.355	1.313	0.785
November	131.3	51.74	23.29	164.6	153.3	1.363	1.235	0.745
December	117.4	51.36	18.88	151.6	141.0	1.284	1.244	0.815
Year	1754.0	902.59	26.16	1881.1	1736.6	15.357	14.720	0.777

Legends:

GlobHor	Horizontal global irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse 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	PR	Performance Ratio

Grid-Connected System: Loss diagram

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Simulation for the first year of operation

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Inverter	Model	SGTU-103	Pnom	10.00 kW ac
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Loss diagram over the whole year