Simulação sem nenhum tipo de perda

Grid-Connected System: Simulation parameters

Project : **Projeto IF**

Geographical Site	**Masvingo**		Country	**Zimbabwe**
Situation	Latitude	20.1°S	Longitude	30.9°E
Time defined as	Legal Time	Time zone UT+2	Altitude	1097 m
	Albedo	0.20		
Meteo data:	**Masvingo**	MeteoNorm 7.1 station - Synthetic		

Simulation variant : **New simulation variant**

Simulation date 15/01/18 00h08

Simulation parameters

Collector Plane Orientation	Tilt	22°	Azimuth	0°
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm
Horizon	Free Horizon			
Near Shadings	No Shadings			

PV Array Characteristics

PV module	Si-poly	Model	**CS6P - 270P**	
Custom parameters definition		Manufacturer	Canadian Solar Inc.	
Number of PV modules		In series	18 modules	In parallel 2 strings
Total number of PV modules		Nb. modules	36	Unit Nom. Power 270 Wp
Array global power		Nominal (STC)	**9.72 kWp**	At operating cond. 8.65 kWp (50°C)
Array operating characteristics (50°C)		U mpp	490 V	I mpp 18 A
Total area		Module area	**57.9 m²**	Cell area 52.6 m²

Inverter		Model	**Primo 8.2-1**	
Custom parameters definition		Manufacturer	Fronius International	
Characteristics		Operating Voltage	80-800 V	Unit Nom. Power 8.20 kWac
Inverter pack		Nb. of inverters	1 units	Total Power 8.2 kWac

PV Array loss factors

Thermal Loss factor	Uc (const)	25.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	474 mOhm	Loss Fraction	1.5 % at STC
Module Quality Loss			Loss Fraction	-0.5 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

User's needs : Unlimited load (grid)

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Grid-Connected System: Main results

Project : **Projeto IF**

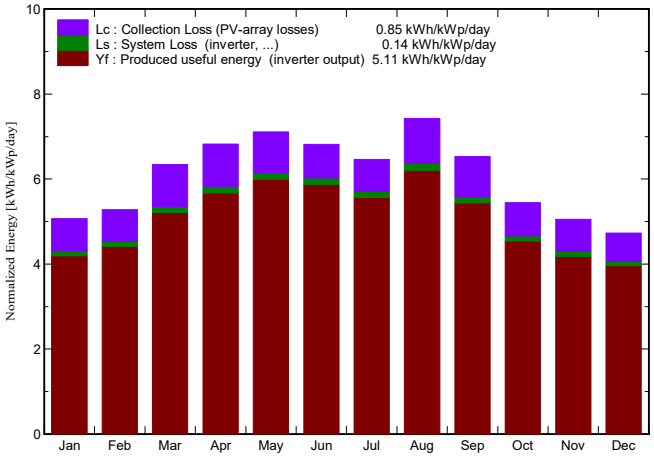
Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	tilt	22°	azimuth	0°
PV modules	Model	CS6P - 270P	Pnom	270 Wp
PV Array	Nb. of modules	36	Pnom total	**9.72 kWp**
Inverter	Model	Primo 8.2-1	Pnom	8.20 kW ac
User's needs	Unlimited load (grid)			

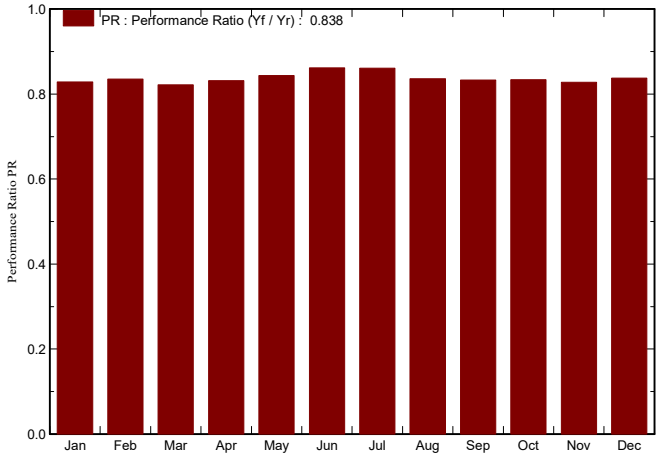
Main simulation results

System Production	**Produced Energy**	**18.12 MWh/year**	Specific prod.	1865 kWh/kWp/year
	Performance Ratio PR	83.8 %		
Investment	Global incl. taxes	33530 Real	Specific	3.45 Real/Wp
Yearly cost	Annuities (Loan 5.0%, 20 years)	2691 Real/yr	Running Costs	0 Real/yr
Energy cost		**0.15 Real/kWh**		

Normalized productions (per installed kWp): Nominal power 9.72 kWp



Performance Ratio PR



New simulation variant

Balances and main results

	GlobHor	T Amb	GlobInc	GlobEff	EArray	E_Grid	EffArrR	EffSysR
	kWh/m²	°C	kWh/m²	kWh/m²	MWh	MWh	%	%
January	172.0	23.87	157.1	151.4	1.299	1.265	14.28	13.90
February	153.9	23.15	147.9	142.8	1.233	1.201	14.40	14.02
March	187.3	22.26	196.6	191.3	1.614	1.570	14.18	13.80
April	177.5	20.25	204.7	200.2	1.699	1.654	14.34	13.96
May	172.7	17.68	220.4	215.5	1.855	1.807	14.54	14.16
June	152.3	15.52	204.5	199.9	1.757	1.713	14.83	14.46
July	154.3	15.17	200.3	195.7	1.720	1.677	14.83	14.45
August	190.2	18.05	230.2	225.4	1.921	1.870	14.42	14.03
September	180.2	20.92	195.8	190.8	1.629	1.586	14.36	13.99
October	169.7	23.48	168.9	163.5	1.405	1.369	14.36	13.99
November	164.6	23.30	151.5	146.2	1.254	1.220	14.29	13.90
December	162.3	23.33	146.6	140.9	1.225	1.193	14.44	14.06
Year	2037.0	20.57	2224.5	2163.5	18.612	18.124	14.45	14.07

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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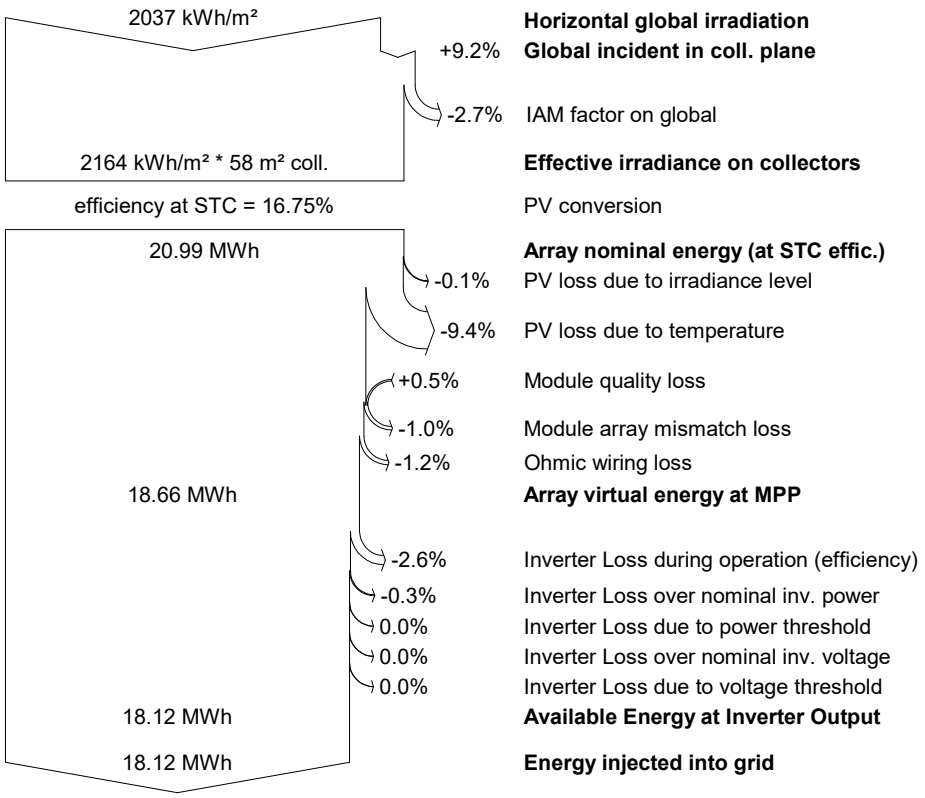
Grid-Connected System: Loss diagram

Project : **Projeto IF**

Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	tilt	22°	azimuth	0°
PV modules	Model	CS6P - 270P	Pnom	270 Wp
PV Array	Nb. of modules	36	Pnom total	**9.72 kWp**
Inverter	Model	Primo 8.2-1	Pnom	8.20 kW ac
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Simulação sem nenhum tipo de perda

Grid-Connected System: P50 - P90 evaluation

Project : **Projeto IF**

Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	tilt	22°	azimuth	0°
PV modules	Model	CS6P - 270P	Pnom	270 Wp
PV Array	Nb. of modules	36	Pnom total	**9.72 kWp**
Inverter	Model	Primo 8.2-1	Pnom	8.20 kW ac
User's needs	Unlimited load (grid)			

Evaluation of the Production probability forecast

The probability distribution of the system production forecast for different years is mainly dependent on the meteo data used for the simulation, and depends on the following choices:

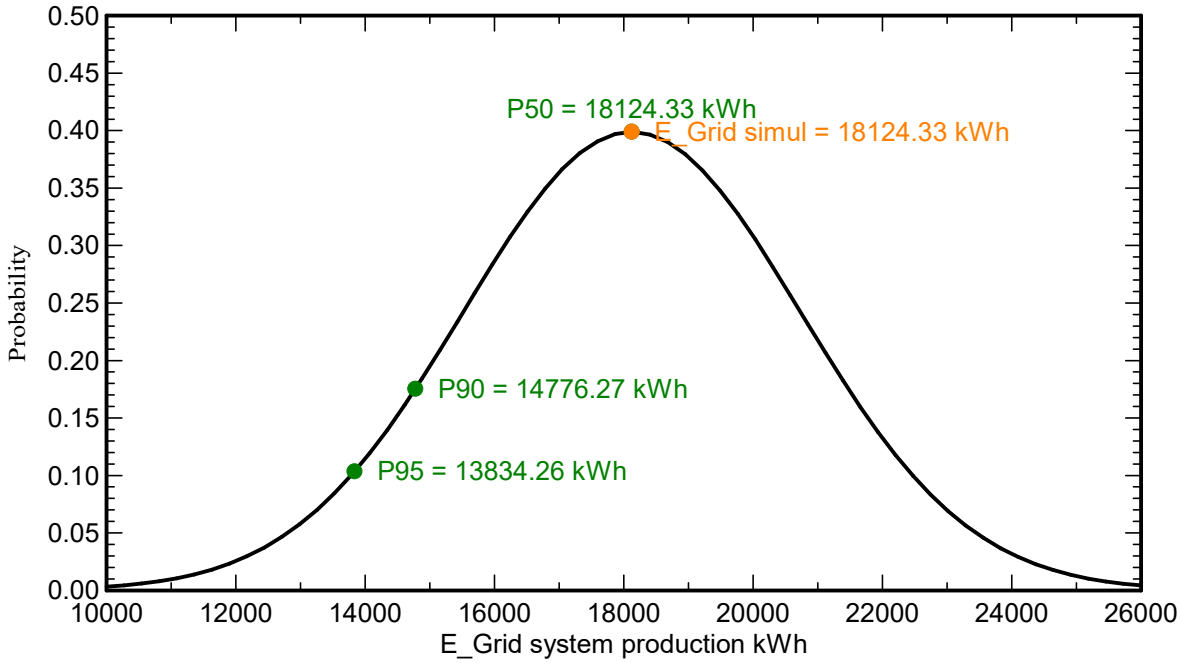
Meteo data source		MeteoNorm 7.1 station		
Meteo data	Kind	Not defined	Year	1995
Specified Deviation	Year deviation from aver.	3 %		
Year-to-year variability	Variance	14.2 %		

The probability distribution variance is also depending on some system parameters uncertainties

Specified Deviation	PV module modelling/parameters	2.0 %	
	Inverter efficiency uncertainty	0.5 %	
	Soiling and mismatch uncertainties	1.0 %	
	Degradation uncertainty	1.0 %	
Global variability (meteo + system)	Variance	14.4 %	(quadratic sum)

Annual production probability		
	Variability	**2.61 MWh**
	P50	**18.12 MWh**
	P90	**14.78 MWh**
	P95	**13.83 MWh**

Probability distribution



Simulação sem nenhum tipo de perda

Grid-Connected System: Economic evaluation

Project : **Projeto IF**

Simulation variant : **New simulation variant**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	tilt	22°	azimuth	0°
PV modules	Model	CS6P - 270P	Pnom	270 Wp
PV Array	Nb. of modules	36	Pnom total	**9.72 kWp**
Inverter	Model	Primo 8.2-1	Pnom	8.20 kW ac
User's needs	Unlimited load (grid)			

Investment

PV modules (Pnom = 270 Wp)	36 units	580 Real / unit	20880	Real
Supports / Integration		0 Real / module	0	Real
Inverter (Pnom = 8.2 kW ac)	1 units	12650 Real / unit	12650	Real
Settings, wiring, ...			0	Real
Substitution underworth			0	Real
Gross investment (without taxes)			**33530**	**Real**

Financing

Gross investment (without taxes)		33530	Real
Taxes on investment (VAT)	Rate 0.0 %	0	Real
Gross investment (including VAT)		33530	Real
Subsidies		0	Real
Net investment (all taxes included)		**33530**	**Real**
Annuities	(Loan 5.0 % over 20 years)	2691	Real/year
Annual running costs: maintenance, insurances ...		0	Real/year
Total yearly cost		**2691**	**Real/year**

Energy cost

Produced Energy	18.1	MWh / year
Cost of produced energy	0.15	Real / kWh