Version 7.4.8

PVsyst - Simulation report

Standalone system

Project: Solar System Design for Household Load.

Variant: New simulation variant

Standalone system with batteries

System power: 3780 Wp

Gazi Town - Afghanistan

Author

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Project summary

Geographical Site
Gazi Town
Afghanistan

Situation

Latitude	34.68 °N
Longitude	70.20 °E
Altitude	812 m
Time zone	UTC+4.5

Project settings
Albedo 0.20

Weather data
Gazi Town
NASA-SSE satellite data 1983-2005 - Synthetic

System summary

Standalone system

Standalone system with batteries

PV Field Orientation
Fixed plane
Tilt/Azimuth 53 / 0 °

User's needs
Daily household consumers
Constant over the year
Average 15.8 kWh/Day

System information

PV Array

Nb. of modules	12 units
Pnom total	3780 Wp

Battery pack

Technology	Lead-acid, vented, tubular
Nb. of units	140 units
Voltage	120 V
Capacity	588 Ah

Results summary

Useful energy from solar	5757.87 kWh/year	Specific production	1523 kWh/kWp/year	Perf. Ratio PR	72.53 %
Missing Energy	21.54 kWh/year	Available solar energy	6800.31 kWh/year	Solar Fraction SF	99.63 %
Excess (unused)	616.87 kWh/year				

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General parameters

Standalone system | **Standalone system with batteries**

PV Field Orientation

Orientation		Sheds configuration		Models used	
Fixed plane		No 3D scene defined		Transposition	Perez
Tilt/Azimuth	53 / 0 °			Diffuse	Perez, Meteonorm
				Circumsolar	separate

User's needs

Daily household consumers
Constant over the year
Average 15.8 kWh/Day

PV Array Characteristics

PV module

Manufacturer	Generic
Model	PM318B01_315
(Custom parameters definition)	
Unit Nom. Power	315 Wp
Number of PV modules	12 units
Nominal (STC)	3780 Wp
Modules	4 string x 3 In series
At operating cond. (50°C)	
Pmpp	3425 Wp
U mpp	145 V
I mpp	24 A

Battery

Manufacturer	Generic
Model	2 LT 12N - L2
Technology	Lead-acid, vented, tubular
Nb. of units	14 in parallel x 10 in series
Discharging min. SOC	20.0 %
Stored energy	58.0 kWh
Battery Pack Characteristics	
Voltage	120 V
Nominal Capacity	588 Ah (C10)
Temperature	Fixed 20 °C

Controller

Universal controller	
Technology	MPPT converter
Temp coeff.	-5.0 mV/°C/Elem.
Converter	
Maxi and EURO efficiencies	97.0 / 95.0 %

Battery Management control

Threshold commands as	SOC calculation
Charging	SOC = 0.92 / 0.75
approx.	136.4 / 126.9 V
Discharging	SOC = 0.20 / 0.45
approx.	119.0 / 123.7 V

Total PV power

Nominal (STC)	3.78 kWp
Total	12 modules
Module area	19.6 m²
Cell area	17.5 m²

Array losses

Thermal Loss factor

Module temperature according to irradiance
Uc (const) 20.0 W/m²K
Uv (wind) 0.0 W/m²K/m/s

DC wiring losses

Global array res. 104 mΩ
Loss Fraction 1.5 % at STC

Serie Diode Loss

Voltage drop 0.7 V
Loss Fraction 0.4 % at STC

Module Quality Loss

Loss Fraction -0.8 %

Module mismatch losses

Loss Fraction 1.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

IAM loss factor

ASHRAE Param.: IAM = 1 - bo (1/cosi -1)
bo Param. 0.05

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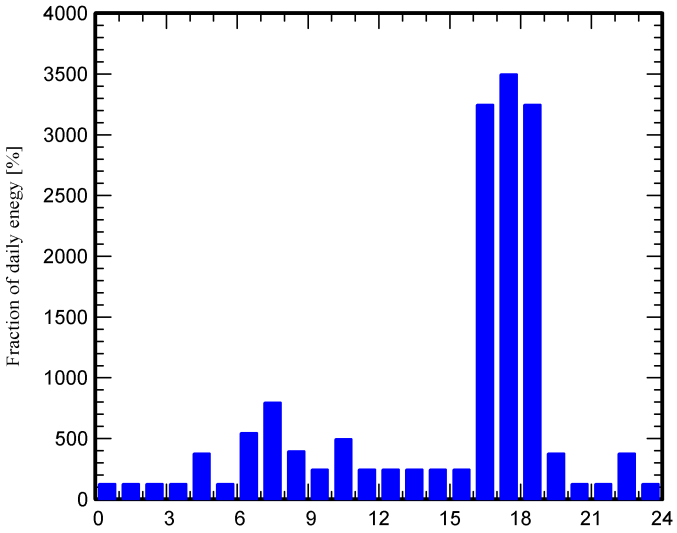
Detailed User's needs

Daily household consumers, Constant over the year, average = 15.8 kWh/day

Annual values

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	12/lamp	13.0	1560
TV / PC / Mobile	2	150/app	2.5	750
Fridge / Deep-freeze	1		24	3000
Dish- and Cloth-washer	1		3	9000
Total	1	500 tot	3.0	1500
Stand-by consumers			24.0	24
Total daily energy				15834

Hourly distribution



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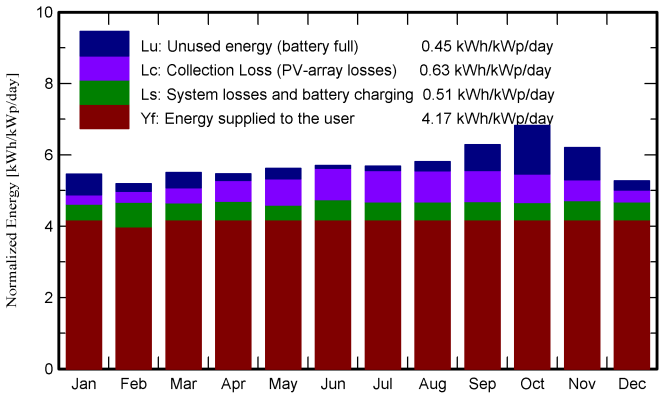
Main results

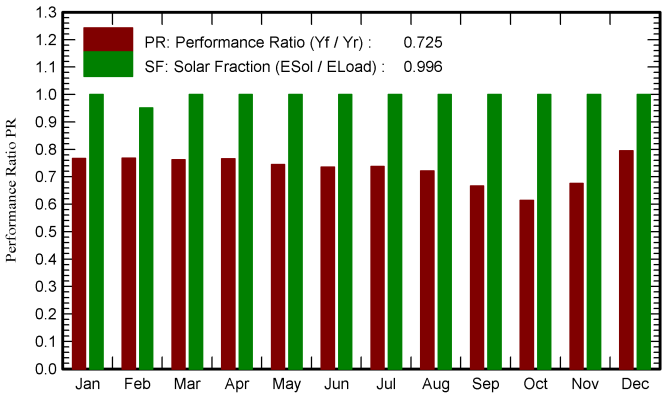
System Production

Useful energy from solar	5757.87 kWh/year	Perf. Ratio PR	72.53 %
Available solar energy	6800.31 kWh/year	Solar Fraction SF	99.63 %
Excess (unused)	616.87 kWh/year		
Loss of Load		**Battery aging (State of Wear)**	
Time Fraction	0.0 %	Cycles SOW	94.9 %
Missing Energy	21.54 kWh/year	Static SOW	90.0 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor kWh/m²	GlobEff kWh/m²	E_Avail kWh	EUnused kWh	E_Miss kWh	E_User kWh	E_Load kWh	SolFrac ratio
January	93.6	166.5	587.3	67.6	0.00	490.9	490.9	1.000
February	102.8	142.7	496.0	21.8	21.54	421.8	443.4	0.951
March	144.8	166.2	572.0	48.8	0.00	490.9	490.9	1.000
April	172.8	158.8	530.0	20.3	0.00	475.0	475.0	1.000
May	218.2	167.4	548.8	34.3	0.00	490.9	490.9	1.000
June	236.7	163.3	523.3	8.2	0.00	475.0	475.0	1.000
July	232.2	168.9	538.1	13.4	0.00	490.9	490.9	1.000
August	202.4	173.7	555.4	30.1	0.00	490.9	490.9	1.000
September	171.6	183.3	593.0	81.9	0.00	475.0	475.0	1.000
October	149.4	207.2	683.6	158.8	0.00	490.9	490.9	1.000
November	108.3	183.3	616.0	101.9	0.00	475.0	475.0	1.000
December	87.4	161.1	556.8	29.6	0.00	490.9	490.9	1.000
Year	1920.2	2042.3	6800.3	616.9	21.54	5757.9	5779.4	0.996

Legends

GlobHor	Global horizontal irradiation
GlobEff	Effective Global, corr. for IAM and shadings
E_Avail	Available Solar Energy
EUnused	Unused energy (battery full)
E_Miss	Missing energy
E_User	Energy supplied to the user
E_Load	Energy need of the user (Load)
SolFrac	Solar fraction (EUsed / ELoad)

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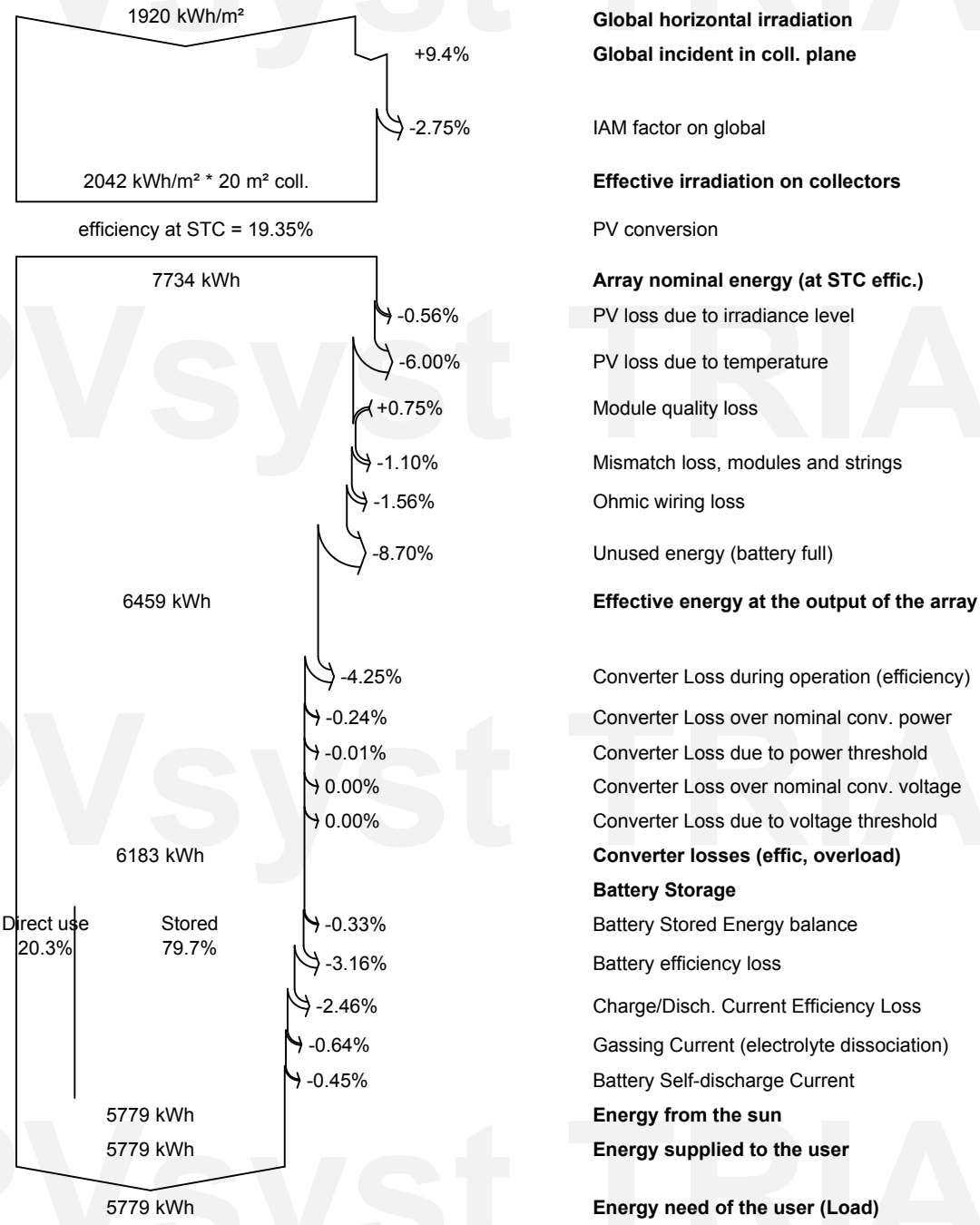
Loss diagram



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Predef. graphs

Daily Input/Output diagram