PVSYST
PHOTOVOLTAIC SOFTWARE

PVsyst - Simulation report

Standalone system

Project: Home Solar project

Variant: New simulation variant

Standalone system with batteries

System power: 68.6 kWp

Sithmara - India

Author

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Project summary

Geographical Site
Sithmara
India

Situation

Latitude	26.52 °(N)
Longitude	79.84 °(E)
Altitude	133 m
Time zone	UTC+5.5

Project settings

Albedo	0.20

Weather data
Sithmara
Meteonorm 8.2 (1996-2015), Sat=100% - Synthetic

System summary

Standalone system

Standalone system with batteries

Orientation #1
Seasonal tilt adjustment

Azimuth	0 °
Summer Tilt	9.1 °
Winter	40.2 °
Nov.-Dec.-Jan.-Feb.	

User's needs
Daily household consumers
Seasonal modulation
Average 216 kWh/Day

System information

PV Array

Nb. of modules	132 units
Pnom total	68.6 kWp

Battery pack

Technology	Lithium-ion, LFP
Nb. of units	7 units
Voltage	205 V
Capacity	1880 Ah

Results summary

Useful energy from solar	75833 kWh/year	Specific production	1105 kWh/kWp/year	Perf. Ratio PR	64.10 %
Missing Energy	2930 kWh/year	Available solar energy	96013 kWh/year	Solar Fraction SF	96.28 %
Excess (unused)	16829 kWh/year				

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General parameters

Standalone system

Orientation #1
Seasonal tilt adjustment

Azimuth	0 °
Summer Tilt	9.1 °
Winter	40.2 °
Nov.-Dec.-Jan.-Feb.	

Standalone system with batteries

Models used

Transposition	Perez
Diffuse	Perez, Meteonorm
Circumsolar	separate

User's needs
Daily household consumers
Seasonal modulation
Average 216 kWh/Day

PV Array Characteristics

PV module

Manufacturer	Generic
Model	ASB-M10-144-520-Bifacial
(Original PVsyst database)	
Unit Nom. Power	520 Wp
Number of PV modules	132 units
Nominal (STC)	68.6 kWp
Modules	22 string x 6 In series
At operating cond. (50°C)	
Pmpp	63.3 kWp
U mpp	224 V
I mpp	283 A

Battery

Manufacturer	Generic
Model	sonnenBatterie hybrid 10p+ /55
Technology	Lithium-ion, LFP
Nb. of units	7 in parallel
Discharging min. SOC	10.0 %
Stored energy	346.4 kWh
Battery Pack Characteristics	
Voltage	205 V
Nominal Capacity	1880 Ah (C10)
Temperature	External ambient temperature

Total PV power

Nominal (STC)	69 kWp
Total	132 modules
Module area	339 m²
Cell area	315 m²

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 = 0.96 / 0.80
Discharging	SOC = 0.10 / 0.35

Array losses

Array Soiling Losses
Loss Fraction 2.0 %

Thermal Loss factor
Module temperature according to irradiance

Uc (const)	29.0 W/m²K
Uv (wind)	0.0 W/m²K/m/s

DC wiring losses

Global array res.	13 mΩ
Loss Fraction	1.50 % at STC

Serie Diode Loss

Voltage drop	0.7 V
Loss Fraction	0.3 % at STC

LID - Light Induced Degradation
Loss Fraction 2.0 %

Module Quality Loss
Loss Fraction -0.38 %

Module mismatch losses
Loss Fraction 2.00 % at MPP

Strings Mismatch loss
Loss Fraction 0.15 %

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Array losses

IAM loss factor

Incidence effect (IAM): Fresnel, AR coating, n(glass)=1.526, n(AR)=1.290

0°	30°	50°	60°	70°	75°	80°	85°	90°
1.000	0.999	0.987	0.963	0.892	0.814	0.679	0.438	0.000

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Detailed User's needs

Daily household consumers, Seasonal modulation, average = 216 kWh/day

Summer (Jun-Aug)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	6.0	600
TV / PC / Mobile	2	100/app	2.0	400
Domestic appliances	1	300/app	2.0	600
Fridge / Deep-freeze	1		24	200000
Dish- and Cloth-washer	1		2	1000
fans	9	70 tot	15.0	9450
ac	1	1000 tot	14.0	14000
Stand-by consumers			24.0	24
Total daily energy				226074

Autumn (Sep-Nov)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	8.0	800
TV / PC / Mobile	2	100/app	2.0	400
Domestic appliances	1	300/app	2.0	600
Fridge / Deep-freeze	1		24	200000
Dish- and Cloth-washer	1		2	1000
fans	9	70 tot	11.0	6930
AC	1	1000 tot	3.0	3000
Stand-by consumers			24.0	24
Total daily energy				212754

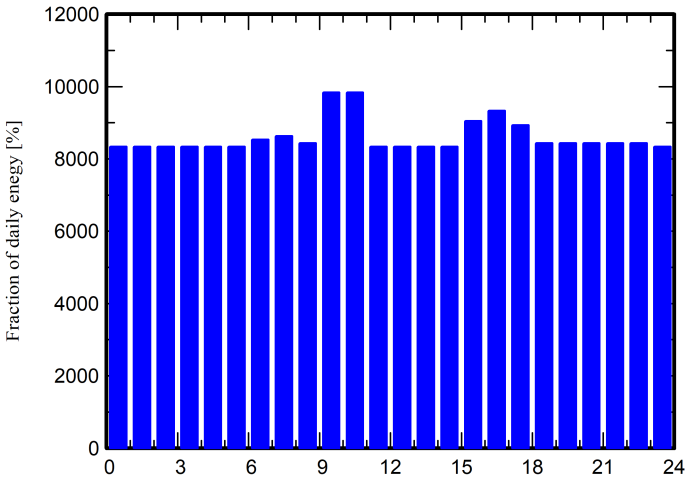
Winter (Dec-Feb)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	8.0	800
TV / PC / Mobile	2	100/app	2.5	500
Domestic appliances	1	400/app	2.0	800
Fridge / Deep-freeze	1		24	200000
Dish- and Cloth-washer	1		2	1000
fan	9	70 tot	0.5	315
geyser	1	1500 tot	2.0	3000
Stand-by consumers			24.0	24
Total daily energy				206439

Spring (Mar-May)

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	7.0	700
TV / PC / Mobile	2	100/app	2.0	400
Domestic appliances	1	300/app	2.0	600
Fridge / Deep-freeze	1		24	200000
Dish- and Cloth-washer	1		2	1000
fan	9	70 tot	11.0	6930
ac	1	1000 tot	8.0	8000
Stand-by consumers			24.0	24
Total daily energy				217654

Hourly distribution



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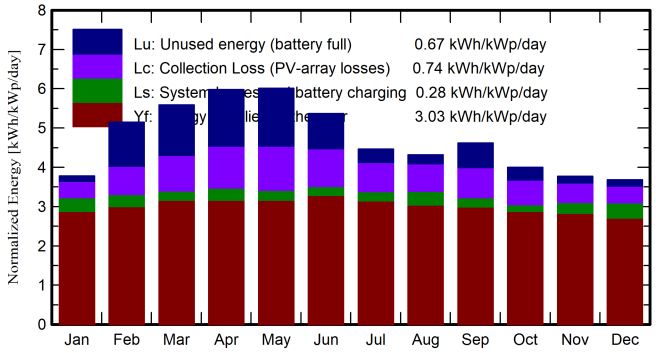
Main results

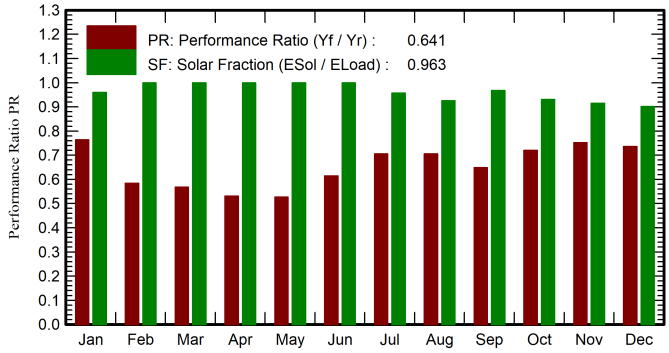
System Production

Useful energy from solar	75833 kWh/year	Perf. Ratio PR	64.10 %
Available solar energy	96013 kWh/year	Solar Fraction SF	96.28 %
Excess (unused)	16829 kWh/year		
Loss of Load		**Battery ageing (State of Wear)**	
Time Fraction	3.8 %	Cycles SOW	97.2 %
Missing Energy	2930 kWh/year	Static SOW	86.9 %
		Battery lifetime	7.6 years

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	89.8	113.2	6860	284	259.7	6140	6400	0.959
February	115.6	139.2	8261	2148	0.0	5780	5780	1.000
March	163.3	166.0	9670	2712	0.0	6747	6747	1.000
April	175.1	172.0	9801	2939	0.0	6530	6530	1.000
May	187.0	178.8	10112	3119	0.0	6747	6747	1.000
June	163.0	154.2	8741	1823	0.0	6782	6782	1.000
July	139.8	131.8	7580	704	305.9	6702	7008	0.956
August	133.0	127.8	7338	463	522.7	6486	7008	0.925
September	133.8	132.5	7633	1283	208.1	6174	6383	0.967
October	117.3	118.6	6901	691	458.0	6137	6595	0.931
November	92.3	109.1	6471	337	545.4	5837	6383	0.915
December	85.4	110.3	6646	326	630.6	5769	6400	0.901
Year	1595.4	1653.4	96013	16829	2930.3	75833	78763	0.963

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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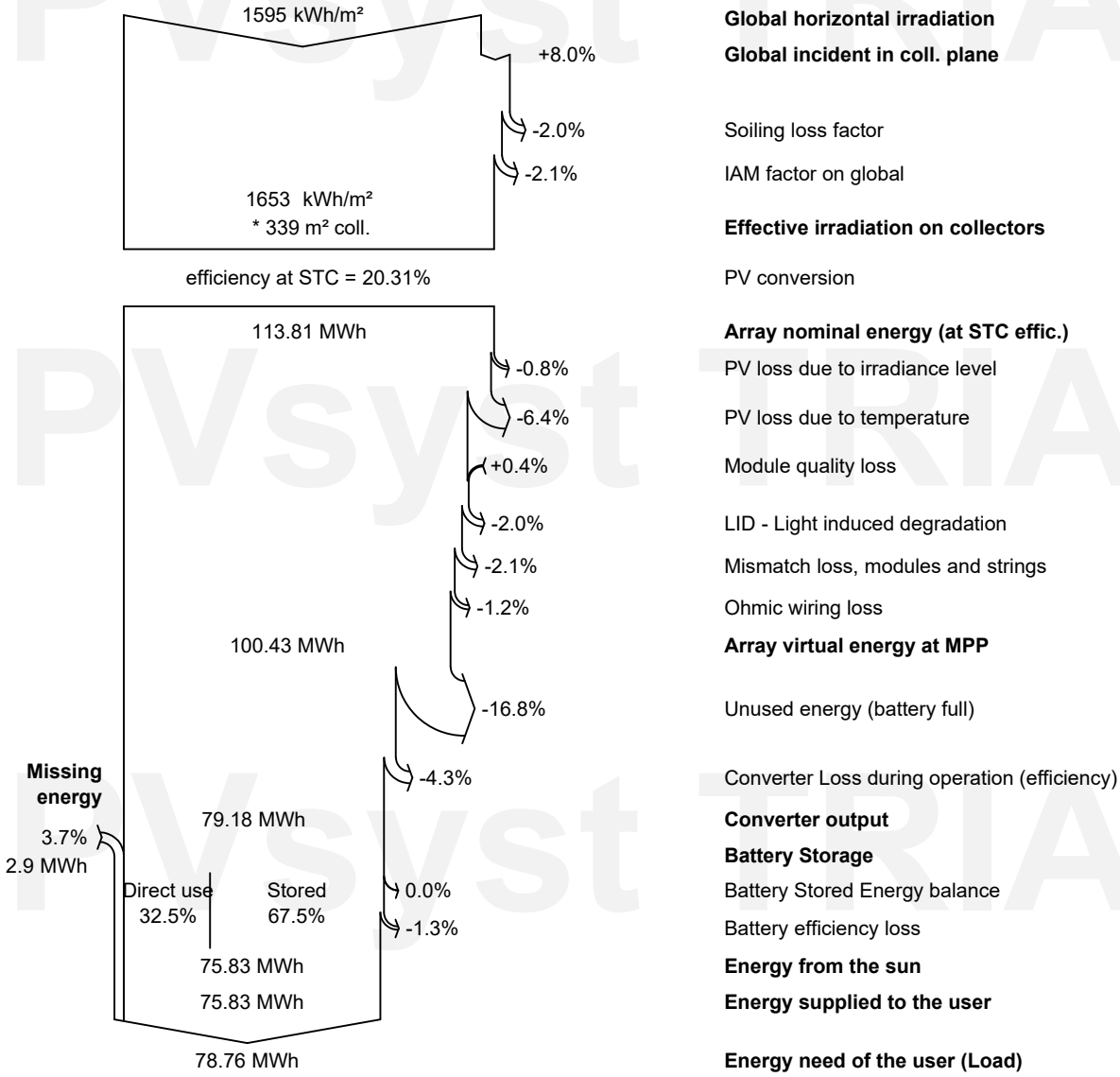
Loss diagram



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Predef. graphs

Daily Input/Output diagram