

Stand Alone System: Simulation parameters

Project : **LOW off grid cottage**

Geographical Site **Ottawa** **Country** **Canada**

Situation Latitude 45.2°N Longitude 76.0°W

Time defined as Legal Time Time zone UT-5 Altitude 100 m

Monthly albedo values

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Albedo	0.80	0.80	0.40	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.60

Meteo data : Ottawa, Synthetic Hourly data

Simulation variant : **Pole mount 12 module**

Simulation date 13/03/13 14h55

Simulation parameters

Coll. plane: Seasonal tilt adjustment Azimuth 0° Winter season O-N-D-J-F-M
Summer Tilt 25° Winter Tilt 60°

Models used Transposition Perez Diffuse Measured

PV Array Characteristics

PV module Si-poly Model **SW 235 Poly**
Manufacturer SolarWorld
Number of PV modules In series 3 modules In parallel 4 strings
Total number of PV modules Nb. modules 12 Unit Nom. Power 235 Wp
Array global power Nominal (STC) **2820 Wp** At operating cond. 2488 Wp (50°C)
Array operating characteristics (50°C) U mpp 81 V I mp p 31 A
Total area Module area **20.1 m²**

PV Array loss factors

Thermal Loss factor U_c (const) 20.0 W/m²K U_v (wind) 0.0 W/m²K / m/s
=> Nominal Oper. Coll. Temp. (G=800 W/m², T_{amb}=20°C, Wind=1 m/s.) NOCT 56 °C
Wiring Ohmic Loss Global array res. 44 mOhm Loss Fraction 1.5 % at STC
Array Soiling Losses Loss Fraction 5.0 %
Module Quality Loss Loss Fraction 1.5 %
Module Mismatch Losses Loss Fraction 2.0 % at MPP
Incidence effect, ASHRAE parametrization IAM = 1 - bo (1/cos i - 1) bo Parameter 0.05

System Parameter System type **Stand Alone System**

Battery Model **PVX-2580L**

Battery Pack Characteristics Manufacturer Concorde
Voltage 48 V Nominal Capacity 472 Ah
Nb. of units 4 in series x 2 in parallel

Regulator Temperature Fixed (20°C)
Model FLEXmax 80 - 48V
Manufacturer Outback

Converter Technology MPPT converter Temp coeff. -5.0 mV/°C/elem.

Battery Management Thresholds Maxi and EURO efficiencies 97.5/96.3 %
Charging 54.7/52.3 V Discharging 47.0/50.4 V
Back-Up Genset Command 47.3/51.6 V

User's needs : Daily household consumers Constant over the year

Stand Alone System: Detailed User's needs

Project : **LOW off grid cottage**
Simulation variant : **Pole mount 12 module**

Main system parameters	System type	Stand alone			
PV Field Orientation	Seasonal tilt: summer/winter	25° / 60°	azimuth	0°	
PV Array	Nb. of modules	12	Pnom total	2820 Wp	
Battery	Model	PVX-2580L	Technology	vented, vehicle starting	
battery Pack	Nb. of units	8	Voltage / Capacity	48 V / 472 Ah	
User's needs	Daily household consumers	Constant over the year	global	2427 kWh/year	

Daily household consumers, Constant over the year, average = 6.6 kWh/day

Annual values

Use 2 days a week	Number	Power	Use	Energy
Other uses	1	130 W tot	24 h/day	3120 Wh/day
Stand-by consumers		240 W tot	24 h/day, 7days/7	5760 Wh/day
Total daily energy				8880 Wh/day

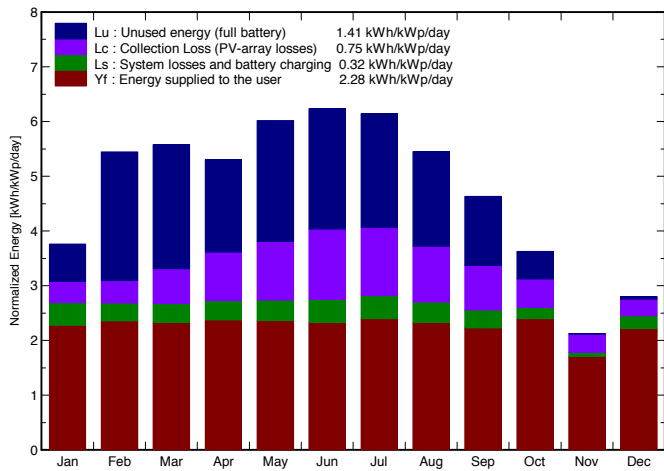
Stand Alone System: Main results

Project : LOW off grid cottage
Simulation variant : Pole mount 12 module

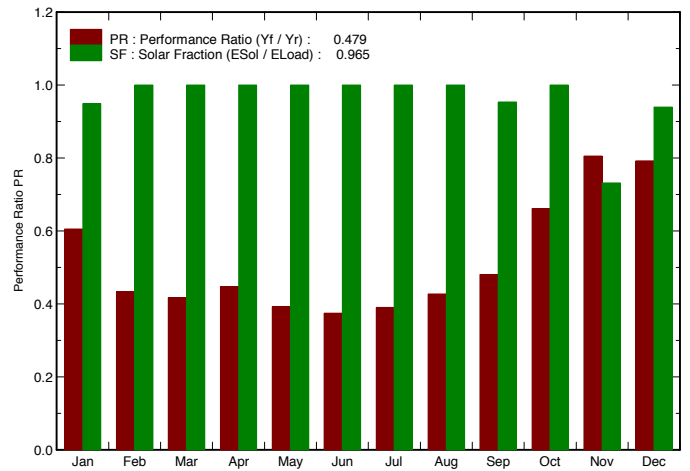
Main system parameters		System type	Stand alone
PV Field Orientation	Seasonal tilt: summer/winter	25° / 60°	azimuth 0°
PV Array	Nb. of modules	12	Pnom total 2820 Wp
Battery	Model	PVX-2580L	Technology vented, vehicle starting
battery Pack	Nb. of units	8	Voltage / Capacity 48 V / 472 Ah
User's needs	Daily household consumers	Constant over the year	global 2427 kWh/year

Main simulation results																	
System Production	<table style="width: 100%; border: none;"> <tr> <td style="text-align: right;">Available Energy</td> <td>3979 kWh/year</td> <td style="text-align: right;">Specific prod.</td> <td>1411 kWh/kWp/year</td> </tr> <tr> <td style="text-align: right;">Used Energy</td> <td>2345 kWh/year</td> <td style="text-align: right;">Excess (unused)</td> <td>1453 kWh/year</td> </tr> <tr> <td style="text-align: right;">Performance Ratio PR</td> <td>47.9 %</td> <td style="text-align: right;">Solar Fraction SF</td> <td>96.5 %</td> </tr> <tr> <td>Loss of Load</td> <td>Time Fraction 3.3 %</td> <td style="text-align: right;">Missing Energy</td> <td>85 kWh/year</td> </tr> </table>	Available Energy	3979 kWh/year	Specific prod.	1411 kWh/kWp/year	Used Energy	2345 kWh/year	Excess (unused)	1453 kWh/year	Performance Ratio PR	47.9 %	Solar Fraction SF	96.5 %	Loss of Load	Time Fraction 3.3 %	Missing Energy	85 kWh/year
Available Energy	3979 kWh/year	Specific prod.	1411 kWh/kWp/year														
Used Energy	2345 kWh/year	Excess (unused)	1453 kWh/year														
Performance Ratio PR	47.9 %	Solar Fraction SF	96.5 %														
Loss of Load	Time Fraction 3.3 %	Missing Energy	85 kWh/year														

Normalized productions (per installed kWp): Nominal power 2820 Wp



Performance Ratio PR and Solar Fraction SF



**Pole mount 12 module
Balances and main results**

	GlobHor kWh/m ²	GlobEff kWh/m ²	E Avail kWh	EUnused kWh	E Miss kWh	E User kWh	E Load kWh	SolFrac
January	52.0	113.7	283.8	59.2	10.63	199.1	209.8	0.949
February	78.0	148.4	388.2	185.3	0.00	186.2	186.2	1.000
March	123.0	167.5	420.3	198.2	0.00	203.5	203.5	1.000
April	142.0	154.1	360.6	142.8	0.00	200.9	200.9	1.000
May	180.0	180.9	417.4	193.0	0.00	206.6	206.6	1.000
June	187.0	181.1	404.9	185.9	0.00	197.8	197.8	1.000
July	187.0	184.5	413.1	181.7	0.00	209.8	209.8	1.000
August	156.0	163.7	372.8	151.0	0.00	203.5	203.5	1.000
September	117.0	134.5	310.1	107.0	9.23	188.5	197.8	0.953
October	78.0	109.5	258.5	44.1	0.00	209.8	209.8	1.000
November	40.0	62.2	141.7	0.6	53.05	144.7	197.8	0.732
December	39.0	84.9	207.5	3.9	12.50	194.1	206.6	0.939
Year	1379.0	1684.9	3978.8	1452.8	85.41	2344.6	2430.0	0.965

Legends:	GlobHor Horizontal global irradiation	E Miss Missing energy
	GlobEff Effective Global, corr. for IAM and shadings	E User Energy supplied to the user
	E Avail Available Solar Energy	E Load Energy need of the user (Load)
	EUnused Unused energy (full battery) loss	SolFrac Solar fraction (EUsed / ELoad)

Stand Alone System: Loss diagram

Project : LOW off grid cottage
Simulation variant : Pole mount 12 module

Main system parameters		System type	Stand alone	
PV Field Orientation	Seasonal tilt: summer/winter	25° / 60°	azimuth	0°
PV Array	Nb. of modules	12	Pnom total	2820 Wp
Battery	Model	PVX-2580L	Technology	vented, vehicle starting
battery Pack	Nb. of units	8	Voltage / Capacity	48 V / 472 Ah
User's needs	Daily household consumers	Constant over the year	global	2427 kWh/year

Loss diagram over the whole year

