Stand Alone System: Simulation parameters

Project : **final project off grid**

Geographical Site	**Wadi El Rayan**		Country	**Egypt**
Situation	Latitude	29.2°N	Longitude	30.4°E
Time defined as	Legal Time	Time zone UT+2	Altitude	-28 m
	Albedo	0.20		
Meteo data:	**Wadi El Rayan**	Meteonorm 7.1 (1980-2009), Sat=100% - Synthetic		

Simulation variant : **New simulation variant**

Simulation date 21/08/21 15h58

Simulation parameters

Collector Plane Orientation	Tilt	30°	Azimuth	0°
Models used	Transposition	Perez	Diffuse	Perez, Meteonorm

PV Array Characteristics

PV module	Si-mono	Model	**JKM 540M-72**	
Custom parameters definition		Manufacturer	Jinkosolar	
Number of PV modules		In series	3 modules	In parallel 5 strings
Total number of PV modules		Nb. modules	15	Unit Nom. Power 540 Wp
Array global power		Nominal (STC)	**8.10 kWp**	At operating cond. 4240 Wp (50°C)
Array operating characteristics (50°C)		U mpp	101 V	I mpp 42 A
Total area		Module area	**29.1 m²**	Cell area 25.6 m²

PV Array loss factors

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	Global array res.	40 mOhm	Loss Fraction	1.5 % at STC
Serie Diode Loss	Voltage Drop	0.7 V	Loss Fraction	0.6 % at STC
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP
Incidence effect, ASHRAE parametrization	IAM =	1 - bo (1/cos i - 1)	bo Param.	0.05

System Parameter	System type	**Stand Alone System**		
Battery	Model	**Volta 6SB100**		
	Manufacturer	Volta		
Battery Pack Characteristics	Voltage	96 V	Nominal Capacity	800 Ah
	Nb. of units	8 in series x 8 in parallel		
	Temperature	Fixed (20°C)		
Controller	Model	Universal controller with MPPT converter		
	Technology	MPPT converter	Temp coeff.	-5.0 mV/°C/elem.
Converter	Maxi and EURO efficiencies	97.0/95.0 %		
Battery management control	Treshold commands as	SOC calculation		
	Charging	SOC = 0.90/0.75	i.e. approx.	110.3/100.3 V
	Discharging	SOC = 0.20/0.45	i.e. approx.	93.9/97.7 V

User's needs :	Daily household consumers	Constant over the year
	average	32.1 kWh/Day

Stand Alone System: Detailed User's needs

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Simulation variant : **New simulation variant**

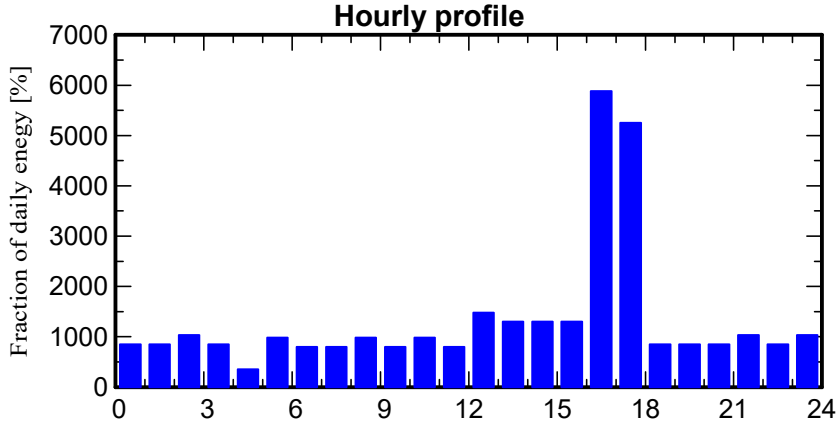
Main system parameters		**Stand alone**		
PV Field Orientation	tilt	30°	azimuth	0°
PV modules	Model	JKM 540M-72	Pnom	540 Wp
PV Array	Nb. of modules	15	Pnom total	**8.10 kWp**
Battery	Model	Volta 6SB100	Technology	sealed, tubular
battery Pack	Nb. of units	64	Voltage / Capacity	**96 V / 800 Ah**
User's needs	Daily household consumers	Constant over the year	global	11.70 MWh/year

Daily household consumers, Constant over the year, average = 32.1 kWh/day

Annual values

	Number	Power	Use	Energy
Lamps (LED or fluo)	15	30 W/lamp	12 h/day	5400 Wh/day
TV / PC / Mobile	5	100 W/app	16 h/day	8000 Wh/day
Mobile charger	15	12 W/app	8 h/day	1440 Wh/day
Fridge / Deep-freeze	2		24 Wh/day	4800 Wh/day
Dish- & Cloth-washers	2		2 Wh/day	8800 Wh/day
Cameras & Security	1	150 W tot	24 h/day	3600 Wh/day
Stand-by consumers			24 h/day	24 Wh/day
Total daily energy				32064 Wh/day

Hourly profile



Stand Alone System: Main results

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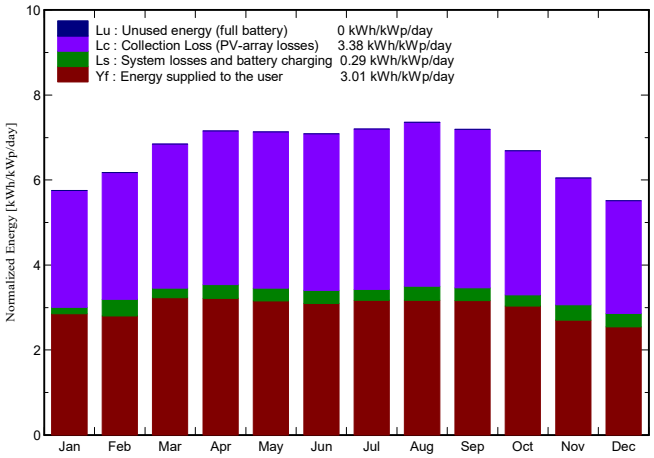
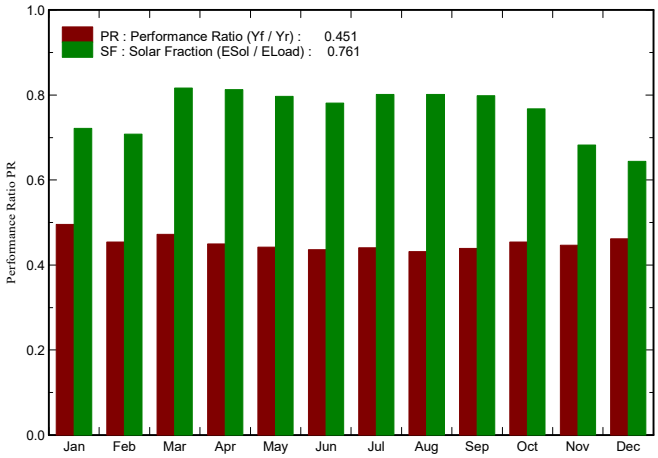
Main simulation results				
System Production	**Available Energy**	**9345 kWh/year**	Specific prod.	1154 kWh/kWp/year
	Used Energy	8911 kWh/year	Excess (unused)	0 kWh/year
	Performance Ratio PR	45.1 %	Solar Fraction SF	76.1 %
Loss of Load	Time Fraction	28.4 %	Missing Energy	2793 kWh/year

Normalized productions (per installed kWp): Nominal power 8.10 kWp



Performance Ratio PR and Solar Fraction SF



New simulation variant

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
January	118.2	169.2	722.9	0.000	276.8	717.2	994.0	0.721
February	130.3	164.0	694.4	0.000	261.9	635.9	897.8	0.708
March	181.4	201.0	830.4	0.000	182.6	811.4	994.0	0.816
April	207.9	202.4	822.1	0.000	180.3	781.6	961.9	0.813
May	237.1	207.9	828.0	0.000	202.0	792.0	994.0	0.797
June	239.6	199.7	785.6	0.000	210.5	751.5	961.9	0.781
July	247.1	209.7	819.2	0.032	197.0	796.9	994.0	0.802
August	231.5	214.9	840.6	0.032	197.4	796.6	994.0	0.801
September	193.7	204.1	805.4	0.000	193.8	768.1	961.9	0.799
October	162.1	196.8	793.2	0.032	231.0	763.0	994.0	0.768
November	125.2	172.3	714.7	0.000	305.5	656.4	961.9	0.682
December	110.1	162.2	688.3	0.000	354.0	639.9	994.0	0.644
Year	2184.2	2304.3	9344.8	0.096	2792.9	8910.5	11703.4	0.761

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

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Loss diagram over the whole year