

5 kW



Parallel & Off-Grid Solar Power Generator



System power: 5 kW
Daily Production: 17-20 kWh
Storage Capacity: 5 kWh LFP



Parallel & Off-Grid Solar System

Project summary

Geographical Site Tehran Iran	Situation Latitude 35.34 °N Longitude 51.30 °E Altitude 0 m Time zone UTC+3.5	Project settings Albedo 0.20
Weather data Tehran Meteonorm 8.1 (1988-2000), Sat=100% - Synthetic		

System summary

Parallel & Off-Grid Solar System	No 3D scene defined, no shadings	
PV Field Orientation Fixed plane Tilt/Azimuth 30 / 0 °	Near Shadings No Shadings	User's needs Daily household consumers Constant over the year Average 20.2 kWh/Day
System information PV Array Nb. of modules 5 units Pnom total 3550 Wp	Inverters Nb. of units 1 unit Pnom total 6000 W	Battery pack Storage strategy: Self-consumption Nb. of units 1 unit Voltage 51.2 V Capacity 100 Ah

Results summary

Produced Energy 6328.28 kWh/year	Specific production 1783 kWh/kWp/year	Perf. Ratio PR 80.29 %
Used Energy 7373.29 kWh/year		Solar Fraction SF 85.83 %

Parallel & Off-Grid Solar System

General parameters

Parallel & Off-Grid Solar System		No 3D scene defined, no shadings	
PV Field Orientation		Sheds configuration	Models used
Orientation		No 3D scene defined	Transposition Perez
Fixed plane			Diffuse Perez, Meteonorm
Tilt/Azimuth	30 / 0 °		Circumsolar separate
Horizon		Near Shadings	User's needs
Free Horizon		No Shadings	Daily household consumers
			Constant over the year
			Average 20.2 kWh/Day
Storage			
Kind	Self-consumption		
Charging strategy		Discharging strategy	
When excess solar power is available		As soon as power is needed	

PV Array Characteristics

PV module		PCS	
Manufacturer	Raimax	Manufacturer	Raimax
Model	Raimax 710Wp	Model	6000
Unit Nom. Power		Unit Nom. Power	
Number of PV modules	710 Wp	Number of inverters	6.00 kWac
Nominal (STC)	5 units	Total power	1 * MPPT 50% 0.5 unit
Modules	3550 Wp	Operating voltage	6.0 kWac
At operating cond. (50°C)	1 strings x 5 In series	Pnom ratio (DC:AC)	80-550 V
Pmpp			1.18
U mpp	3293 Wp		
I mpp	188 V		
	18 A		
Total PV power		Total inverter power	
Nominal (STC)	3.55 kWp	Total power	6 kWac
Total	5 modules	Nb. of inverters	1 unit
Module area	15.5 m ²		
Cell area	14.6 m ²	Pnom ratio	1.18
Battery Storage			
Battery			
Manufacturer	Raimax		
Model	LFP-100Ah-52V		
Battery pack		Battery Pack Characteristics	
Nb. of units	1 Unit	Voltage	51.2 V
Discharging min. SOC	20.0 %	Nominal Capacity	100 Ah)
Stored energy	5 kWh	Temperature	External ambient temperature
Battery input charger			
Model	Generic		
Max. charg. power	5 kWdc		
Max./Euro effic.	97.0/95.0 %		
Battery to Use inverter			
Model	Generic		
Max. disch. power	5.0 kWac		
Max./Euro effic.	97.0/95.0 %		

Parallel & Off-Grid Solar System

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. 174 mΩ
Loss Fraction 1.5 % at STC

Module Quality Loss

Loss Fraction 3.0 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

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	0.962	0.892	0.816	0.681	0.440	0.000



Parallel & Off-Grid Solar System

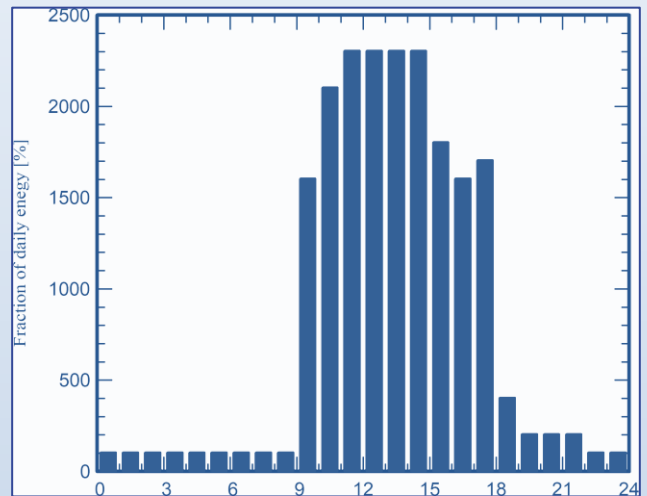
Detailed User's needs

Daily household consumers, Constant over the year, average = 20.2 kWh/day

Annual values

	Nb.	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	10/lamp	5.0	500
TV / PC / Mobile	1	200/app	6.0	1200
Fridge / Deep-freeze	1		24	2501
Air Conditioner	1	1500 tot	9.0	13500
Water Pump	1	500 tot	5.0	2500
Total daily energy				20201

Hourly distribution



پایش انرژی مبنا

Parallel & Off-Grid Solar System

Main results

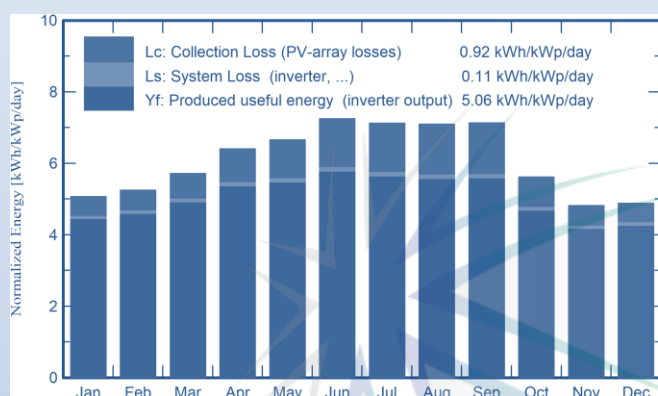
System Production

Produced Energy	6328.28 kWh/year	Specific production	1783 kWh/kWp/year
Used Energy	7373.29 kWh/year	Perf. Ratio PR	80.29 %
		Solar Fraction SF	85.83 %

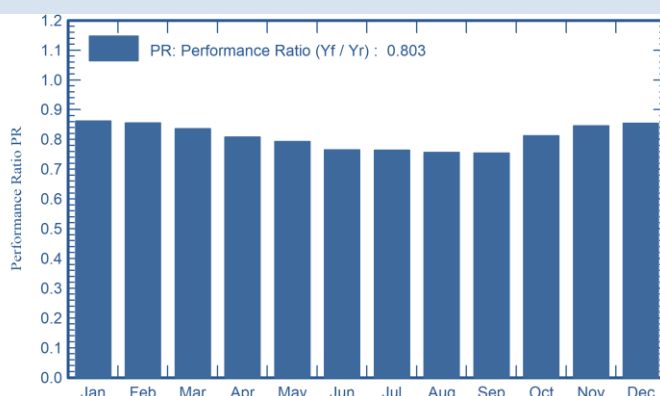
Battery aging (State of Wear)

Cycles SOW	97.3 %
Static SOW	89.7 %
Battery lifetime	9.7 years
Battery Warranty By Mabna	3 years

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

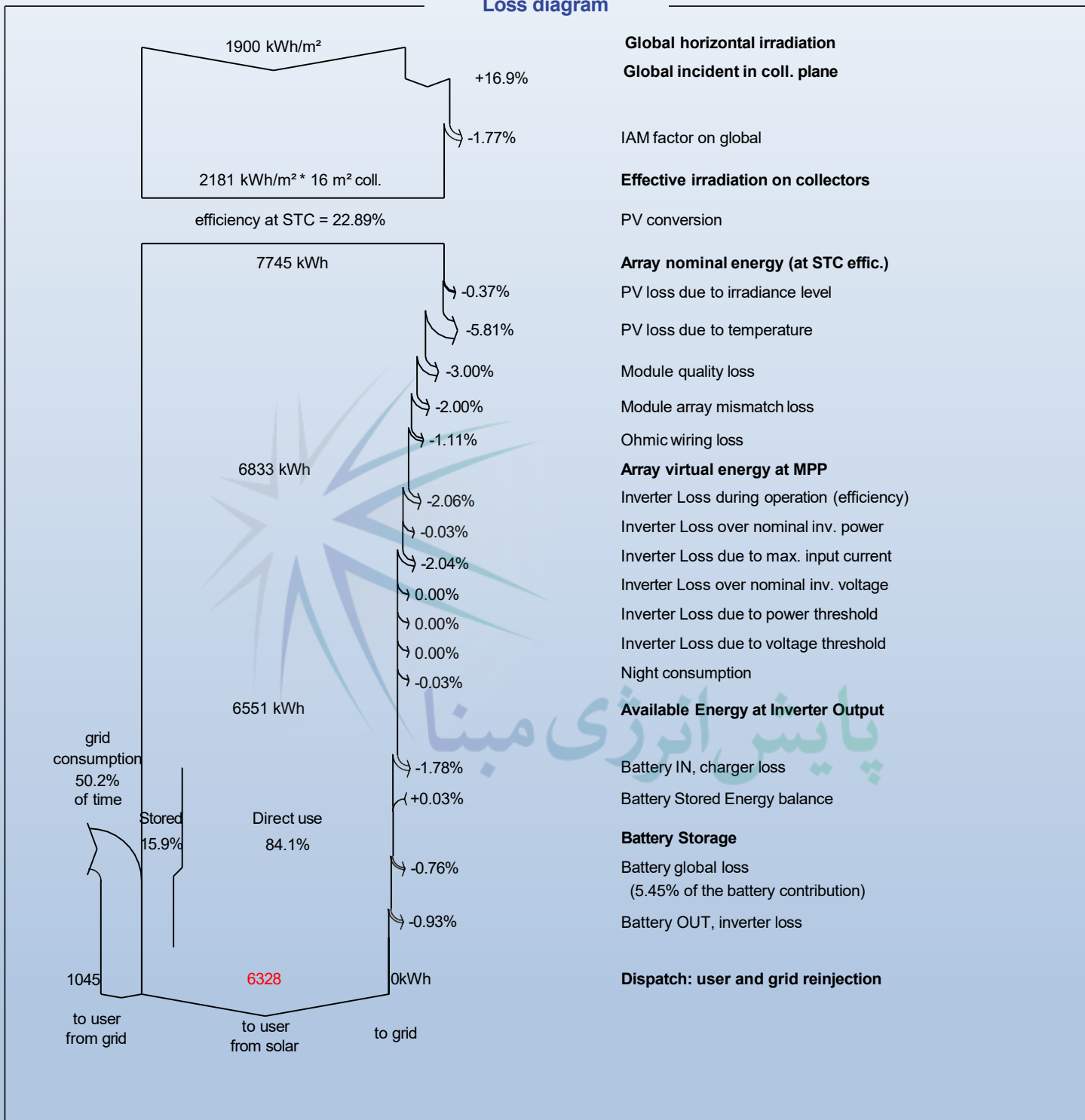
	GlobHor kWh/m ²	DiffHor kWh/m ²	T_Amb °C	GlobInc kWh/m ²	GlobEff kWh/m ²	EArray kWh	E_User kWh	E_Solar kWh	E_Grid kWh	EFrGrid kWh
January	94.8	25.60	7.20	157.0	154.9	501.3	626.2	480.3	0.000	146.0
February	105.1	40.30	7.30	146.9	144.8	467.7	565.6	446.0	0.000	119.6
March	146.5	64.20	10.36	177.0	173.9	553.9	626.2	525.6	0.000	100.7
April	178.7	80.70	13.78	191.9	188.2	585.1	606.0	550.8	0.000	55.2
May	210.3	93.40	20.08	206.3	202.0	617.4	626.2	580.9	0.000	45.4
June	230.6	91.10	24.62	217.2	212.5	630.2	606.0	590.1	0.000	16.0
July	229.7	89.00	27.12	220.6	216.0	636.5	626.2	598.1	0.000	28.2
August	211.5	78.20	27.22	220.0	215.7	628.2	626.2	590.9	0.000	35.3
September	180.7	45.10	23.18	213.8	210.0	609.5	606.0	572.1	0.000	33.9
October	130.9	49.70	18.64	173.8	171.2	528.3	626.2	501.3	0.000	124.9
November	93.6	33.40	12.84	144.5	142.4	455.3	606.0	434.1	0.000	172.0
December	87.3	21.20	9.01	151.2	149.4	481.0	626.2	458.3	0.000	168.0
Year	1899.7	711.90	16.84	2220.3	2181.0	6694.3	7373.3	6328.3	0.000	1045.0

Legends

GlobHor	Global horizontal irradiation	EArray	Effective energy at the output of the array
DiffHor	Horizontal diffuse irradiation	E_User	Energy supplied to the user
T_Amb	Ambient Temperature	E_Solar	Energy from the sun
GlobInc	Global incident in coll. plane	E_Grid	Energy injected into grid
GlobEff	Effective Global, corr. for IAM and shadings	EFrGrid	Energy from the grid

Parallel & Off-Grid Solar System

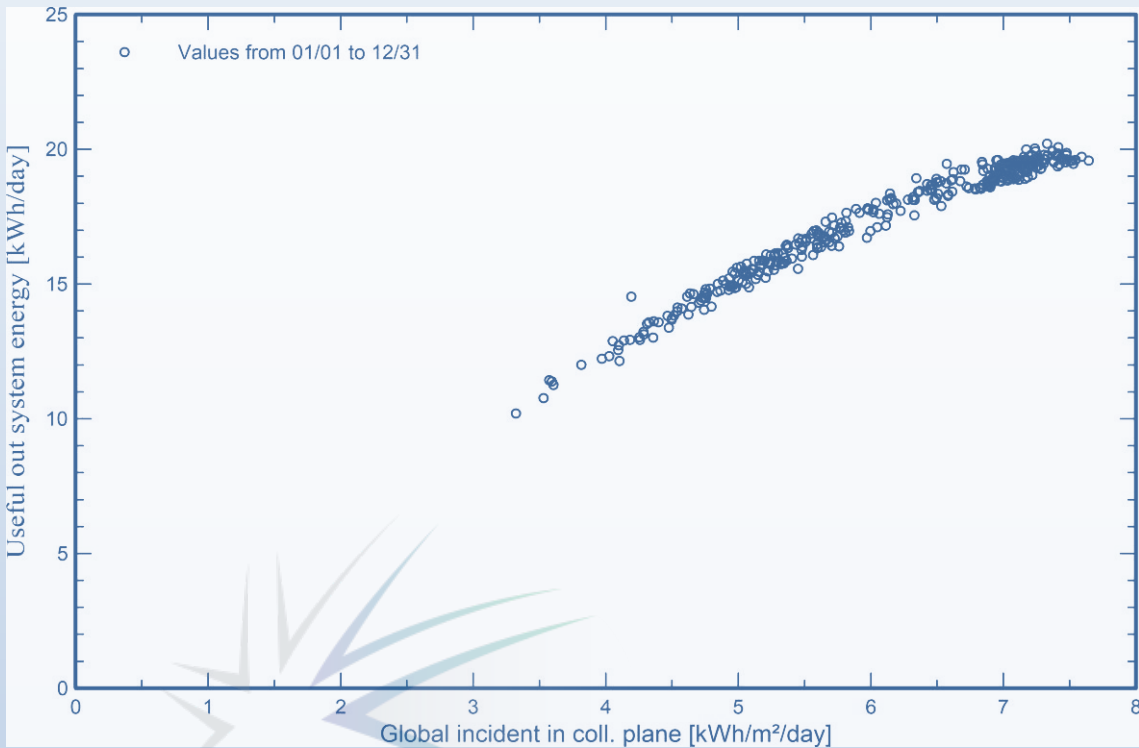
Loss diagram



Parallel & Off-Grid Solar System

Predef. graphs

Daily Input/Output diagram



Daily System Output Energy

