

PVsyst - Simulation report

Stand alone system

Project: RES - Luisa Di Francesco

Variant: New simulation variant

Stand alone system with batteries

System power: 4200 Wp

Benasque - Spain

**PVsyst V7.2.8**

VC0, Simulation date:
23/11/21 19:55
with v7.2.8

Project summary**Geographical Site****Benasque**

Spain

Situation

Latitude 42.61 °N

Longitude 0.52 °E

Altitude 1142 m

Time zone UTC+1

Project settings

Albedo 0.20

Meteo data

Benasque

Meteonorm 8.0 (2006-2017), Sat=100% - Synthetic

System summary**Stand alone system****PV Field Orientation**

Fixed plane

Tilt/Azimuth 60 / 0 °

Stand alone system with batteries**User's needs**

Daily household consumers

Constant over the year

Average 7.4 kWh/Day

System information**PV Array**

Nb. of modules

14 units

Pnom total

4200 Wp

Battery pack

Technology

Lead-acid, sealed, Gel

Nb. of units

24 units

Voltage

48 V

Capacity

729 Ah

Results summary

Available Energy 5663 kWh/year

Specific production

1348 kWh/kWp/year

Perf. Ratio PR

34.90 %

Used Energy

2713 kWh/year

Solar Fraction SF

100.00 %

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General parameters**Stand alone system****PV Field Orientation****Orientation**

Fixed plane
Tilt/Azimuth 60 / 0 °

Horizon

Average Height 17.5 °

Stand alone system with batteries**Sheds configuration**

No 3D scene defined

User's needs

Daily household consumers
Constant over the year
Average 7.4 kWh/Day

Models used

Transposition Perez
Diffuse Perez, Meteonorm
Circumsolar separate

PV Array Characteristics**PV module**

Manufacturer Generic
Model AS-P1203-H-300
(Original PVsyst database)
Unit Nom. Power 300 Wp
Number of PV modules 14 units
Nominal (STC) 4200 Wp
Modules 2 Strings x 7 In series

At operating cond. (50°C)

Pmpp 3830 Wp
U mpp 209 V
I mpp 18 A

Controller

Manufacturer Generic
Model Conext_MPPT_80_600 - 48V
Technology MPPT converter
Temp coeff. -5.0 mV/°C/Elem.

Converter

Maxi and EURO efficiencies 96.0 / 94.1 %

Total PV power

Nominal (STC) 4 kWp
Total 14 modules
Module area 23.3 m²

Battery

Manufacturer Generic
Model Secura OPzV_600
Technology Lead-acid, sealed, Gel
Nb. of units 24 in series
Discharging min. SOC 15.1 %
Stored energy 29.7 kWh

Battery Pack Characteristics

Voltage 48 V
Nominal Capacity 729 Ah (C10)
Temperature Average between fixed 20 °C
and External

Battery Management control

Threshold commands as Battery voltage
Charging 54.9 / 50.2 V
Corresp. SOC 0.92 / 0.75
Discharging 45.5 / 48.9 V
Corresp. SOC 0.12 / 0.45

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. 189 mΩ
Loss Fraction 1.5 % at STC

Serie Diode Loss

Voltage drop 0.7 V
Loss Fraction 0.3 % at STC

Module Quality Loss

Loss Fraction -0.5 %

Module mismatch losses

Loss Fraction 2.0 % at MPP

Strings Mismatch loss

Loss Fraction 0.1 %

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



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Horizon definition

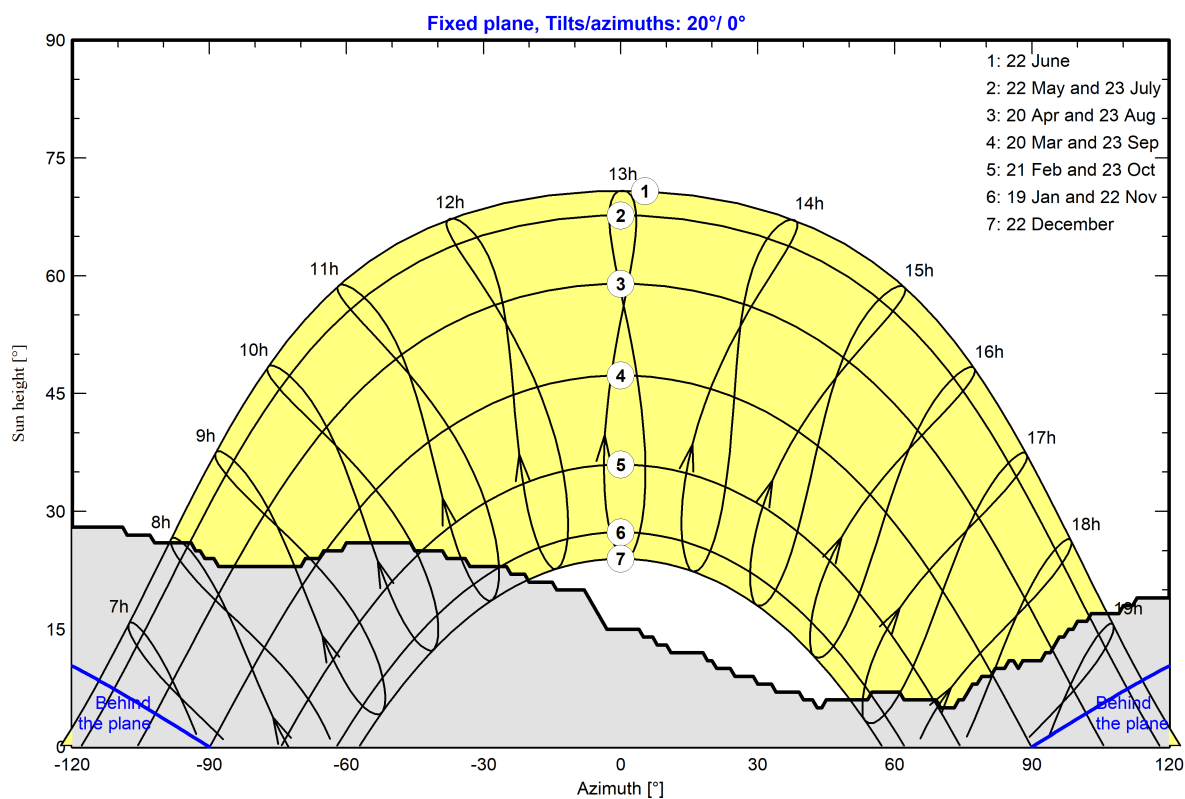
Meteonorm horizon for, Lat. = 42.600°, Long. = 0.530°

Average Height 17.5 ° Albedo Factor 0.27
Diffuse Factor 0.77 Albedo Fraction 100 %

Horizon profile

Azimuth [°]	-179	-177	-173	-169	-156	-154	-152	-147	-144	-136	-131	-129	-122	-108
Height [°]	12.0	11.0	9.0	10.0	13.0	14.0	15.0	17.0	18.0	23.0	24.0	25.0	28.0	27.0
Azimuth [°]	-91	-88	-69	-60	-45	-38	-24	-20	-14	5	8	11	21	24
Height [°]	24.0	23.0	24.0	26.0	25.0	24.0	22.0	21.0	20.0	14.0	13.0	12.0	10.0	10.0
Azimuth [°]	25	30	34	40	45	55	62	74	77	79	85	87	92	99
Height [°]	9.0	8.0	7.0	6.0	6.0	7.0	6.0	6.0	8.0	9.0	11.0	10.0	11.0	15.0
Azimuth [°]	102	112	122	128	138	141	150	153	156	166	168	174	178	180
Height [°]	16.0	18.0	19.0	20.0	23.0	22.0	20.0	18.0	19.0	19.0	18.0	16.0	15.0	13.0

Sun Paths (Height / Azimuth diagram)



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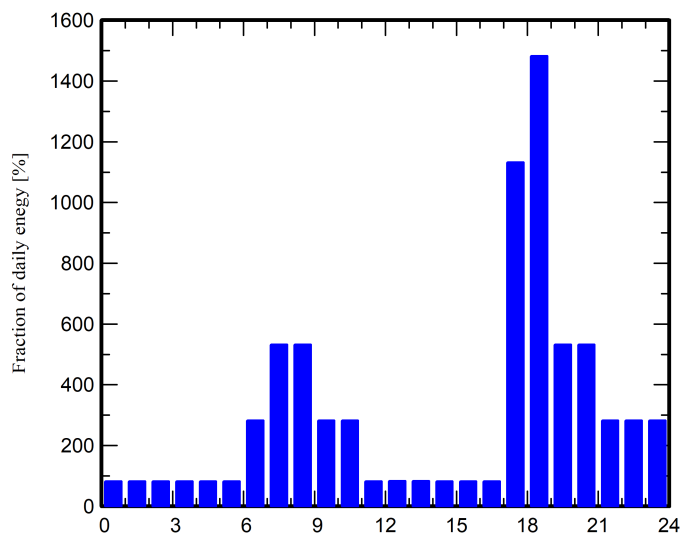
with v7.2.8

Detailed User's needs

Daily household consumers, Constant over the year, average = 7.4 kWh/day

Annual values

	Number	Power	Use	Energy
		W	Hour/day	Wh/day
Lamps (LED or fluo)	10	20W/lamp	12.0	2400
TV / PC / Mobile	1	250W/app	5.0	1250
Domestic appliances	2	300W/app	1.0	600
Fridge / Deep-freeze	1		24	1500
Dish- and Cloth-washer	1		2	2
Other uses	2	300W tot	2.0	1200
Stand-by consumers			24.0	480
Total daily energy				7432Wh/day

Hourly distribution



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Main results

System Production

Available Energy 5663 kWh/year
Used Energy 2713 kWh/year
Excess (unused) 2702 kWh/year

Loss of Load

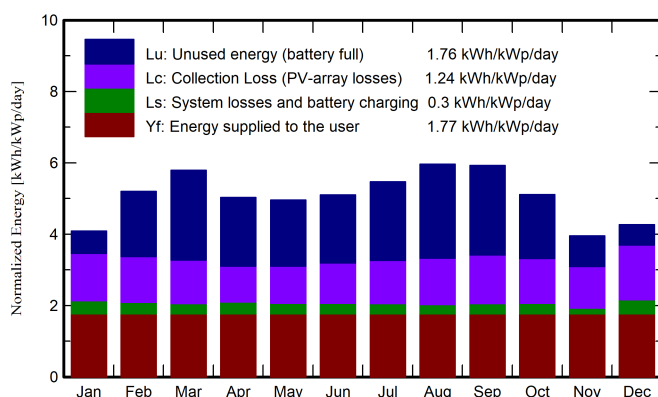
Time Fraction 0.0 %
Missing Energy 0 kWh/year

Specific production 1348 kWh/kWp/year
Performance Ratio PR 34.90 %
Solar Fraction SF 100.00 %

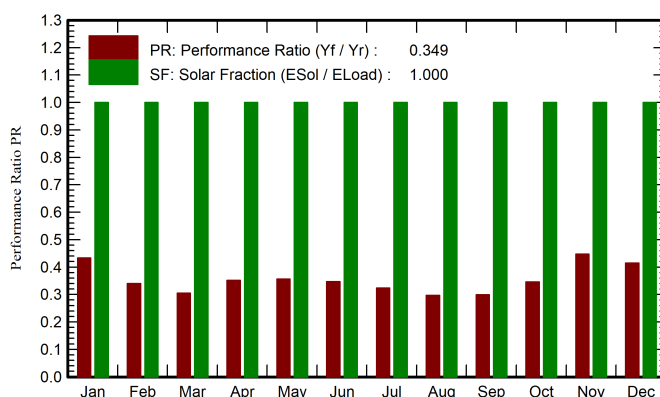
Battery aging (State of Wear)

Cycles SOW 95.0 %
Static SOW 95.2 %

Normalized productions (per installed kWp)



Performance Ratio PR



Balances and main results

	GlobHor	GlobEff	E_Avail	EUnused	E_Miss	E_User	E_Load	SolFrac
	kWh/m ²	kWh/m ²	kWh	kWh	kWh	kWh	kWh	ratio
January	61.2	91.3	340.6	80.8	0.000	230.4	230.4	1.000
February	83.2	118.5	444.6	214.9	0.000	208.1	208.1	1.000
March	135.2	153.7	578.3	327.4	0.000	230.4	230.4	1.000
April	154.6	130.9	487.3	241.2	0.000	223.0	223.0	1.000
May	191.6	132.4	490.9	240.9	0.000	230.4	230.4	1.000
June	207.8	131.0	481.4	239.5	0.000	223.0	223.0	1.000
July	223.5	147.4	536.3	286.5	0.000	230.4	230.4	1.000
August	198.8	162.9	589.4	341.6	0.000	230.4	230.4	1.000
September	149.5	153.7	558.6	315.3	0.000	223.0	223.0	1.000
October	104.0	132.8	484.7	233.0	0.000	230.4	230.4	1.000
November	64.0	90.3	333.2	107.8	0.000	223.0	223.0	1.000
December	56.4	90.3	337.4	73.6	0.000	230.4	230.4	1.000
Year	1629.8	1535.2	5662.7	2702.3	0.000	2712.7	2712.7	1.000

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

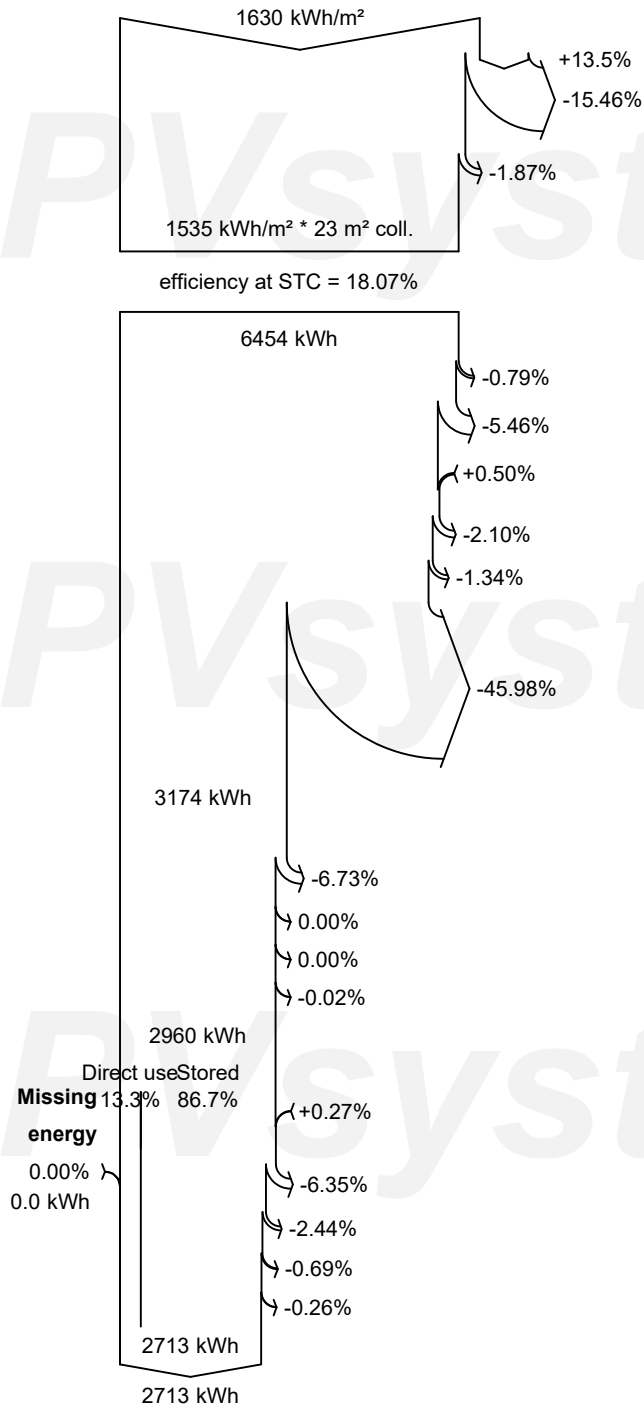
E_User Energy supplied to the user
E_Load Energy need of the user (Load)
SolFrac Solar fraction (EUsed / ELoad)



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Loss diagram



Global horizontal irradiation

Global incident in coll. plane

Far Shadings / Horizon

IAM factor on global

Effective irradiation on collectors

PV conversion

Array nominal energy (at STC effic.)

PV loss due to irradiance level

PV loss due to temperature

Module quality loss

Mismatch loss, modules and strings

Ohmic wiring loss

Unused energy (battery full)

Effective energy at the output of the array

Converter Loss during operation (efficiency)

Converter Loss due to power threshold

Converter Loss over nominal conv. voltage

Converter Loss due to voltage threshold

Converter losses (effic, overload)

Battery Storage

Battery Stored Energy balance

Battery efficiency loss

Charge/Disch. Current Efficiency Loss

Gassing Current (electrolyte dissociation)

Battery Self-discharge Current

Energy supplied to the user

Energy need of the user (Load)

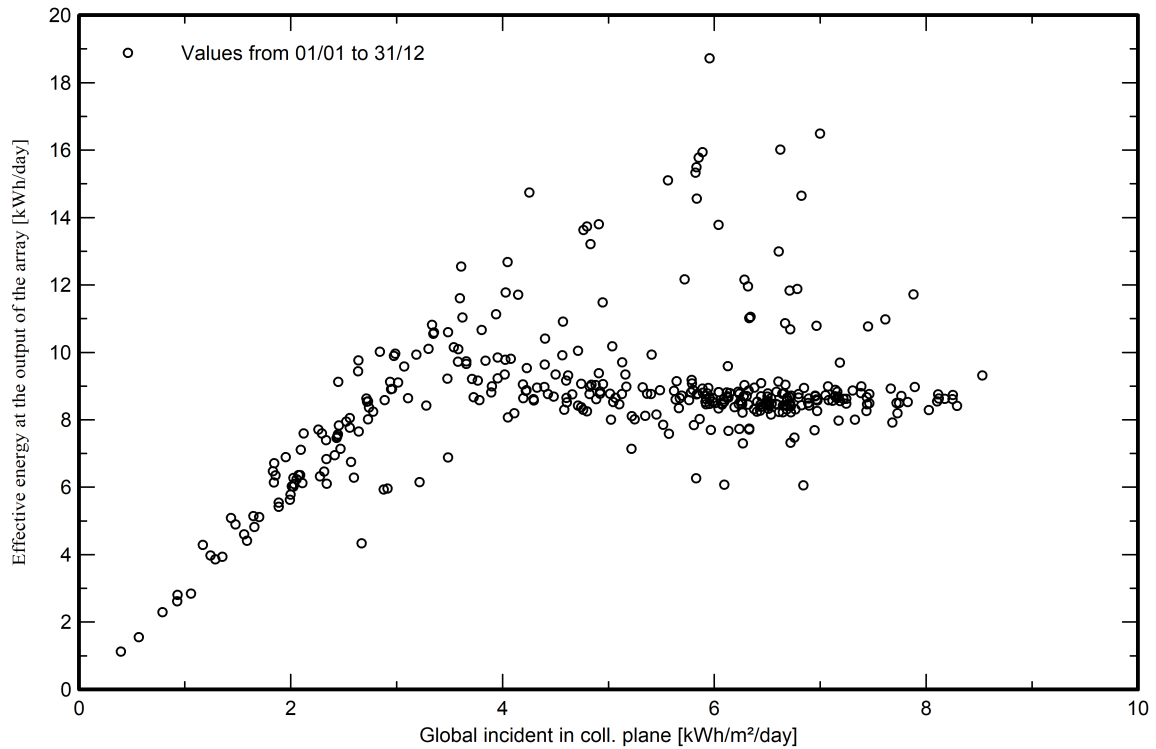


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Special graphs

Daily Input/Output diagram



PVsyst TRIAL

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