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Къщата на Стефан (Stefans' House)						
Grid-Connected System: Simulation parameters						
Project :		Stafans House				
Geographical Site		Stefans House		Country	Bulgaria	
Situation		Latitude	42.1°N	Longitude	24.7°E	
Time defined as		Legal Time	Time zone UT+1	Altitude	168 m	
		Albedo	0.20			
Meteo data :		Stefans House, Meteonorm SYN File				
Simulation variant :		First Variant				
		Simulation date	09/12/09 17h10			
Simulation parameters						
Collector Plane Orientation		Tilt	30°	Azimuth	0°	
Horizon		Free Horizon				
Near Shadings		No Shadings				
PV Array Characteristics						
PV module	Si-poly	Model	STP 175-24/Ac			
		Manufacturer	Suntech			
Number of PV modules		In series	6 modules	In parallel	1 strings	
Total number of PV modules		Nb. modules	6	Unit Nom. Power	175 Wp	
Array global power		Nominal (STC)	1.05 kWp	At operating cond.	951 Wp (50°C)	
Array operating characteristics (50°C)		U mpp	198 V	I mpp	5 A	
Total area		Module area	7.7 ml			
PV Array loss factors						
Heat Loss Factor		ko (const)	29.0 W/mlK	kv (wind)	0.0 W/mlK / m/s	
=> Nominal Oper. Coll. Temp. (800 W/ml, Tamb=20°C, wind 1 m/s)				NOCT	45 °C	
Wiring Ohmic Loss		Global array res.	1374.0 mOhm	Loss Fraction	3.1 % at STC	
Serie Diode Loss		Voltage Drop	0.7 V	Loss Fraction	0.3 % at STC	
Module Quality Loss				Loss Fraction	3.0 %	
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	Grid-Connected System			
Inverter		Model	Sitop Solar T1200			
		Manufacturer	Siemens			
Inverter Characteristics		Operating Voltage	115-250 V	Unit Nom. Power	1.2 kW AC	
User's needs :		Unlimited load (grid)				

Къщата на Стефан (Stefans' House)

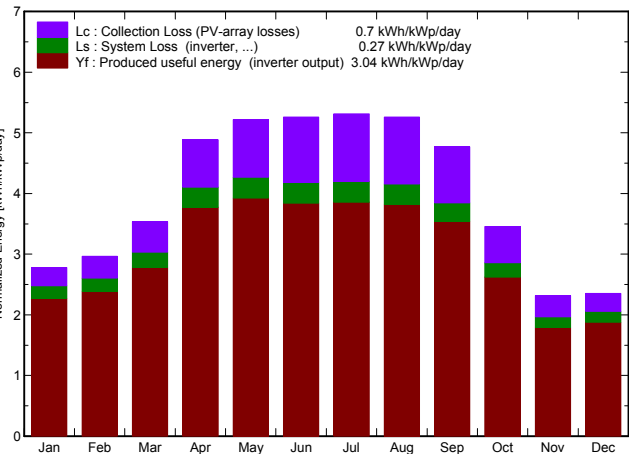
Grid-Connected System: Main results

Project : **Stafans House**
Simulation variant : **First Variant**

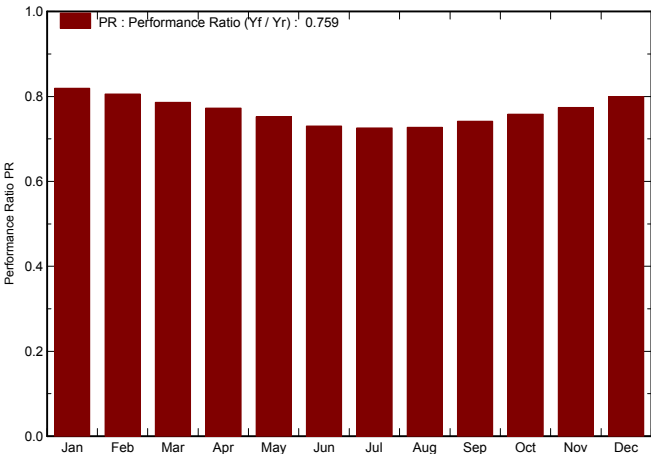
Main system parameters	System type	Grid-Connected	
PV Field Orientation	tilt	30°	azimuth 0°
PV modules	Model	STP 175-24/Ac	Pnom 175 Wp
PV Array	Nb. of modules	6	Pnom total 1.05 kWp
Inverter	Model	Sitop Solar T1200	Pnom 1.20 kW ac
User's needs	Unlimited load (grid)		

Main simulation results			
System Production	Produced Energy	1167 kWh/year	Specific 1111 kWh/kWp/year
	Performance Ratio PR	75.9 %	
Investment	Global incl. taxes	3350 e	Specific 3.19 e/Wp
Yearly cost	Annuities (Loan 5.0%, 20 years)	269 e/yr	Running Cost 0 e/yr
Energy cost		0.23 e/kWh	

Normalized productions (per installed kWp): Nominal power 1.05 kWp



Performance Ratio PR



First Variant
Balances and main results

	GlobHor	T Amb	GlobInc	GlobEff	EArray	EOutInv	EffArrR	EffSysR
	kWh/m1	°C	kWh/m1	kWh/m1	kWh	kWh	%	%
January	53.9	-1.82	86.1	83.6	80.8	74.1	12.24	11.23
February	64.5	-0.47	83.0	80.5	76.6	70.2	12.06	11.04
March	96.1	5.44	109.6	106.2	98.7	90.5	11.76	10.77
April	139.1	10.95	146.5	141.9	129.3	118.9	11.52	10.60
May	164.6	16.61	161.7	156.3	138.9	127.7	11.22	10.31
June	165.5	20.84	157.8	152.5	131.8	121.0	10.90	10.01
July	170.6	23.08	164.7	159.1	136.7	125.6	10.83	9.95
August	157.9	23.26	163.0	157.8	135.3	124.5	10.84	9.97
September	125.1	19.72	143.1	138.8	121.2	111.5	11.06	10.17
October	85.5	13.82	107.1	103.9	93.0	85.3	11.34	10.39
November	49.0	6.54	69.5	67.4	61.9	56.5	11.64	10.61
December	45.8	1.44	72.9	70.7	67.0	61.2	11.99	10.96
Year	1317.6	11.69	1465.1	1418.7	1271.3	1166.9	11.33	10.40

Legends:	GlobHor	Horizontal global irradiation	EArray	Effective energy at the output of the array
	T Amb	Ambient Temperature	EOutInv	Available Energy at Inverter Output
	GlobInc	Global incident in coll. plane	EffArrR	Effic. Eout array / rough area
	GlobEff	Effective Global, corr. for IAM and shadings	EffSysR	Effic. Eout system / rough area

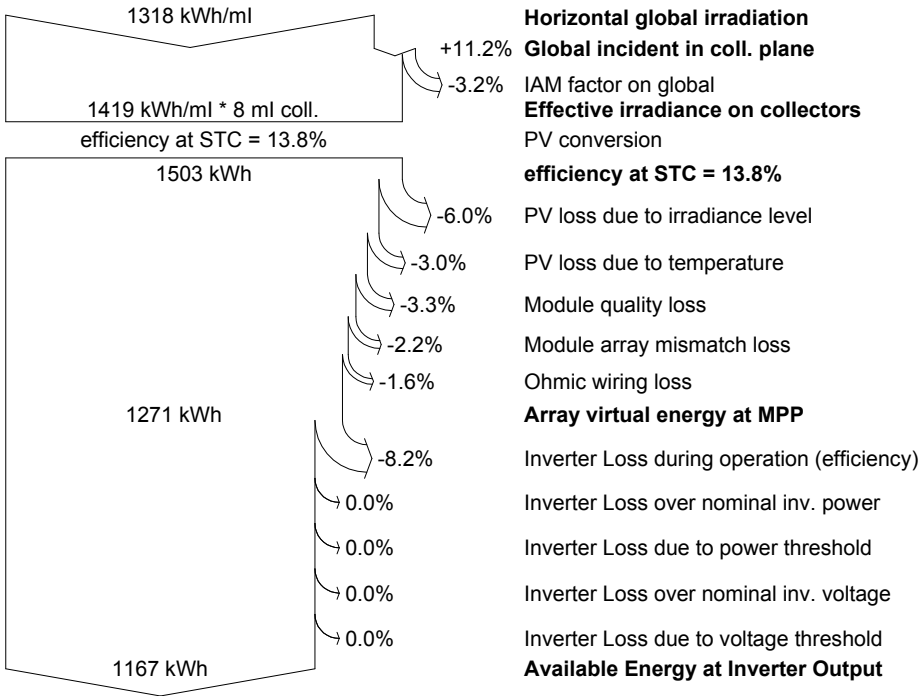
Къщата на Стефан (Stefans' House)

Grid-Connected System: Loss diagram

Project : **Stafans House**
Simulation variant : **First Variant**

Main system parameters	System type	Grid-Connected		
PV Field Orientation	tilt	30°	azimuth	0°
PV modules	Model	STP 175-24/Ac	Pnom	175 Wp
PV Array	Nb. of modules	6	Pnom total	1.05 kWp
Inverter	Model	Sitop Solar T1200	Pnom	1.20 kW ac
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



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Къщата на Стефан (Stefans' House)				
Grid-Connected System: Economic evaluation				
Project :	Stafans House			
Simulation variant :	First Variant			
Main system parameters	System type	Grid-Connected		
PV Field Orientation	tilt	30°	azimuth	0°
PV modules	Model	STP 175-24/Ac	Pnom	175 Wp
PV Array	Nb. of modules	6	Pnom total	1.05 kWp
Inverter	Model	Sitop Solar T1200	Pnom	1.20 kW ac
User's needs	Unlimited load (grid)			
Investment				
PV modules (Pnom = 175 Wp)	6 units	350 e / unit		2100 e
Supports / Integration		0 e / module		0 e
Inverter (Pnom = 1.2 kW ac)	1 units	750 e / unit		750 e
Settings, wiring, ...				250 e
Substitution underworth				-0 e
Gross investment (without taxes)				3350 e
Financing				
Gross investment (without taxes)				3350 e
Taxes on investment (VAT)	Rate 0.0 %			0 e
Gross investment (including VAT)				3350 e
Subsidies				-0 e
Net investment (all taxes included)				3350 e
Annuities	(Loan 5.0 % over 20 years)			269 e/year
Annual running costs: maintenance, insurances ...				0 e/year
Total yearly cost				269 e/year
Energy cost				
Produced Energy				1167 kWh / year
Cost of produced energy				0.23 e / kWh

Къщата на Стефан (Stefans' House)

Grid-Connected System: Long Term Financial Balance

Project : **Stafans House**Simulation variant : **First Variant**

Main system parameters

PV Field Orientation

PV modules

PV Array

Inverter

User's needs

System type

tilt

Model

Nb. of modules

Model

Unlimited load (grid)

Grid-Connected

30°

STP 175-24/Ac

6

Sitop Solar T1200

azimuth 0°

Pnom 175 Wp

Pnom total **1.05 kWp**

Pnom 1.20 kW ac

Electricity sale

Feed-in Tariff

0.07 Euro/kWh

Annual connexion tax

0 e

Warranty over **20 years**

Long term balance and Running conditions

Annual sale tariff depreciation

0.0 % / year

Annual production reduction

-1.0 % / year

Feed-in tariff Warranty over

20 years

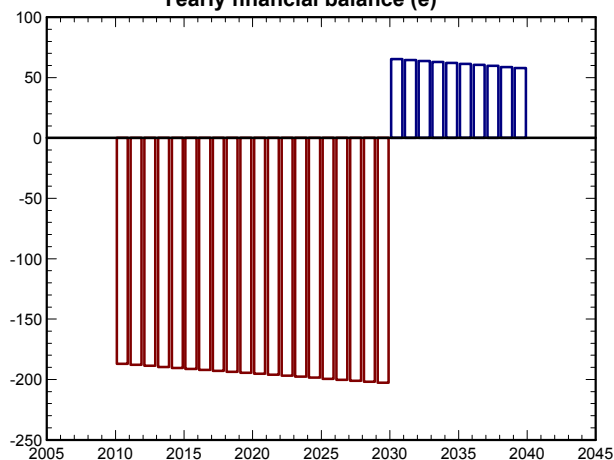
Tariff reduction after contractual warranty

0 %

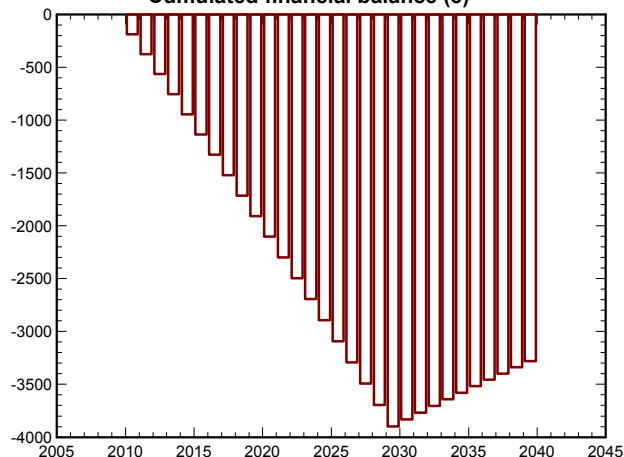
Loan duration (payment of annuities)

20 years

Yearly financial balance (e)



Cumulated financial balance (e)



Long term economic balance

Year	Loan 5.0 %	Running costs	Sold energy	Yearly Balance	Cumul. Balance
2010	269	0	82	-187	-187
2011	269	0	81	-188	-375
2012	269	0	80	-189	-564
2013	269	0	79	-190	-753
2014	269	0	78	-190	-944
2015	269	0	78	-191	-1135
2016	269	0	77	-192	-1327
2017	269	0	76	-193	-1520
2018	269	0	75	-194	-1714
2019	269	0	74	-194	-1908
2020	269	0	74	-195	-2103
2021	269	0	73	-196	-2299
2022	269	0	72	-197	-2496
2023	269	0	71	-198	-2694
2024	269	0	70	-199	-2893
2025	269	0	69	-199	-3092
2026	269	0	69	-200	-3292
2027	269	0	68	-201	-3493
2028	269	0	67	-202	-3695
2029	269	0	66	-203	-3898
2030	0	0	65	65	-3832
2031	0	0	65	65	-3768
2032	0	0	64	64	-3704
2033	0	0	63	63	-3641
2034	0	0	62	62	-3579
2035	0	0	61	61	-3518
2036	0	0	60	60	-3457
2037	0	0	60	60	-3398
2038	0	0	59	59	-3339
2039	0	0	58	58	-3281