

# 10 kW PV rooftop system in ECREEE's headquarters



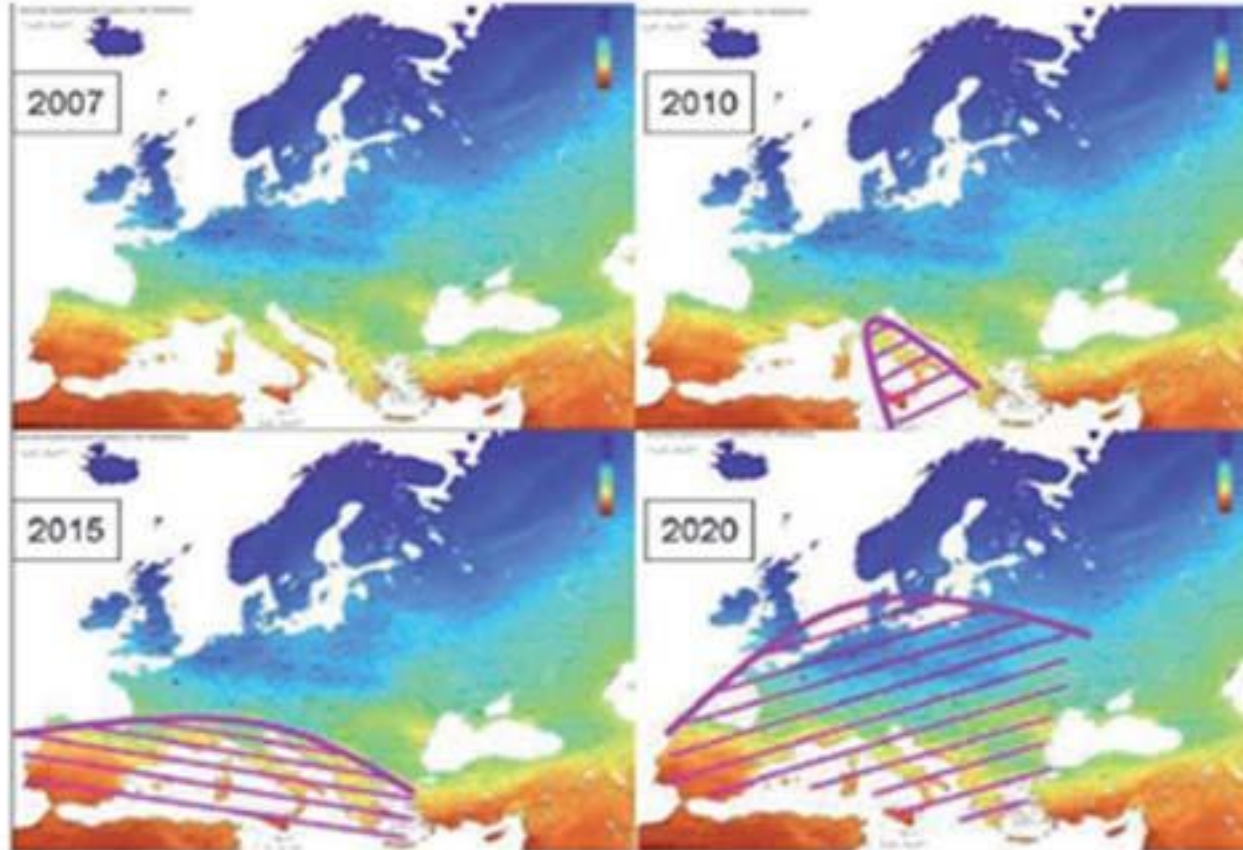
Friday, 28<sup>th</sup> September 2012  
DAKAR, SENEGAL



# GRID PARITY IN EUROPE



Grid Parity of PV electrical energy, geographically



Source: EPIA



# GRID PARITY IN CAPE VERDE?? (AND IN WEST AFRICA?)



**MORE SOLAR RESOURCE!!**



Global Horizontal Irradiance



**END USER TARIFF  
THREE TIMES HIGHER  
0,30 EURO/KWH**



## OVERVIEW



### **Project characteristics:**

January 2011: Approval of RE Law in Cape Verde

9,9 kW PV roof-top system for ECREEE's office consumption

Battery bank with 10 hours of autonomy

### **Project schedule:**

February 2011 ToR elaboration

April 2011 tender process

August 2011 contract signature with PROSOLIA

November 2011 installation completed, connection to the grid as back-up

April 2012 connection to the grid to feed-in and bidirectional counter



# ELECTRICITY DEMAND EVALUATION



Equipments	Capacity (W)	Hour Utilization / Day.	Utilization days/ Month. (KWh)	Unit. Consumption/ Month (KWh)	Num. installed Equipments	Average Consumption/ Month. (KWh/M)	Average Consumption/ Year (KWh/Y)
Telephone Exchange (1,3A,220V)	280	4	22	25	1	25	296
Server	220	4	22	19	1	19	232
Desktop Computers & Printers	300	4	22	26	9	238	2,851
Laptops	65	1	22	1		0	0
Printers	50	1	22	1	14	15	185
Photocopier & Printer	920	2	22	40	1	40	486
Photocopier (big)	920			0	1	0	0
Internet Router (12V; 1A)	12	8	22	2	1	2	25
Fax Machine	50	1	22	1	2	2	26
Lights Flourescente 36 W	36	8	22	6	23	146	1,749
Lights Flourescente 18 W	18	8	22	3	23	73	874
Lights Globes	11	8	22	2	6	12	139
Refrigerator (small)	370	2	30	22	3	67	799
Bebedouro	123	2	30	7	2	15	177
Air Conditioners 18.000 BTH/h	1,100	6	22	145	3	436	5,227
Air Conditioners 9000 BTH/h	870	6	22	115	11	1,263	15,159
				Total (without AC)		653	7,840
				Total ( A.cond.)		1,699	20,386
				TOTAL (with AC)		2,352	28,226

AC share  
72%

7,840  
20,386



## PV system operation:



The system will operate as follows:

- The PV system is connected to the grid and to the battery bank;
- As a priority, the photovoltaic system recharges the batteries, enabling them to be always loaded and available in case of grid electricity failure;
- After charging the batteries, the system connects automatically to the grid, supplying electricity directly to the building through a bidirectional counter, registering the energy supplied by the solar system to the grid;
- In case of electricity failure, the building will be powered by battery bank, which should guarantee the energy supply to the building for at least 10 hours;
- The PV system should again give priority to recharge the batteries, then repeating the cycle of operation.



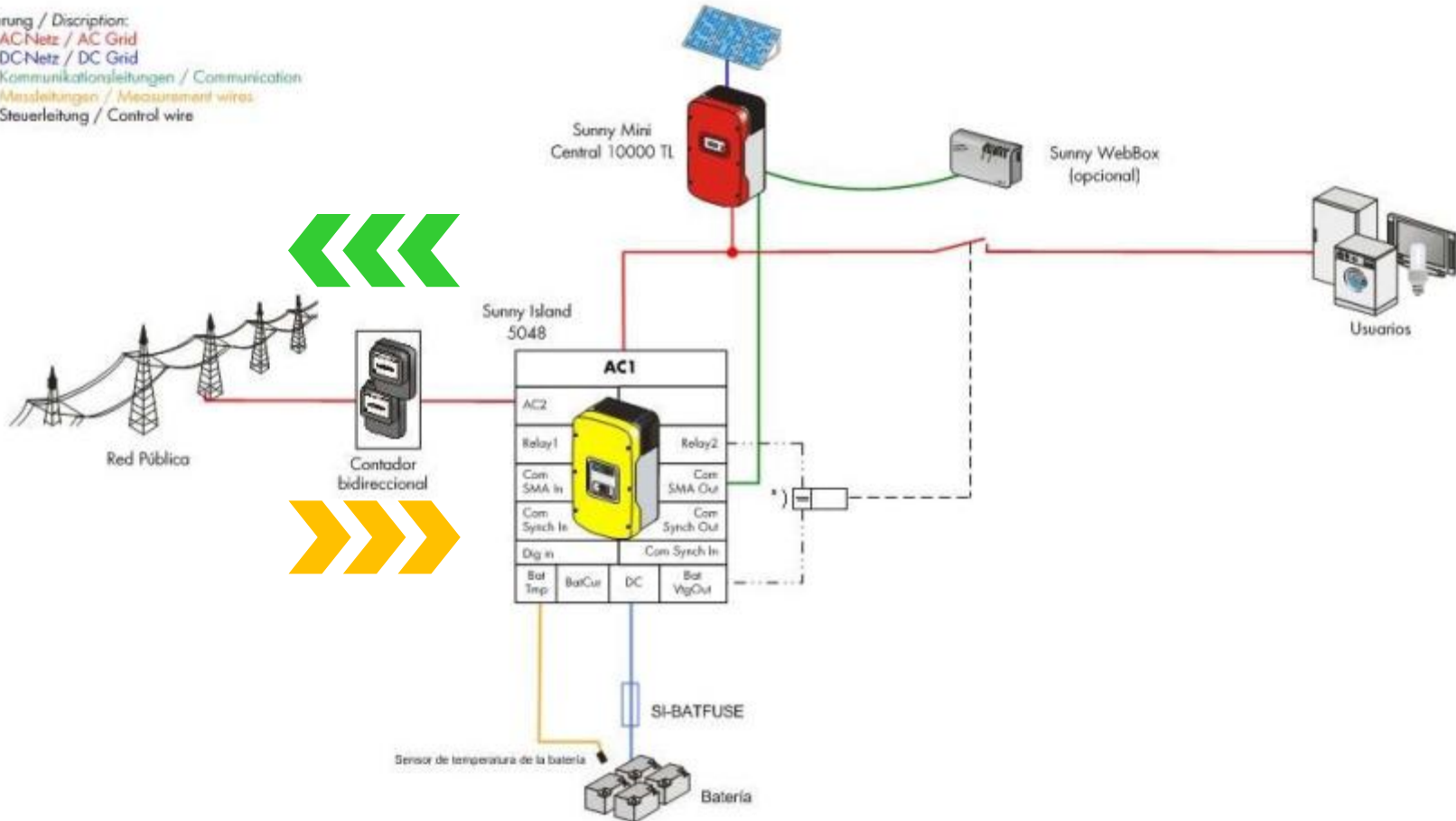


# PV SYSTEMS OPERATION (CONT.)



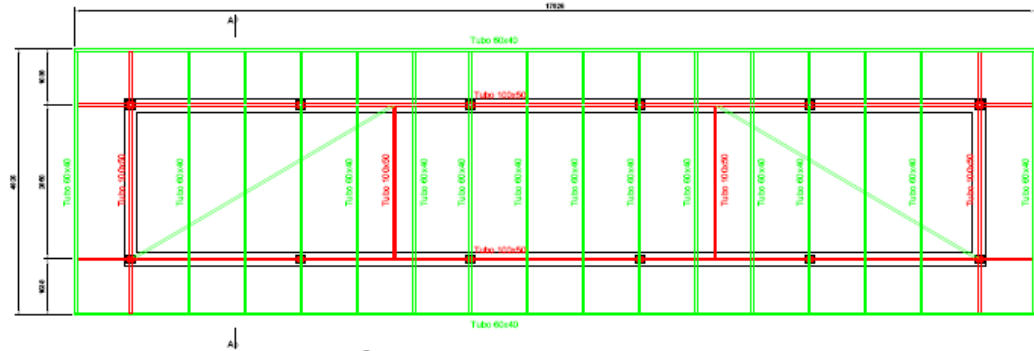
Erläuterung / Discription:

- AC-Netz / AC Grid
- DC-Netz / DC Grid
- Kommunikationsleitungen / Communication
- Messleitungen / Measurement wires
- - - Steuerleitung / Control wire

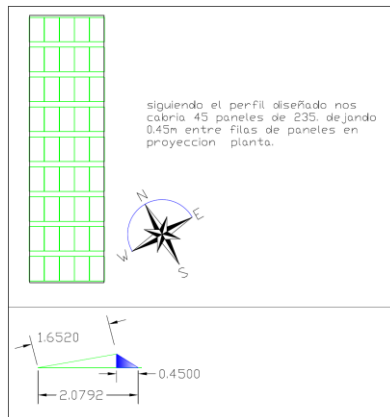




Analyzing the roof space



Structure design



Studying the PV modules distribution



Corrective measures to wind stress





# BATTERY AND INVERTERS ROOM





# MONITORING



SUNNY PORTAL | US-English

The screenshot displays the Sunny Portal monitoring interface. Two data pop-ups are overlaid on the main dashboard. The first pop-up shows the status of the ECREEE Headquarters, and the second shows the status of a specific battery unit (SI5048EH:1260011165). A chart in the background shows power and total yield over time.

ECREEE Headquarters	
Power	1543 W
Energy today	38.971 kWh
Energy total	12.484 MWh

SI5048EH:1260011165	
Battery charge level	76.6 %
Battery voltage	49 V
Battery charge mode	Boost
Power	1.3 kW

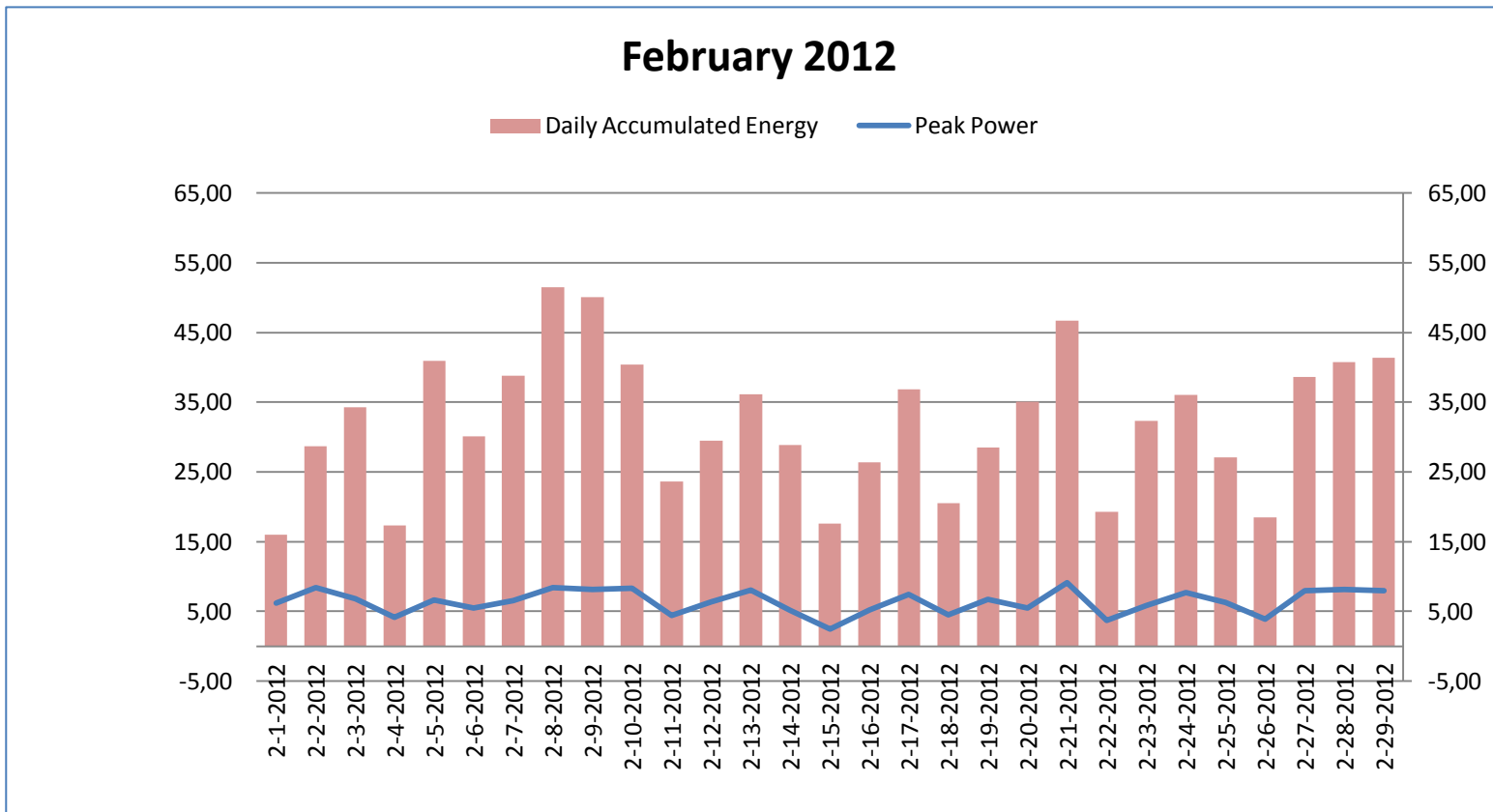
Chart Legend: Power [kW] ECREEE Headquarters (blue line), Total yield [kWh] ECREEE Headquarters (orange area)

Chart Y-axis: [kWh] Meter change (0.0 to 4.0)

Chart X-axis: 8:00 PM / 27, 10:00 PM / 27, 12:00 AM / 28



# Real production/consumption





# Case of household in CV (2,2 kW PV without storage)



## RETScreen Financial Analysis - Power project

Financial parameters		
<b>General</b>		
Fuel cost escalation rate	%	8.0%
Inflation rate	%	8.0%
Discount rate	%	10.0%
Project life	yr	25
<b>Finance</b>		
Incentives and grants	€	
Debt ratio	%	80.0%
Debt	€	8,644
Equity	€	2,161
Debt interest rate	%	8.00%
Debt term	yr	10
Debt payments	€/yr	1,288
<b>Income tax analysis</b>		
Effective income tax rate	%	
Loss carryforward?		No
Depreciation method		Declining balance
Half-year rule - year 1	yes/no	Yes
Depreciation tax basis	%	
Depreciation rate	%	
Tax holiday available?	yes/no	No
<b>Annual income</b>		
<b>Electricity export income</b>		
Electricity exported to grid	MWh	4
Electricity export rate	€/MWh	300.00
Electricity export income	€	1,156
Electricity export escalation rate	%	4.0%

Project costs and savings/income summary			
<b>Initial costs</b>			
Feasibility study	4.6%	€	500
Engineering	4.6%	€	500
Power system	67.8%	€	7,323
Balance of system & misc.	23.0%	€	2,482
<b>Total initial costs</b>	<b>100.0%</b>	<b>€</b>	<b>10,804</b>
<b>Annual costs and debt payments</b>			
O&M		€	73
Fuel cost - proposed case		€	0
Debt payments - 10 yrs		€	1,288
<b>Total annual costs</b>		<b>€</b>	<b>1,361</b>
<b>Periodic costs (credits)</b>			
Inverter-controller - 10 yrs		€	1,506
<b>Annual savings and income</b>			
Fuel cost - base case		€	0
Electricity export income		€	1,156
<b>Total annual savings and income</b>		<b>€</b>	<b>1,156</b>

Yearly cash flows			
Year	Pre-tax	After-tax	Cumulative
#	€	€	€
0	-2,161	-2,161	-2,161
1	-165	-165	-2,326
2	-123	-123	-2,448
3	-80	-80	-2,528
4	-35	-35	-2,563
5	11	11	-2,552
6	59	59	-2,493
7	108	108	-2,385
8	159	159	-2,226
9	211	211	-2,015
10	-2,987	-2,987	-5,002
11	1,609	1,609	-3,392
12	1,667	1,667	-1,725
13	1,726	1,726	-1
14	1,787	1,787	1,788
15	1,850	1,850	3,638
16	1,915	1,915	5,553
17	1,981	1,981	7,535
18	2,050	2,050	9,584
19	2,120	2,120	11,705
20	-4,829	-4,829	6,876
21	2,266	2,266	9,142
22	2,342	2,342	11,485
23	2,420	2,420	13,905
24	2,500	2,500	16,404
25	2,581	2,581	18,985



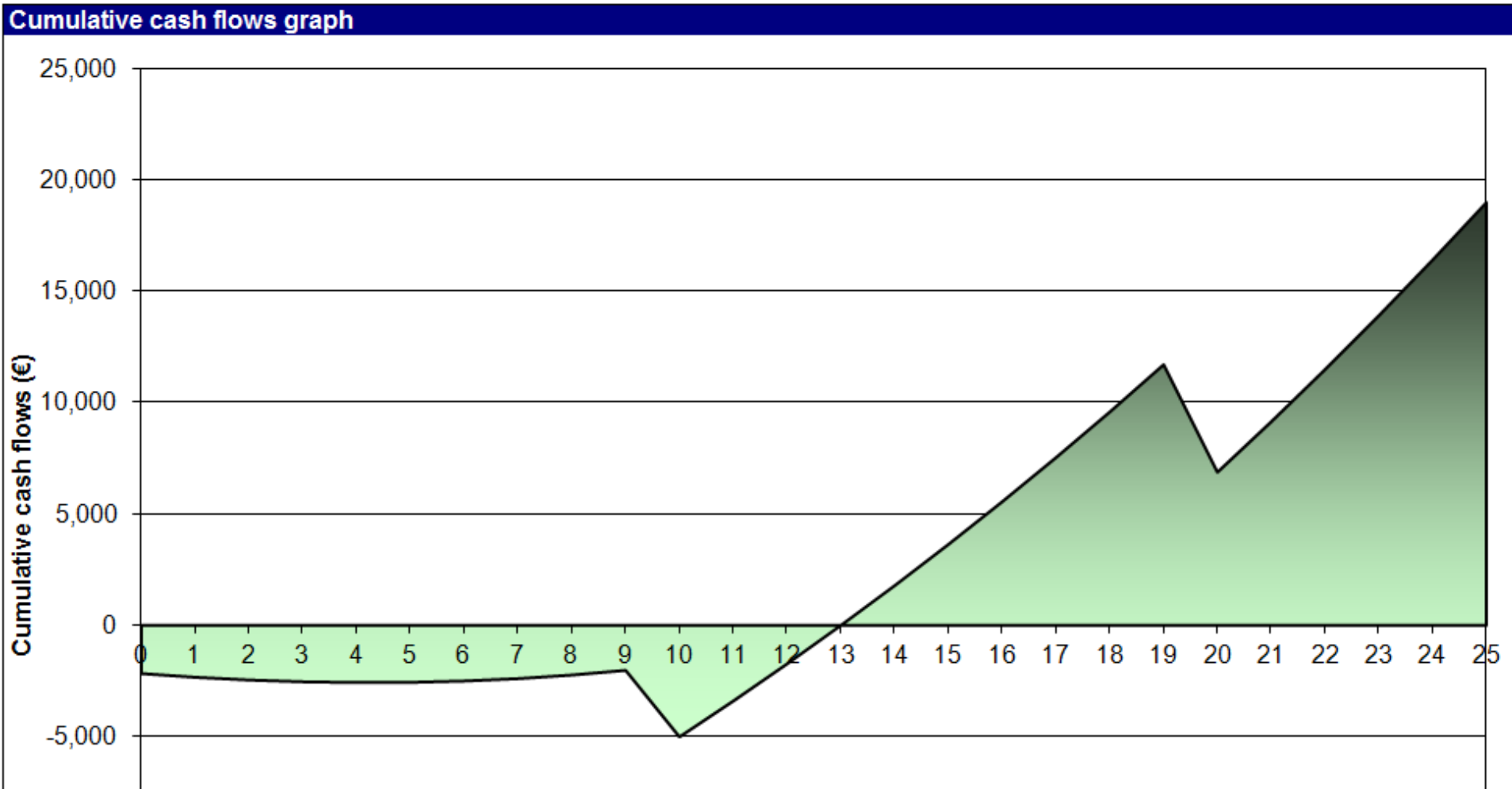
# Case of household in CV (2,2 kW PV without storage)



Financial viability		
Pre-tax IRR - equity	%	12.7%
Pre-tax IRR - assets	%	3.6%
After-tax IRR - equity	%	12.7%
After-tax IRR - assets	%	3.6%
Simple payback	yr	10.0
Equity payback	yr	13.0
Net Present Value (NPV)	€	1,283
Annual life cycle savings	€/yr	141
Benefit-Cost (B-C) ratio		1.59
Debt service coverage		-1.32
Energy production cost	€/MWh	274.52
GHG reduction cost	€/tCO <sub>2</sub>	(53)



# Case of household in CV (2,2 kW PV without storage)







# Video of the installation





# Merci! Thank you! Muito Obrigado!

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