Expert Group Meeting

Sustainable consumption and production: Energy Efficiency, focusing on the “Means to Upscale Energy Efficiency projects in the Building Sector

Lessons learned from the Prosol program for the development of solar water heater market in Tunisia

26 september 2012

Rafik MISSAOUI, Alcor
Presentation plan

- Main market barriers
- Outlook on solar water heater market history in Tunisia
- PROSOL mechanism presentation
- Impacts of the program
- Conclusion: key lessons
Main market barriers

SWH development in some countries

Taux de pénétration du CES dans différents pays en 2010

Source: Rafik Missaoui (compilation de plusieurs sources de données : ESTIF, AIE, statistiques pays, etc.)
Main market barriers

Economic barriers

- Low profitability of SWH for the end user
  - Subsidized conventional energy tariffs

- Investment barriers
  - Low investment capacity of households
  - No easy access to bank credit
Main market barriers

Tariff effects on the profitability for the end user

LPG Tariff and SWH profitability for the end users
Main market barriers

Tariff effects on the market development

<table>
<thead>
<tr>
<th>Country</th>
<th>m²/1000 inh</th>
<th>Tariff LPG (€/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tunisia</td>
<td>50</td>
<td>Regulation effect</td>
</tr>
<tr>
<td>Morocco</td>
<td>100</td>
<td>Incentive effect</td>
</tr>
<tr>
<td>Turkey</td>
<td>150</td>
<td>Tariff effect</td>
</tr>
<tr>
<td>Isreal</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Jordan</td>
<td>250</td>
<td></td>
</tr>
</tbody>
</table>

Main market barriers

Tariff effects on the market development
Main market barriers
Investment cost barriers

Average SWH price in different countries in 2008

$/m² of collectors

Source: ESTIF, adapted by ALCOR
Main market barriers
Investment cost barriers

Average price of SWH in different countries in 2008
Parity of Power Purchase

Source: ALCOR, 2009

$ ppp/m² of collector

France 1 071
Allemagne 877
Portugal 905
Autriche 795
Italie 673
Maroc 1 547
Espagne 676
Finland 464
Tunisie 1 127
Grèce 372
Chypre 490
Turquie 547
Israel 344

Source: ALCOR, 2009
Outlook on solar water heater market development in Tunisia

Evolution of installed thermal solar collectors index

Index (%)

Base 1985

83000 m²

Fiscal incentives (VAT = 0 and CD = 10%)
Specific credit system (via STEG)
No investment subsidies
One public supplier and no private
No quality control system

2350 m²  5494 m²  328 m²  17000 m²  7500 m²

Rafik Missaoui, 2011
PROSOL SWH mechanism presentation
The financial mechanism

A public investment subsidy
- Improve the pay back period for the end-user
- Sustainable resources for the subsidy: the National Fund for Energy Conservation
- Flat subsidy to avoid price inflation: 55 €/m² of collector
- Optimization of the Subsidy size: **Win – Win subsidy**

A loan to end user
- Remove the constraints of limited household capacity of investment
- Good sizing of the loan period in order make the monthly reimbursement equal to the energy bill reduction: 5 years
- Reimbursement through the electricity bill to enlarge the eligible households

CDM revenues
- Prosol program is under validation as a CDM Program of Activity
Pay back period of the public subsidy for the State according to international energy price

International energy price ($/barrel) vs. Pay back period for the State (years)

PROSOL SWH mechanism presentation

Profitability of the subsidy for the State
### Market driven prices of SWH

<table>
<thead>
<tr>
<th>Loans</th>
<th>DT</th>
</tr>
</thead>
<tbody>
<tr>
<td>550</td>
<td>550</td>
</tr>
<tr>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>950</td>
<td>950</td>
</tr>
<tr>
<td>1150</td>
<td>1150</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subsidies</th>
<th>DT</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

**Initial payment** = (SWH cost + administrative fees) - (Subsidy + Loan) - Management fees - Initial payment

<table>
<thead>
<tr>
<th>Monthly reimbursement on electricity bill (DT)</th>
<th>DT</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
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<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>
PROSOL SWH mechanism presentation

Financial scheme of SWH: example

SWH 200 L
Basic price: 1150 DT

Credits
- 550 DT
- 750 DT
- 950 DT
- 1150 DT

Subsidy
- 200 DT
- 400 DT

Initial payment = (SWH cost + files cost) – (Subsidy + credit)

Management fees: 35,400 DT

Monthly reimbursement on STEG bill (DT)
- 10,721
- 14,619
- 18,5
- 22,416
PROSOL SWH mechanism presentation
Financial scheme of SWH: example

SWH 300 L
Basic price: 1650 DT

<table>
<thead>
<tr>
<th>Credits</th>
<th></th>
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<tbody>
<tr>
<td>550 DT</td>
<td></td>
</tr>
<tr>
<td>750 DT</td>
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</tr>
<tr>
<td>950 DT</td>
<td></td>
</tr>
<tr>
<td>1150 DT</td>
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</tbody>
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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>200 DT</td>
<td></td>
</tr>
<tr>
<td>400 DT</td>
<td></td>
</tr>
</tbody>
</table>

Initial payment = (SWH cost + Mg Fees) – (Subsidy + credit)

Management fees: 35,4 DT
Initial payment: 100 DT

Monthly reimbursement on STEG bill (DT)

<table>
<thead>
<tr>
<th></th>
<th>10,721</th>
<th>14,619</th>
<th>18,518</th>
<th>22,4 DT</th>
</tr>
</thead>
</table>

- PROSOL SWH mechanism presentation
- Financial scheme of SWH: example
Accreditation of the suppliers on the base of eligibility criteria
- Being a Tunisian company
- Financial solidity
- Human capacities, etc.

Accreditation of SWH models: certification from a recognized laboratory

Accreditation of installer based on capacity skill

Control of a random sample of 10% of the new installed SWH

Guarantee of the SWH by the supplier: 5 years for the collector and 10 years for the tank
PROSOL SWH mechanism presentation

Institutional organization

- National Agency for Energy Conservation
  - Program coordinator
  - Quality control
  - Subsidy Management
  - Awareness and capacity building

- STEG (Utility)
  - Credit umbrella
  - Reimbursement collection
  - Loan guarantee

- Bank (private)
  - Provide funds to the Utility
  - Tender base selected

- Suppliers / installers
  - Market development
  - Turnkey SWH installation
PROSOL mechanism presentation

Loan reimbursement collection through the electricity bill

1. Customer identification
2. Subsidy payment
3. Simple Contract signature on many copies
4. PROSOL MIS sharing
5. Transfer order
6. Payment of suppliers
7. Loans Reimbursements

Suppliers

Contract transfer registration in STEG customer MIS

Bank

Frame Agreement Credit line open to STEG

SWHS Customers

Utility customer
PROSOL SWH mechanism presentation
Contractual schedule of supplier payment

1. **Aug**
   - Validation of doc by ANME

2. **Sep**
   - Doc sent to STEG
   - Payment of Subsidy

3. **Oct**
   - Transfer order from STEG to bank
   - Credit validation

4. **Nov**
   - Transfer to suppliers

Legend:
- (m) | (m+1) | (m+2) | (m+3)
Impact of PROSOL program

Economic impact

Employment and industry development

- From 6 suppliers (1 producer) in 2004 to more than 40 suppliers in 2012 with 6 producers (80% of the market) + export
- Around 4000 employments
- 20 SWH models in 2004 to more than 120 models in 2010

Energy and environment impact

- 65 koe/m²/year
- 150 keCO2/m²/year
- Public subsidy reduction to LPG: around 20 €/m²/year
Impact of PROSOL program
Price decreasing

Evolution of current and constant prices of SWH in Tunisia
1996-2008

Current prices (Observed)
Constant prices
Annual market

Impact of PROSOL program
Price decreasing
Conclusion

- A need for clear and strong economic signal to the end user
- Large scale SWH market needs specific and innovative financial and institutional mechanisms
- Stick as much as possible to the market rules to avoid market distortion
- These mechanisms have to be based on a stakeholders win – win approach
- They have to be negotiated with all key stakeholders under a transparent process based on a good comprehension of their interest
- Need for a clear definition of the role of stakeholders and their responsibilities on the base of a detailed manual of procedures
Conclusion

- Good assessment of the **financial risk** and designate **who will take it**.
- **Learning process** and Step by step development approach
- Need for human resources to develop the large scale program
- Quality control to make the end user confident at the beginning of the process
- Awareness and capacity building
- Do not take risk with **emerging** and not confirmed technology
- Take profit from CDM opportunity
Thank you