Estimated economic benefits and job creation potential of the Moroccan Solar Plan

Christoph Kost
Fraunhofer Institute for Solar Energy Systems ISE, Freiburg, Germany

Rabat, Morocco, 01.06.2011
www.ise.fraunhofer.de
Research, Development and Services at Fraunhofer ISE

Research
Materials Modelling Methods

Development
Components, Prototypes, Systems, Procedures

Services
Consulting, Tests Monitoring Quality Assurance
Overview
Benefits of Moroccan Solar Plan

1. Introduction to assessment

2. Results: Economic benefits and job creation (MENA)

3. Results for Morocco

4. Conclusions
Effects of CSP growth – Economic assessment

CSP projects in MENA can give benefits to the region:

- Creation of new jobs in RE industry
- Economic impact
- International trade
- Increase of technical know-how
- Energy security

Dynamic economic model approach that considers a stable local market based on three different scenarios:

- Technological assessment of production processes and value chain analysis
- Market potential / market scenarios
- Reference plant
- Status-quo of local manufacturing in CSP projects
- Component specific potential for local manufacturing

Source: Acciona
How do different scenarios for CSP market deployment in North Africa effect local markets?

- Scenarios cover different cases of market development
- Different implications on local economic benefit
- Effects on realization of local supply and component manufacturing
High cost share of key solar components and services – Reference Plant – Parabolic Trough 50 MW

Data:
- Parabolic Trough technology from Spanish market
- 50 MW with storage for 7 hours
- Total investment 364 Mio US$ in 2010
- Future cost reductions depending on world scenario (16 - 40 % by 2020)
- Plant is used for component values

This reference plant was used to calculate economic and social effects in MENA region.
Assumption of created jobs during construction per reference plant

- Total jobs (one year basis) are calculated at 1580 in reference plant in year 2010
- Indirect job creation in supply industry for components of 300 – 400 jobs per year
Different status-quo of CSP local manufacturing

- Current status-quo by evaluating current ISCCS projects
- Findings have been transferred to a virtual 50 MW reference plant.
- Conclusion: Very different status-quo has to be considered: 43 % compared to 18 %

Approach:
- All components with local content have been identified.
- ISCCS plants in Egypt, Morocco and Algeria have been assessed.
- Cost structure and job effects of reference plant were used.
Overview
Benefits of Moroccan Solar Plan

1. Introduction to assessment
2. Results: Economic benefits and job creation (MENA)
3. Results for Morocco
4. Conclusions
Component specific roadmap in the model

<table>
<thead>
<tr>
<th>Scenario A and B:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pylons, Foundation, Support structure (Egypt)</td>
<td>Metal support structure, EPC (Egypt)</td>
<td>EPC (rest)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Scenario C:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pylons, Foundation, Support structure (Egypt)</td>
<td>Metal support structure, EPC (rest)</td>
<td>Mirrors, Swivel joints, Receiver</td>
<td>Project development, Management</td>
</tr>
</tbody>
</table>

- Low market growth in scenario A and B will influence components manufacturing.

- Additional competences and know-how would be shifted to MENA region when large market attracts new investment and new capacities.
Medium market shows acceptable local share – in best case scenario high participation of local industry.

- Local manufacturing for many components and services possible
- But: Attractive market size is required to create local industry with national and international companies in MENA market

Remarks:
- Average values for all countries (see different status-quo)
- Some projects with up to 80% local participation possible

~ 60%
Cumulated jobs (1-year) between 30,000 and 180,000 could be generated by 2020

- Up to **14,3 Bill US$** locally generated revenues in 2020 in best case scenario possible, up to **57% average local share** in 2025 possible
- Increase of local participation gives new employment opportunities in RE sector (60,000 to 80,000 permanent).
- O&M Jobs are permanent over at least 25 years
If same components that are also manufactured for local markets will be exported to EU, USA or MENA (2 GW by 2020, 5 GW by 2025), that leads to revenues up to 10 bn US$ for local CSP industry.

International market integration and new business opportunities for the region.
Overview
Benefits of Moroccan Solar Plan

1. Introduction to assessment
2. Results: Economic benefits and job creation (MENA)
3. Results for Morocco
4. Conclusions
Support and benefits of Moroccan Solar “Plans”

- **2011**
  - 1. Tranche
    - Ouarzazate
    - 500 MW
  - Support required

- **2015**
  - 2 GW
  - Long-term
    - Desertec roll-out
    - Different Sites
  - Economic and social benefits
Economic model results for Morocco

Local Share (Morocco)

Szenario Assumptions

CSP in Morocco
- 2100 MW by 2020
- 5500 MW by 2025

Local revenues:
- By 2020 : 4.6 bn$
- By 2025 : 14.2 bn$

Total jobs (permanent)
- 2020 : 11,000
- 2025 : 23,000
Summary – CSP in Morocco

Morocco could benefit from a new, high potential industry if the country’s advantages are exploited and the barriers can be overcome:

- The overall high potential for the application of the CSP technology itself
- Proximity to other booming markets and unique position close to Southern Europe
- Cost advantages
- Average share of locally added value ranges from 18% in 2010 to 60% in 2025.
- Experience of international CSP actors in the region
- Market demand is main driver of local manufacturing
Thank You Very Much for Your Attention!

Fraunhofer Institute for Solar Energy Systems ISE

Christoph Kost

Christoph.Kost@ise.fraunhofer.de
www.ise.fraunhofer.de
Fraunhofer Institute for Solar Energy Systems ISE

Director: Prof. Eicke R. Weber
Staff: 1000
Budget: €55 million 42% from industry
Established: 1981 Freiburg, Germany

Business Areas:
- Silicon Photovoltaics
- Alternative Photovoltaic Technologies
- Solar Thermal Technology
- Renewable Power Supply
- Applied Optics and Functional Surfaces
- Hydrogen Technology
Economic results of CSP market growth

<table>
<thead>
<tr>
<th>in Mio US$ (cumulated)</th>
<th>2012</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>Local share by 2025</th>
<th>Cost reduction by 2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scenario A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct</td>
<td>30</td>
<td>193</td>
<td>916</td>
<td>1,498</td>
<td>25.7 % ~ 16 %</td>
<td></td>
</tr>
<tr>
<td>indirect</td>
<td>20</td>
<td>125</td>
<td>571</td>
<td>946</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scenario B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct</td>
<td>61</td>
<td>465</td>
<td>2,163</td>
<td>3,495</td>
<td>30.6 % ~ 16 %</td>
<td></td>
</tr>
<tr>
<td>indirect</td>
<td>39</td>
<td>251</td>
<td>1,167</td>
<td>1,959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scenario C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>direct</td>
<td>368</td>
<td>2,803</td>
<td>14,277</td>
<td>45,226</td>
<td>56.6 % ~ 40 %</td>
<td></td>
</tr>
<tr>
<td>indirect</td>
<td>206</td>
<td>1,403</td>
<td>6,999</td>
<td>21,675</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Economic benefit depends on market growth and realized local manufacturing
- Benefit have different levels based on industry potential

- Up to **14,3 Bill US$** locally generated revenues in 2020 in best case scenario possible
- Up to **57 % average local share** in 2025 possible