Local Content in CSP/CST Projects: Assessment of the Chilean Industry

Felipe Cuevas¹, Rodrigo Vásquez², Rodrigo Mancilla¹, Tomás Baeza¹, Pablo Tello¹

¹ Chilean Solar Committee - CORFO
² Senior Advisor of GIZ’s Energy and Renewable Energy Program

24th Solarpaces Conference
2-5 October 2018
Casablanca, Morocco
ABOUT THE CHILEAN SOLAR COMMITTEE

- Chilean Government Agency (Created by Corfo, Chilean Economic Development Agency)
- Promote the development of a national solar energy industry
- Increase the competitiveness, productivity, technological capabilities, and markets of the country
- Promote the characteristics of Atacama Desert and its great solar resource
ABOUT GIZ

- German agency for international cooperation
- 28 years in Chile. Since 2004 with focus on energy
- Study within the scope of the 4e program: Renewable Energy and Energy Efficiency in Chile

<table>
<thead>
<tr>
<th>Project</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar energy, CPS-CST and large scale PV</td>
<td>2014 - 2019</td>
</tr>
<tr>
<td>Self-Supply Renewable Energy in Chile</td>
<td>2015 – 2019</td>
</tr>
<tr>
<td>Cogeneration for industrial applications</td>
<td>2015 - 2019</td>
</tr>
<tr>
<td>Global carbon market</td>
<td>2017 - 2018</td>
</tr>
</tbody>
</table>
MOTIVATION OF THE STUDY

Great solar energy resource in the northern part of the country

Presence of a mining sector, which has been the main driver of an industry development in the region

Is it possible to develop a solar concentration industry, able to provide services and components in Chile?
CSP/CST PROJECTS IN CHILE

Two projects in operation

Minera Centinela (ex-Tesoro)
Antofagasta Region
PT-1 solar thermal system (Abengoa)
18,000 m² aperture, equivalent to 7 MWth
3 storage tanks, 120 m³ each
Heat supply for electro-winning process

Local content:
Civil works, collector assembly, cables, insulation, piping, storage tanks

Jucosol
Valparaíso Region
LAT73 solar thermal system (3M)
700 m² aperture, equivalent to 500 kWth
1 storage tanks, 50 m³
Heat supply for grape juice production

Local content:
Civil works, collector assembly, heat exchangers, cables, insulation, piping, storage tanks, flexible joints, anti-seismic design
CSP/CST PROJECTS IN CHILE

One project under construction

Cerro Dominador (110 MW)
Antofagasta Region
10,600 heliostats, 140 m² each (1,480,000 m²)
1 cold storage tank. 22,000 m³ @290 ºC. Carbon steel
2 hot storage tanks. 2 x 12,000 m³ @560 ºC. Stainless steel
Tower: 218 m height
Receiver: 32 m height

Local content:
Tower structure. Anti-seismic design, assembly
50,000 ton solar salts
Heliostat assembly. Rioglass installed an assembly warehouse.
Local workers from the region
Civil works, raw materials for foundations.
CSP/CST PROJECTS IN CHILE

Eight projects under development

- 7 projects, 2075 MW with environmental approval
- 1 project, 400 MW under environmental evaluation

CSP technology development in Chile dominated by solar towers
- 5 solar tower projects, 1645 MW
- 3 parabolic trough projects, 730 MW

Each project with at least 10 hours of storage. Solar salts might be provided by local suppliers

METHODOLOGY

- Identification of the value chain

- Information about components: raw materials, manufacturing process, synergies with other industries

DLR. Potential for developing a manufacturing industry for CSP/CST in Chile
Three reports: Value chain description; CSP manufacturing requirements; Validation by Companies and Recommendations
METHODOLOGY

- Interviews with companies that have been involved in existing projects
- Identification of the challenges they have faced.

- Interviews with companies that have the potential for providing either components or services
- Exhaustive search including companies sponsored by Corfo and databases from sectorial associations

ASIMET: Metallurgical and Metal-mechanic Industry Association
SOFOFA: Federation of Chilean Industry
ACERA: Chilean Association for Renewable Energy
AIA: Industry Association from the Antofagasta Region
- Assessment has been published in a document (in Spanish)
  Available online
  https://4echile.cl/documentos/Potencial-industrial-de-Chile-para-industria-solar-web.pdf

- Information about 25 companies willing to be part of the value chain of CSP/CST projects
- Barriers
- Proposal for actions
Publication of the technical information about the companies

Name and address

Contact

Main products

Machinery and manufacturing process available

- **Bosch S.A.**
  - **Main products**: Machinery and manufacturing process available
  - **Contact**: Fernando Valderrama
  - **Cargo**: Jefé Comercial
  - **Teléfono**: +56 2 2620 8820
  - **e-mail**: navilejos@bosch.cl

- **Components CSP/CST manufactured**: Sheet, pipes, tubes, wires, rods, sheets, plastic, etc.
- **Experience in CSP/CST projects**: Design, manufacturing, installation, commissioning, operation, maintenance, and lifetime extension.
- **Experience in other projects**: Various projects related to CSP/CST technologies.

- **Production capacity**: 1.000,000 tons per year of galvanized steel.


Observations

- **Experience in other projects**: Various projects related to CSP/CST technologies.

- **Market share**: 50-60% of the mercado nacional de galvanizado.

- **Sinergies with CSP/CST products**: Compatibility with CSP/CST technologies.

- **Potential CSP/CST products**: Variety of CSP/CST products and components.

- **Production capacity**: 1.000,000 tons per year.

- **Experience in other projects**: Various projects related to CSP/CST technologies.

- **Level of willingness detected**: High willingness to collaborate and share knowledge.

- **Certifications**: Various certifications related to quality and safety standards.

- **Potential CSP/CST products**: Variety of CSP/CST products and components.
**COMPONENTS FEASIBLE TO BE MANUFACTURED IN CHILE**

<table>
<thead>
<tr>
<th>Component</th>
<th>Production capacity</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel structures</td>
<td>117,600</td>
<td>ton/year</td>
</tr>
<tr>
<td>Flat mirrors (4 mm)</td>
<td>700,000</td>
<td>m²/year</td>
</tr>
<tr>
<td>Stainless steel storage tanks</td>
<td>3,440</td>
<td>ton/year</td>
</tr>
<tr>
<td>Carbon steel storage tanks</td>
<td>25,400</td>
<td>ton/year</td>
</tr>
<tr>
<td>Power transformer</td>
<td>2,000</td>
<td>MVA/year</td>
</tr>
<tr>
<td>Thermal insulation (mineral wool)</td>
<td>12,000</td>
<td>ton/year</td>
</tr>
<tr>
<td>Hydraulic pumps</td>
<td>4,000</td>
<td>units/year</td>
</tr>
</tbody>
</table>
BARRIERS

The demand for components depends on the number of CSP/CST projects implemented

Design diversity of some components

The decision to acquire components is made overseas

Lack of knowledge on CSP/CST technologies, their benefits and their potential component demand
PROPOSAL FOR ACTIONS

Promote innovation and development of components

Support pre-investment studies

Promote associativity

Attract foreign technology providers

Dissemination of opportunities created by CSP/CST projects

Education and training
PROPOSAL FOR ACTIONS

Promote innovation and development of components

*Solarbosch*
Two fundings from Corfo granted

Development of a solar tower prototype
Development of an air-cavity receiver
CONCLUSIONS

Construction sector and manufacturing industry are capable of carrying out a significant part of the construction of CSP/CST plants.

Share of local components, plus construction and assembly might represent between 18 and 56% of total CSP costs, excluding O&M (DLR).

Share of storage systems could be significant, given that both salts and tanks can be provided in Chile.

Based on previous experience in the country, it is estimated that the share will be smaller at the beginning (+/- 20%) and increase as Chilean companies gain experience, knowledge and reputation.
Thank You

Felipe Cuevas
felipe.cuevas@codesser.cl
http://www.comitesolar.cl/english

24th Solarpaces Conference
2-5 October 2018
Casablanca, Morocco