Solar Process Heat Systems For Mining
Introduction to ABENGOA
Abengoa (MCE: ABG.B) is an international company that applies innovative technology solutions for sustainable development in the energy and water sectors.

**Energy generation**
- Renewable energy: solar plants (tower, parabolic-trough, solar-gas hybrid, PV) and wind power.
- Conventional generation (combined cycle, cogeneration, biomass, etc.).
- Biofuels (bioethanol, biodiesel, ETBE).

**Transmission and distribution (T&D)**
Large scale transmission systems (AC and DC):
- Transmission lines.
- Electrical substations.

**Water and environment**
- Desalination plants.
- Water treatment and recycling.
- Water transport and distribution.

**Infrastructures & services**
- Electrical and mechanical facilities.
- Transport (railway).
- Manufacturing.
- Commercialization and auxiliary manufacturing.
- Telecommunications.
- Singular buildings.
Introduction to Abengoa

Abengoa Main Magnitudes

Global presence with leadership position recognised by relevant publications (ENR, GWI)

Abengoa has its own network of engineers specialising in different fields and generating synergies among themselves so as to offer the best possible services.

Engineering capacity of ~625,000 man-hours/year

Construction

O&M

Manufacture & procurement

Value chain

+10 GW of installed capacity and over 1.8 GW of conventional generation assets under construction

1.8GW Construction Capacity

10GW Installed

2.5 GW of solar and 232 MW of wind assets completed, and 544 MW of solar under construction

+27,000 km of electric transmission and distribution lines and more than 330 substations over the past 15 years

1.5 Mm³/d

For 7 million

+ 1.5 million m³/day of desalination installed capacity and 690,000 m³/day under construction

332 awarded and filed patents since 2008

For the past 10 years

0 150 300

2011 2012 2013 2014 2015

ABENGOA
Diversified Client Base across Geographies
CSH for Mining Overview
Need for energy in mining

Processes Units which consume energy in mining

- Grinding
- Transport
- Melting
- Drying
- Leaching
- Separation of solvents
- Others

Demand for Heat and Electric Energy that can be supplied from a renewable source

2014 (21.9 TWh)
- Concentrates production: 24%
- Desalination and pumping: 1%
- Smelting: 5%
- LXSEW: 1%
- Open-pit mining: 2%
- Underground mining: 7%
- Refining: 6%
- Services: 6%

2025 (39.5 TWh)
- Concentrates production: 62%
- Desalination and pumping: 3%
- Smelting: 1%
- LXSEW: 4%
- Open-pit mining: 17%
- Underground mining: 2%
- Refining: 4%
- Services: 1%

Fuente: Cochilco, 2014. Evolución del consumo energético en la industria de extracción de cobre
Solar thermal technology is a source of sustainable energy supply for mining

- Production of thermal energy: steam / heat supplies for unit processes
- Production of electric power
- Supplies for 24 hours thanks to thermal energy storage
Need for energy in mining

Thermal Energy Production

Minera El Tesoro - Atacama Desert, Chile
- One of the largest industrial applications of solar thermal technology in the world
- Operational since 2012
- Turnkey delivery to the mining industry
- Thermal energy supplied 24x7 for electro-winning process
- Reduces diesel fuel consumption by 55%
- Eliminates 10,000 tons of CO2 annually

Frito Lay - Modesto, California
- Operational since 2008
- Largest solar thermal system in the United States
- 300 prg to heat oil used to cook Sun Chips

Federal Correctional Institution - Littleton, Colorado
- Operational since 2010
- Thermal energy supplied for domestic hot water heating
- Hot water storage tank allows 24x7 hot water supply

Federal Correctional Institution - Phoenix, Arizona
- Operational since 1999
- Thermal energy supplied for hot water heating for sterilization, laundry and domestic use
- Substitutes net electricity of 1.1 million kWh annually

Solar collector
Recirculation pump
Thermal storage
Feed pump
Process heat consumer
3

CSH for Mining Case Study
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<th>Case Study</th>
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<tr>
<td><strong>Minera El Tesoro project</strong></td>
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<td>• First CSP plant in Chile, largest industrial solar application in the world</td>
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<td>• Turn-key delivery for client site in the Atacama desert</td>
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<td>• Solar array provides thermal energy for 24x7 electro-Mining process unit</td>
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<td>• 24,445 MWht/year (megawatt-hour) through 1,280 PT-1 modules, 6 hectares land usage</td>
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<td>• Replaced 55% of the diesel used in 2 heaters need to raise the temperature of the solutions in electrowinning process</td>
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<td>• Water temperature will rise between 80 to 85 degree Celsius, to transfer the heat to the copper solution</td>
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<td>• Reduction of fuel transport 125 trucks/year</td>
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<td>• Avoiding 10,000 tons CO2 annually</td>
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The advantages of using CSH in remote areas
The advantages of using CSH in remote areas

1. Reliable Supply: By using fully integrated storage, CSH is a solution that reliable and available as conventional technologies, but fueled by the sun.

2. Logistic: Avoid the problems of transporting diesel and Natural gas to remote areas.

3. Reduce the Risks and costs: Reduce the allocation of diesel dollars in the Operating Budget. Integrating storage will eliminate fuel risk while still reducing costs and enhancing sustainability.


Thank you