



ABENGOA

Solar Process Heat Systems For Mining

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1

Introduction to ABENGOA

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

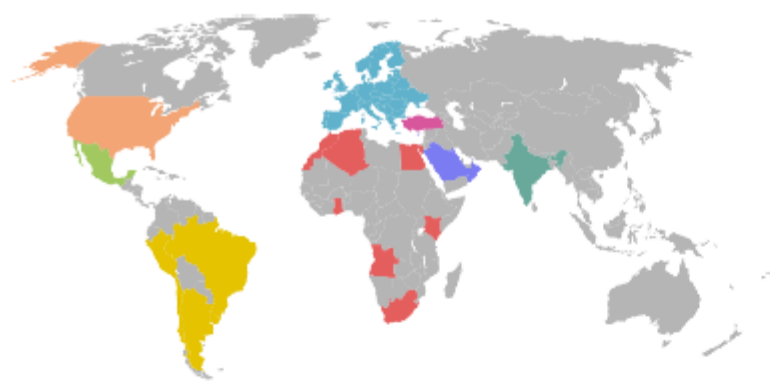
- Desalination plants.
- Water treatment and recycling.
- Water transport and distribution.



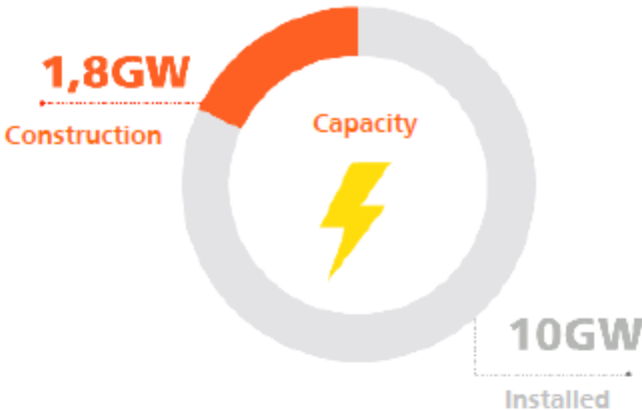
Infrastructures & services

- Electrical and mechanical facilities.
 - Transport (railway).
 - Manufacturing.
- Commercialization and auxiliary manufacturing.
- Telecommunications.
- Singular buildings.





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



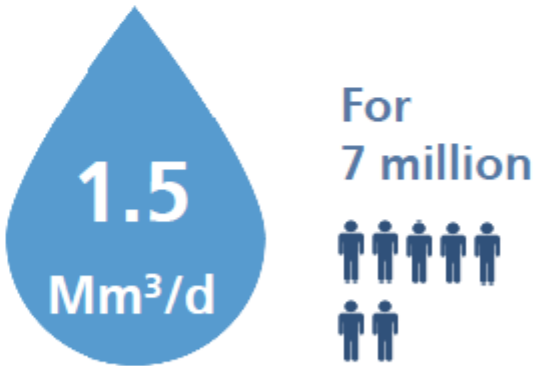
+10 GW of installed capacity and over 1.8 GW of conventional generation assets under construction



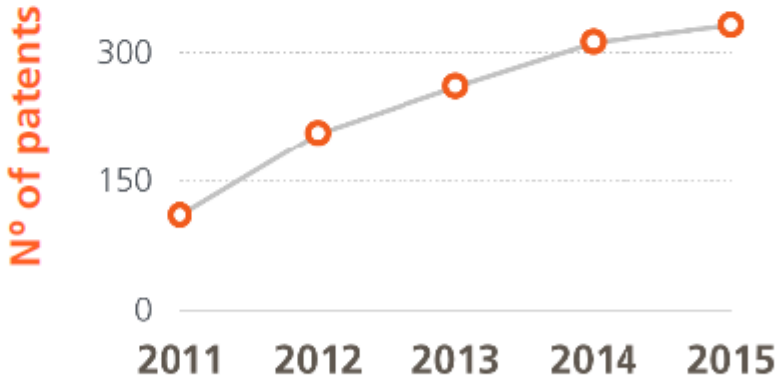
2.5 GW of solar and 232 MW of wind assets completed, and 544 MW of solar under construction



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



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



332 awarded and filed patents since 2008





2

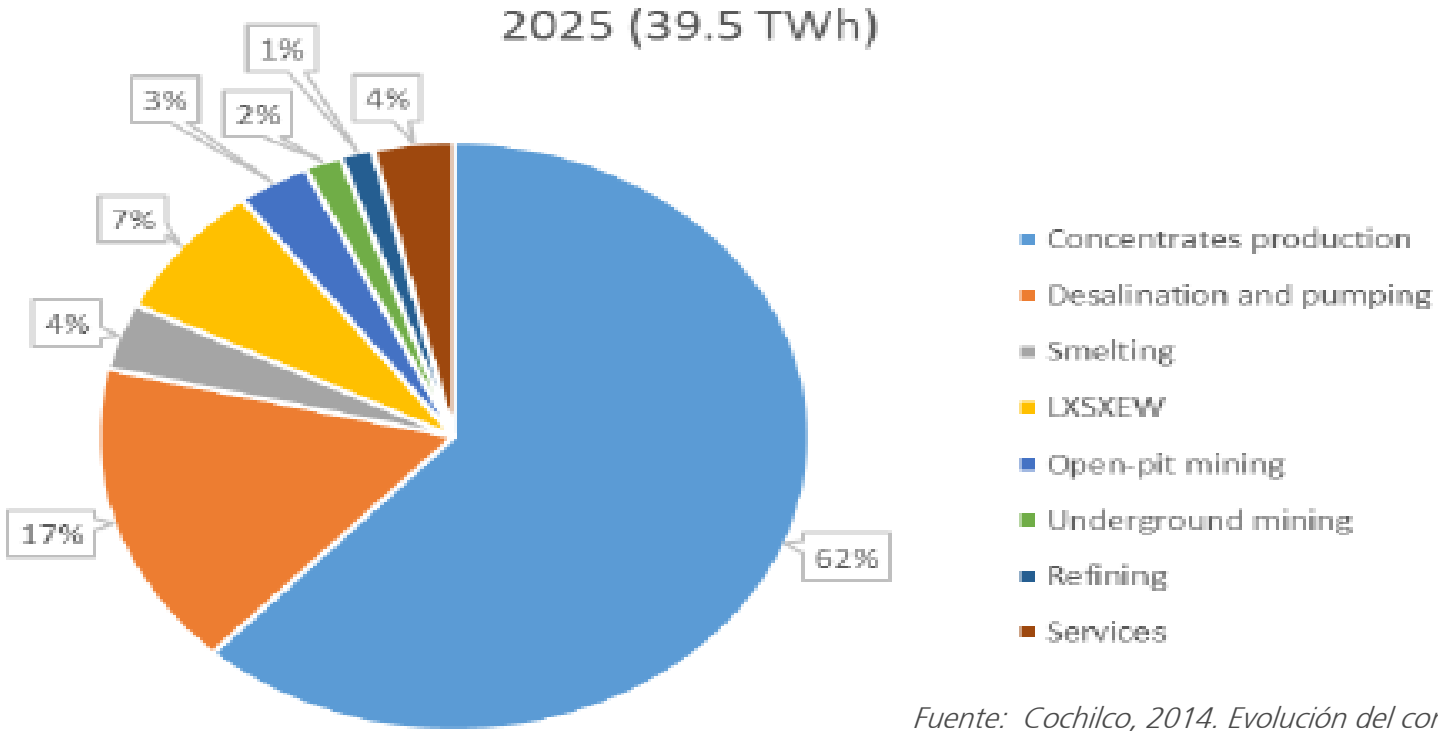
CSH for Mining Overview

Processes Units which consume energy in mining

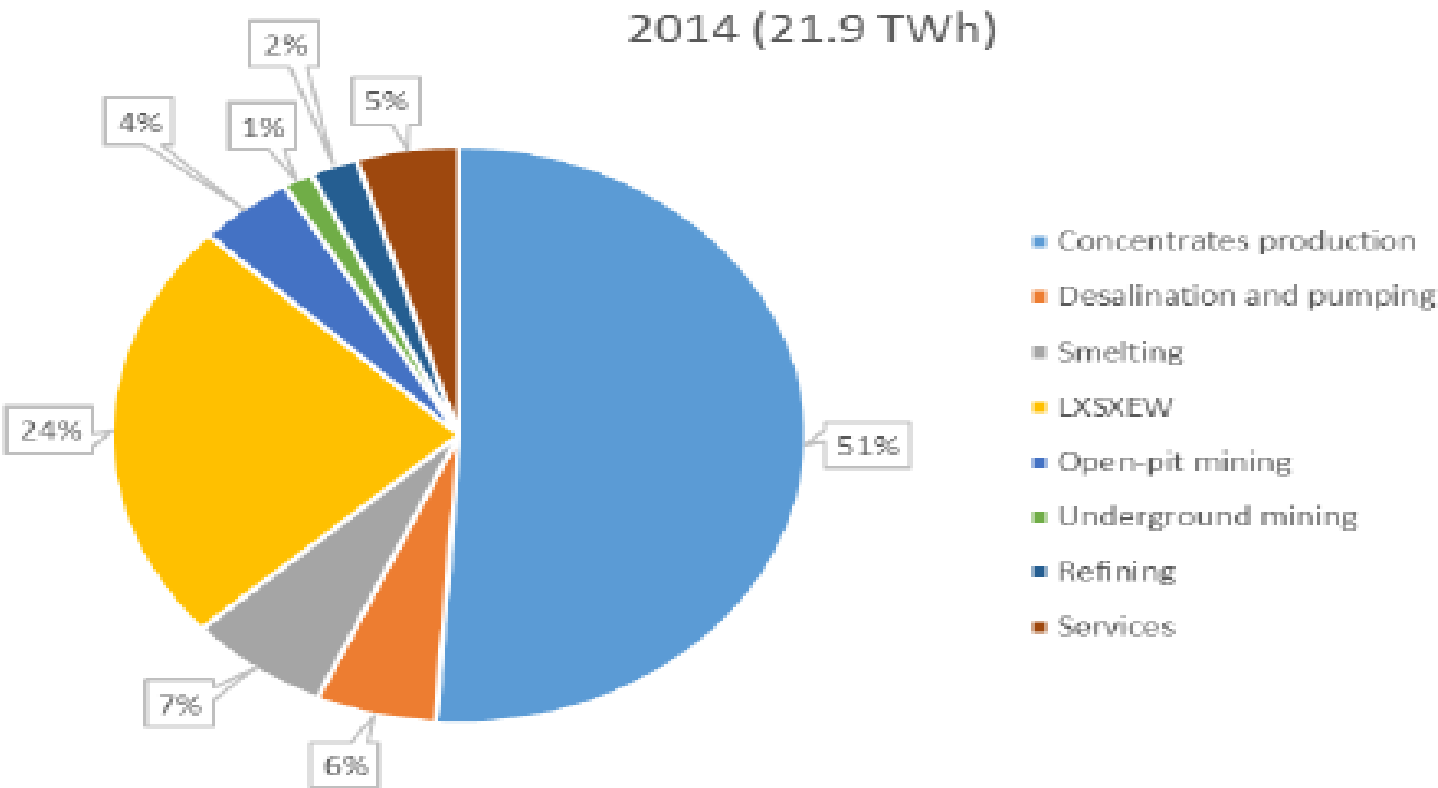
- Grinding
- Transport
- Melting
- Drying
- Leaching
- Separation of solvents
- Others



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

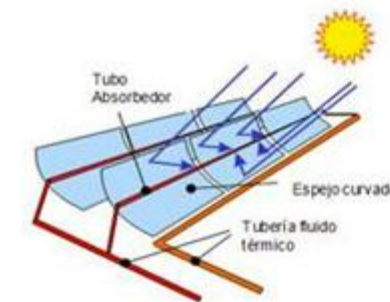
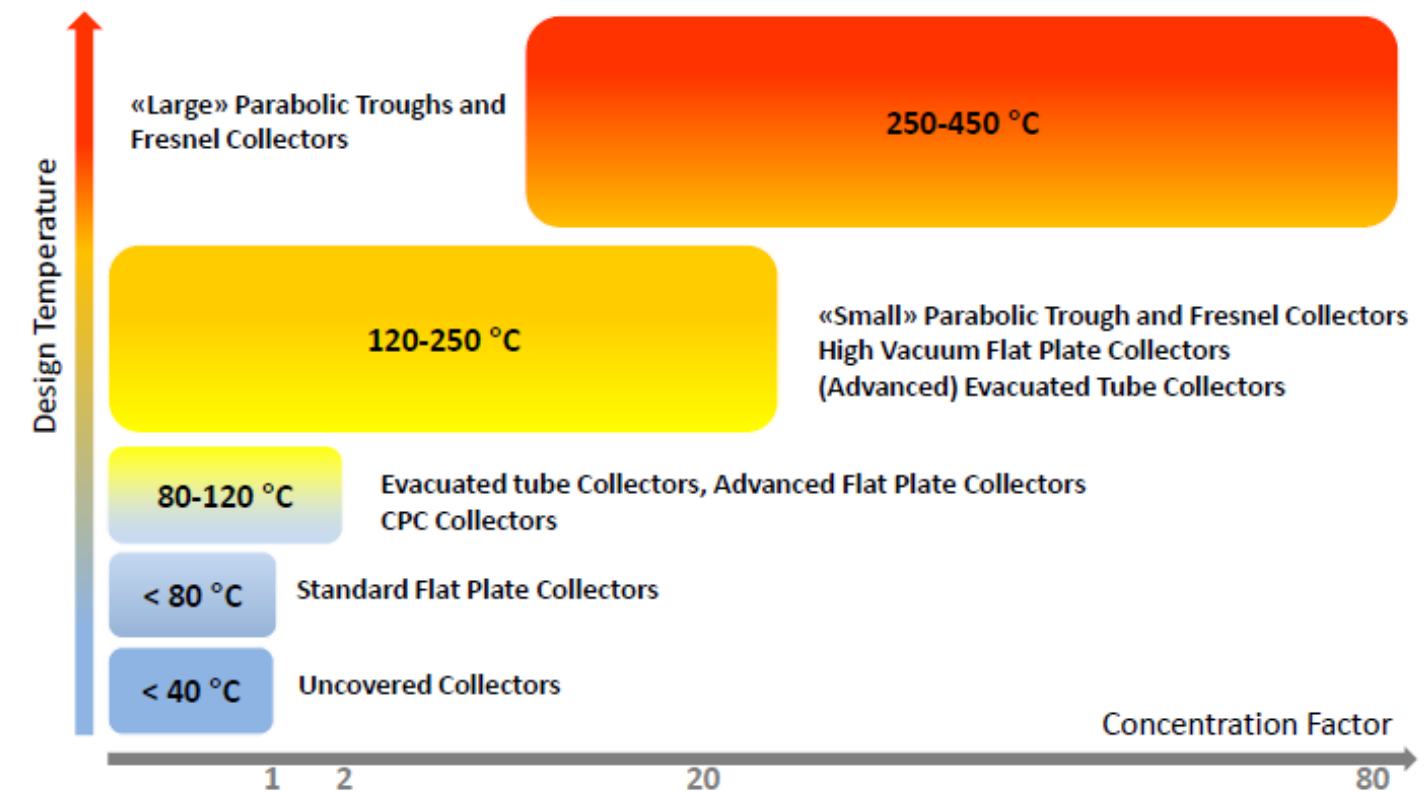


Fuente: Cochilco, 2014. Evolución del consumo energético en la industria de extracción de cobre

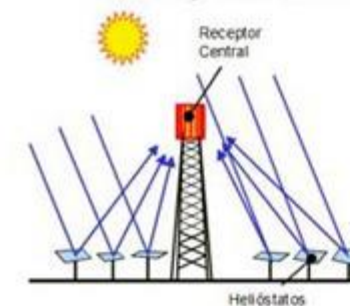


Solar thermal technology is a source of sustainable energy supply for mining

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



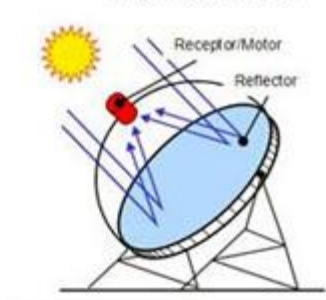
Cilindro-parabólicos



Receptor Central

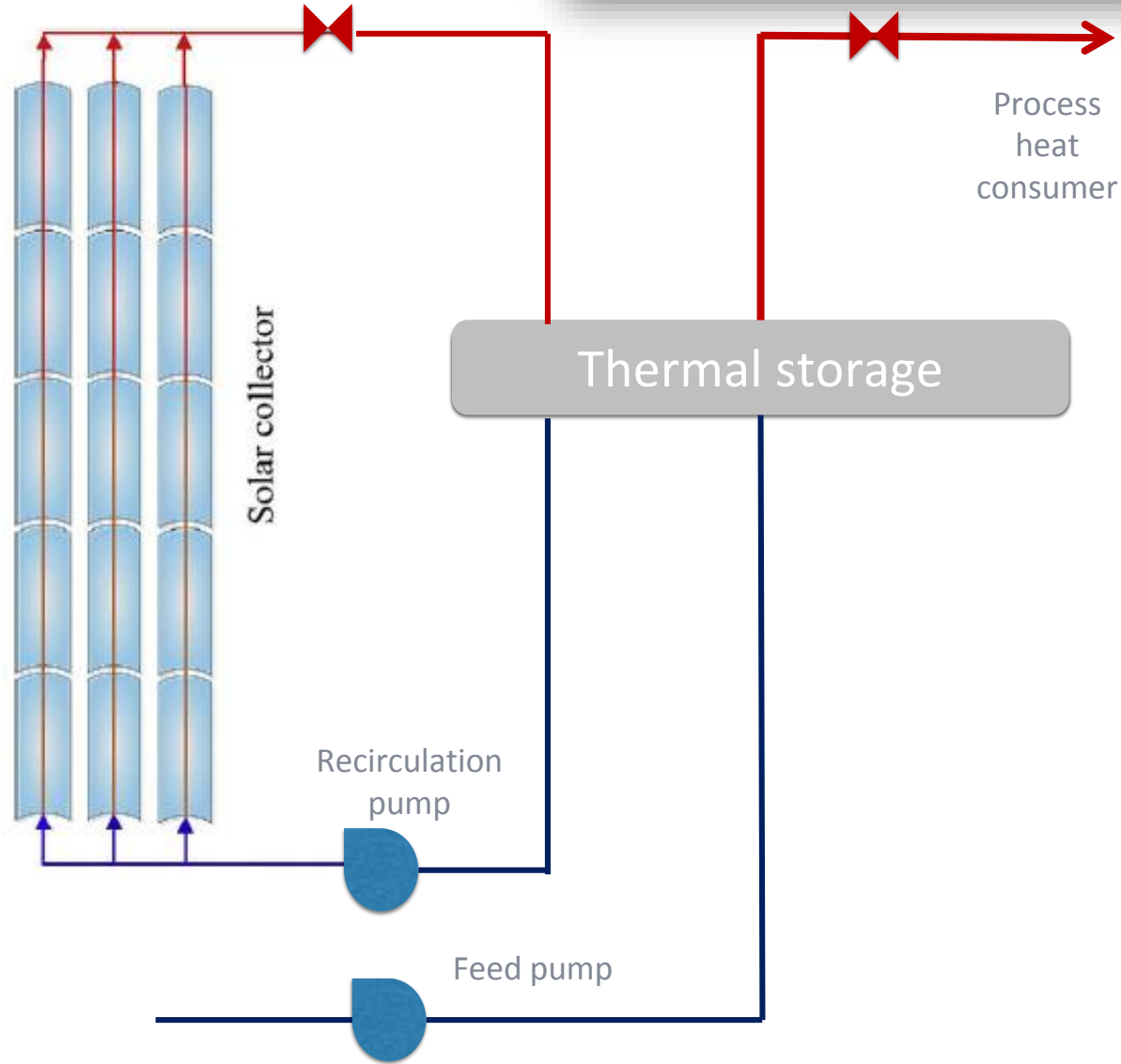


Fresnel Lineal



Discos parabólicos

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



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



Frito Lay - Modesto, California

- Operational since 2008
- Largest solar thermal system in the United States
- 300 psig to heat oil used to cook Sun Chips



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



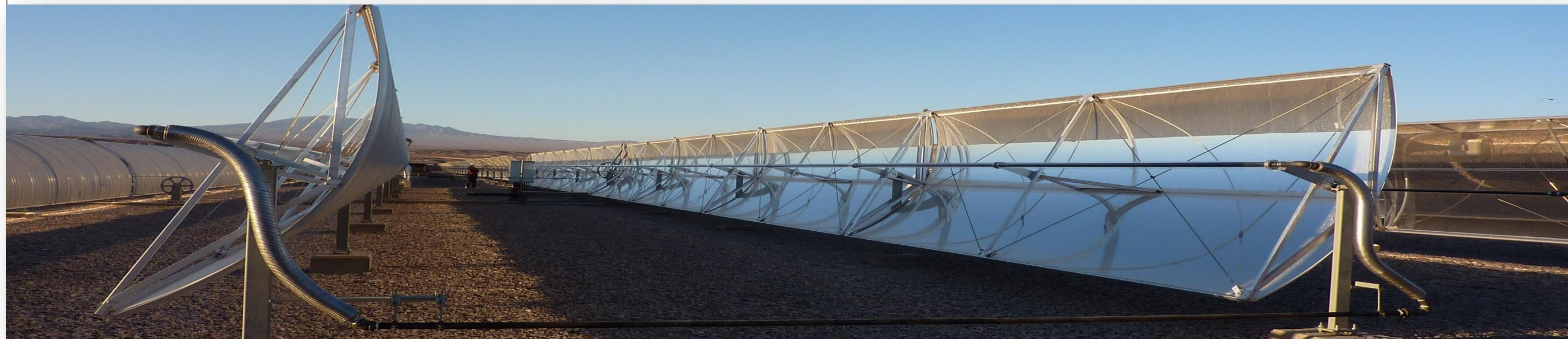


3

CSH for Mining Case Study

Minera El Tesoro project

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





4

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 is reliable and available as conventional technologies, but fueled by the sun.



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.



2. Logistic:

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



4. Environmental:

Reduce carbon emissions.



Thank you

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