



CUPRATHERM

Thermal energy storage system



DEPARTAMENT OF MECHANICAL
AND METALLURGICAL ENGINEERING



INDUSTRIAL SECTOR
ENERGY



DEVELOPMENT LEVEL
TRL 4

PROBLEM



Globally, heat accounts for approximately 50% of final energy consumption and produces about 40% of the energy sector's CO₂ emissions. In Chile, thermal uses represent around 35% of final consumption and rely predominantly on fossil fuels. Although renewable electricity generation has grown significantly - particularly solar and wind generation in the country's northern macro-zone - it has not yet been widely incorporated into industrial thermal processes. Surplus renewable generation is therefore sometimes curtailed and cannot currently be utilized.



Professor(s)
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Intellectual property
Protection strategies under
evaluation.

Development status
TRL 4: laboratory-validated
functional prototype.

SOLUTION



The technology is a battery-based thermal energy storage system that uses copper slag as the storage medium. Conceived as an easy-to-integrate plug-and-play solution, it stores electrical energy during low-cost periods and subsequently supplies it in a controlled manner according to process demand. A control system manages charging and discharging to deliver continuous, stable heat, enabling efficient and flexible decarbonization of industrial thermal processes with low implementation costs.

ADVANTAGES



Higher energy density.



Wide thermal operating
range.



Lower cost and greater
durability, with no
pressurization or severe
corrosion.



More sustainable
through the use of
waste material (copper
slag).

MARKET



The solution targets heat-intensive industries such as mining, food, chemicals, and cement, particularly operations with processes above 100 °C. In Chile, this market represents approximately 40.9 TWh of thermal energy per year. With increasing availability of low-cost renewable electricity, the technology can reduce operating costs by replacing fossil fuels, thereby decreasing exposure to price volatility and helping reduce emissions and meet decarbonization targets.