Heliogen

Replacing Fuels with Sunlight

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Cost-effectively replacing fossil fuels solves the world's CO_2 problem.

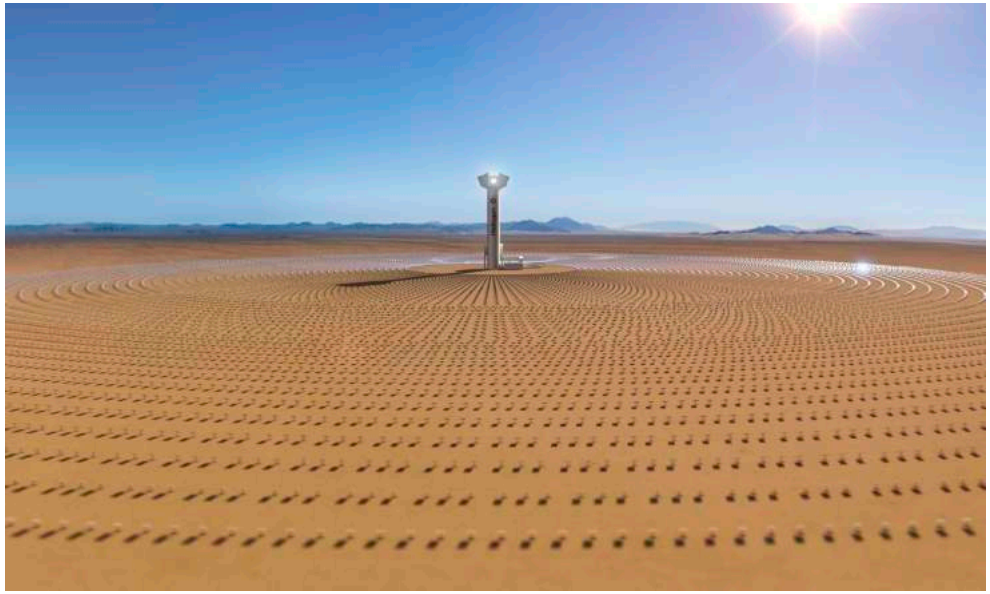
Heliogen develops the technology to do just that.

Existing Decarbonization Pathways for Mining

- Equipment electrification
- Renewable hydrogen
- Renewable electricity PV + batteries
- These solutions are not cost-effective or easy to deploy
- The mining industry needs a cost-effective solution to rapidly decarbonize

The Solution: Heliogen's Sunlight Refinery™

- *Sunlight Refineries* capture, concentrate, and refine sunlight into cost-effective, renewable energy on demand
- *Sunlight Refineries* utilize Heliogen's unique advanced computer vision software to precisely align an array of mirrors (heliostats), reflecting sunlight to a single target with unprecedented accuracy
- *Sunlight Refineries* are modular and can be easily deployed in proximity to mining operations or in remote areas



Photorealistic rendering of Heliogen's Sunlight Refinery

Our Renewable Energy On Demand Products

HelioHeat™

- Carbon-free, ultra-high temperature heat
- Energy is stored thermally as heat in rocks; most cost-effective energy storage available
- Target cost: < delivered natural gas

HelioPower™

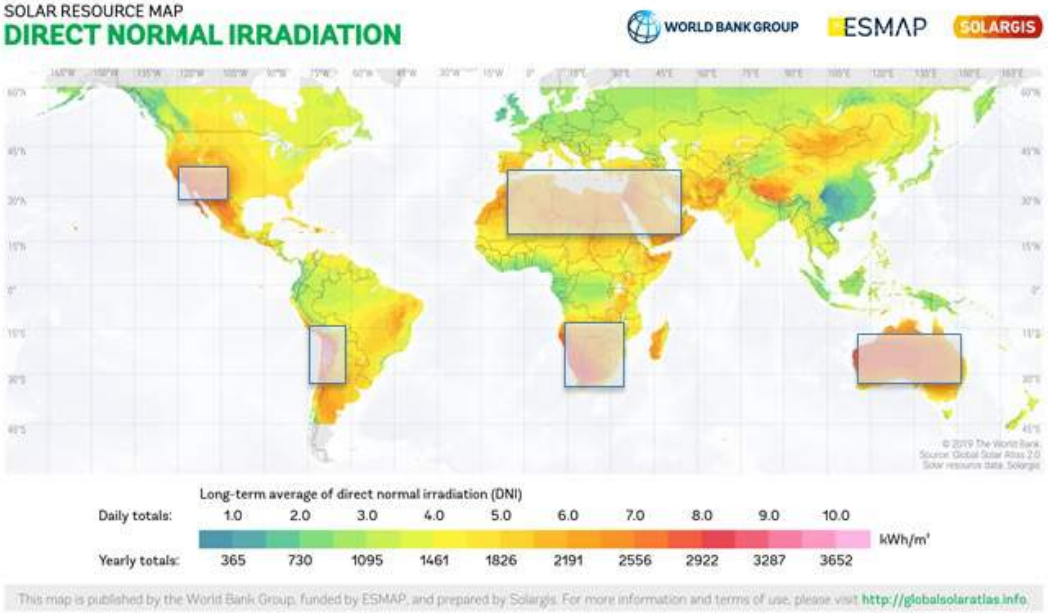
- On demand, low carbon electricity made from concentrated sunlight
- Target cost: < 5¢/kWh

HelioFuel™

- Clean, renewable fuels like green hydrogen
- Around the clock electricity enables near 100% electrolyzer utilization for hydrogen production
- Target cost: < $2/kg

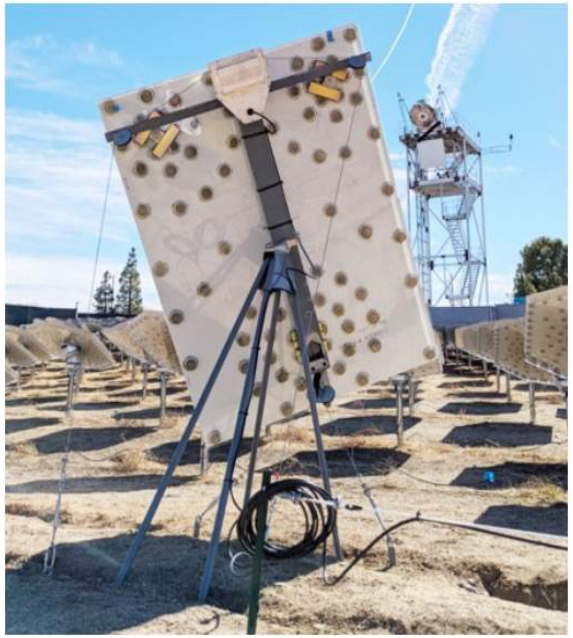
Decarbonizing with Sunlight

- Direct Normal Irradiation (DNI) is a measure of annual solar resource available per m^2
- The greater the DNI, the better the economics
- South America is well known for having the best sunshine on the planet, followed closely by Australia and Africa
- Many mines are already located in these regions



Source: Solargis

Leveraging Breakthrough Technology



Heliogen's next-generation heliostat

Moore's Law (Software vs. Hardware)

Heliogen uses software and computer vision to precisely control thousands of small mirrors to create ultra-high temperatures, **unlocking low-cost thermal energy storage**

Reduced Installed Costs

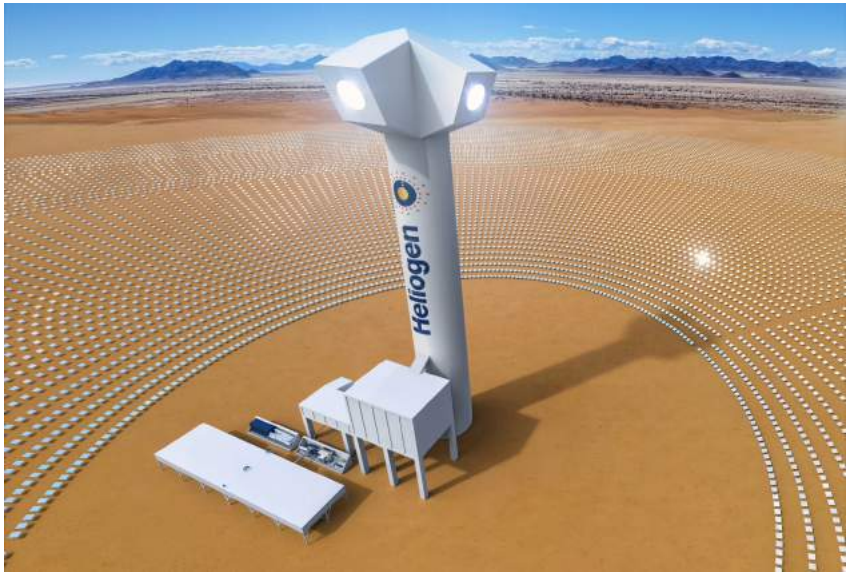
Heliogen's heliostats are **mass-produced**, easy to deploy, **requiring little in-field assembly**

Faster Installation

Heliogen's patented closed-loop control system **eliminates the need for months-long manual calibration**

Heliogen Revolutionizes Traditional CSP

- **Traditional CSP systems:**
  - Large budgets (hundreds of millions / project)
  - Long timelines (5 years)
  - Molten salts operational issues
- **Heliogen's Sunlight Refinery™:**
  - Modular system in 5 MW blocks that can be customer sited
  - Small budgets (tens of millions / project)
  - Short timelines (~2 years)
  - Economies of scale for facilities with multiple modules



Photorealistic rendering of Heliogen's Sunlight Refinery

Traction

RioTinto

Rio Tinto selects Heliogen's breakthrough solar technology to provide carbon-free energy to Boron mine

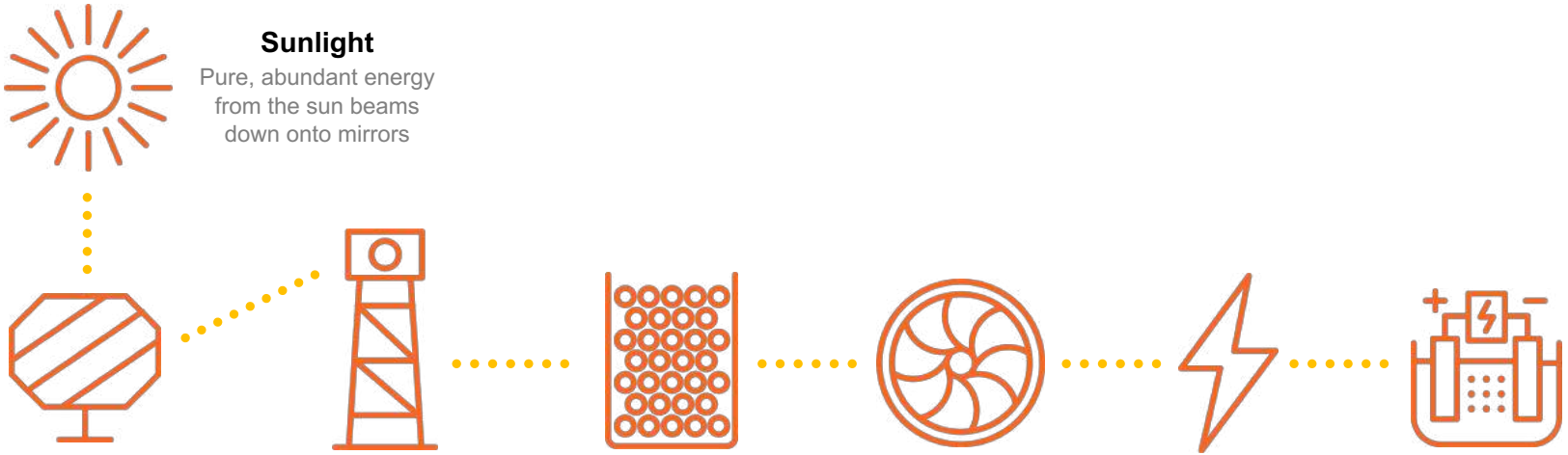
Heliogen-Enabled Applications for Mines

Steam:
150° – 450°C
Medium-temperature heating, drying, and leaching

Electricity:
>700°C
Baseload power for off-grid or remote mines

Hydrogen:
~800°C
Green hydrogen as a fuel or feedstock

HelioFuel™: Clean, renewable fuels like hydrogen



Sunlight
Pure, abundant energy from the sun beams down onto mirrors

Heliostats
An array of computer-controlled mirrors (heliostats) collects and concentrates sunlight

HelioHeat™
Captured sunlight equivalent to 1.2k suns is converted to carbon-free, ultra-high temperature heat

Storage
Ultra-high temperature heat is stored safely in hot rocks

Turbine / Generator
Generated heat then drives a turbine engine

HelioPower™
renewable electricity

HelioFuel™
Electrolyzer generates green hydrogen

A Natural Fit for the Mining Industry

Resilience and energy security.

CSP reimagined – modular, lower installed costs, co-located.

Local content for economic development

We are currently exploring deployments with key players in the mining industry in South Africa and Namibia who are eager to become early adopters.

We welcome the opportunity to green your operations cost-effectively.

Heliogen's demonstration facility in Lancaster, California

Thank You

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