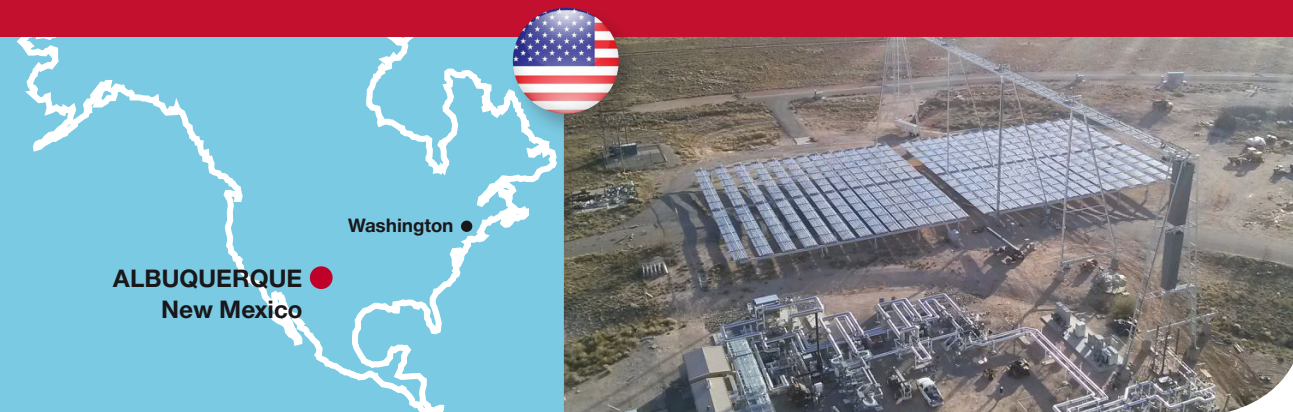


ALBUQUERQUE, UNITED STATES



Linear Fresnel with Molten Salt, a High-Temperature, Robust Solution for Storage.



PROJECT

Partner: Sandia National Laboratories.

Supplier: AREVA Solar.

Supply scope: full-width Compact Linear Fresnel Reflector (CLFR) solar salt heater with 5,000 m² of solar field connected to the Sandia molten salt loop, allowing for high temperature operations (550°C) and direct thermal energy storage, without heat exchangers between the solar field and the storage system.



PARTNER

Sandia National Laboratories:

Sandia National Laboratories is a multi-program U.S. laboratory with main facilities in Albuquerque, New Mexico, and Livermore, California. Sandia has major R&D responsibilities in energy and environmental technologies and economic competitiveness, and is host to the National Solar Thermal Test Facility, where a Molten Salt Test Loop (MSTL) was recently commissioned.

Designed and built to exacting specifications, Sandia's MSTL system provides a means to perform accelerated lifetime testing on power plant-size components, reducing start-up risks for newly constructed generation facilities. No other test facility in the world is capable of supporting such extensive, large-scale research.



OVERVIEW

AREVA is integrating a CLFR solar salt heater with the Molten Salt Test Loop at Sandia National Laboratories Solar Thermal Test Facility in Albuquerque, New Mexico. The CLFR system will demonstrate first-hand AREVA Solar's ability to deliver the highest-quality, most reliable storage solution.

AREVA Solar's molten salt heater system uses its proven, reliable CLFR design — an array of mirrors that concentrate the sun's energy to heat a working fluid to high temperatures in an elevated tube receiver. But, instead of using water as its working fluid, this system uses molten salt in the receiver.

Molten salt as a fluid is non-flammable, non-toxic, composed of 60% sodium nitrate / 40% potassium, and can be fully

recycled as fertilizer at the end of the plant lifetime. Several CSP plants under construction or in operation use the same salts.

The solar salt heater deployed at Sandia consists of two full-size reflector bays, of the same design and specifications as those already deployed in commercial projects. It offers a valuable reference upon which to demonstrate this proven design for other commercial tenders with thermal energy storage.



TECHNOLOGY

AREVA Solar's CLFR technology:

- Low-cost, most land-efficient and water conservative CSP technology
- Well-suited for new and existing power plants

- Modular and scalable; simple and durable design
- On-site and regional manufacturing; standard materials for high local content

How Our Technology Works:



1/ Flat mirrors reflect sunlight onto a linear receiver above the mirror field.

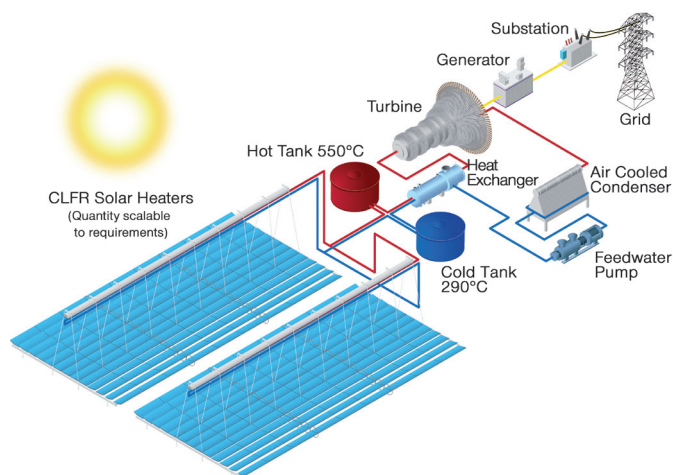
2/ Molten salt flows through tubes in the receivers.

3/ Concentrated sunlight raises the salt's temperature in the tubes.

The system draws molten salt from a cold (~290 to 300°C) tank, uses the mirrors to heat it to as high as 550°C, and passes that hot liquid to a separate tank for storage. When needed, the high-temperature molten salt is passed through

a salt-to-steam heat exchanger to produce superheated steam for electricity generation. The molten salt then returns to the cold tank, and the process repeats.

The storage tank is typically sized to store enough thermal energy to run the power block at full load from 4 to 15 hours. Depending on project requirements, this storage enables the shifting of power production to peak hours and/or increasing operating hours with up to 24 hours during the peak solar season and stable output during low DNI winter days.



BENEFITS

Molten salt storage is not new. But combining it with Compact Linear Fresnel Reflector (CLFR) technology is. The result is a dependable, lower-cost technology that enables users to enjoy all the advantages of CLFR technology along with the benefits of extended dispatchability through molten salt storage—day and night.

AREVA Solar Molten Salt Heaters combined with Direct Molten Salt Storage creates a new offer to complement the existing Solar Direct Steam Generation solution. This new solution with storage, offered in 2014, enables AREVA to meet our customers' unique energy requirements with tailor-made solutions. AREVA Solar technology and systems are backed by AREVA's performance guarantees and global energy expertise.



RESOURCES

At peak construction, the project created up to 30 jobs.



TIMEFRAME

Operation started in January 2014.

AREVA INTERNATIONAL COMMERCIAL ORGANIZATION / MARKETING DEPARTMENT

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