

PMC-EF2a

(2.04.02)

**U.S. DEPARTMENT OF ENERGY  
EERE PROJECT MANAGEMENT CENTER  
NEPA DETERMINATION**



RECIPIENT: Halotechnics

STATE: CA

**PROJECT TITLE :** Advanced Thermal Energy Storage System with Novel Molten Salt; Halotechnics; NREL Tracking No. 11-030

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
		NREL-11-030	GO10337

**Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:**

**CX, EA, EIS APPENDIX AND NUMBER:**

## Description:

- B3.6** Siting, construction (or modification), operation, and decommissioning of facilities for indoor bench-scale research projects and conventional laboratory operations (for example, preparation of chemical standards and sample analysis); small-scale research and development projects; and small-scale pilot projects (generally less than two years) conducted to verify a concept before demonstration actions. Construction (or modification) will be within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible).
- A9** Information gathering (including, but not limited to, literature surveys, inventories, audits), data analysis (including computer modeling), document preparation (such as conceptual design or feasibility studies, analytical energy supply and demand studies), and dissemination (including, but not limited to, document mailings, publication, and distribution; and classroom training and informational programs), but not including site characterization or environmental monitoring.
- A11** Technical advice and planning assistance to international, national, state, and local organizations.

## Rational for determination:

The SunShot Incubator project represents a significant component of the U.S. Department of Energy (DOE) business strategy of partnering with U.S. industry to accelerate the commercialization of solar energy system research and development (R&D) to meet aggressive cost and installed capacity goals. This specific partnership leverages technical capabilities and resources within the National Renewable Energy Laboratory (NREL) and other DOE laboratories/facilities to enhance and support areas of expertise within a small business in order to accelerate the development of the small business's technology. This early-stage assistance in crossing the technological barriers to commercialization also provides a better level of understanding and development for the investment community to base decisions on.

This work effort is for the 12-month, Tier 1, SunShot Incubator by the recipient, Halotechnics of Emeryville, California, beginning in November 2011. A test system composed of insulated storage tanks (hot and cold), molten salt pumps (hot and cold), a furnace for heat input, and a radiator for heat rejection would be developed utilizing a high stability, low melting point molten salt as the heat transfer and thermal storage material. The proposed project scope includes the development of the system to pump, heat, and store the novel material and demonstrate its viability as a superior product to what is currently available. A miniature Concentrated Solar Plant (CSP) would be built at a laboratory scale, with each critical component designed with an eye toward scalability to commercial size. The R&D objectives to be pursued under this work effort would be to build a 30 kWh thermal storage system operating at 700 °C (hot tank) and 300 °C (cold tank). Once proven at laboratory scale, the tank design would lend itself to scaling up to storing thousands of tons of salt and eliminating the need to use expensive nickel alloy construction. This approach would eliminate the greatest amount of risk from critical components of the molten salt thermal storage system.

To achieve project objectives, each critical component would be designed and tested individually, followed by a complete system test verifying adequate performance. The work would be done five tasks, as shown below:

- Task 1 – Proof-of-concept molten salt physical properties and corrosion data. This would involve the synthesis of 100 g of the company's proof-of-concept fluid and providing to NREL a complete physical property datasheet relevant for heat transfer and thermal storage applications.
- Task 2 – Tank Design. This would include tank modeling, detailed design, and validation testing of a hot and cold tank, and providing the test data to NREL.
- Task 3 – Pump design. This would include purchasing commercially available pumps and modifying them so that they would be capable of operating at hot and cold temperatures.
- Task 4 – Thermal Power Rating. This would include development of a thermal model of the furnace and molten salt coolant to verify that the salt can reliably be heated to 700 °C using radiative heat transfer, and to develop a radiative heat sink to cool the molten salt as it flows from the hot to the cold tank. Test data would be provided to NREL.

- Task 5 – Full system testing would include a full system test of the thermal energy storage prototype.

The work would be accomplished with the use of computers, machines and tools. The design of the tanks, the pumps and the piping would be done with computers utilizing a 3D solid modeling software package. This would be used for the generation of mechanical drawings for manufacturing. The salt would be weighed out using a balance and then cooked in the tank for it to be ready as the heat transfer fluid. The construction of the tanks and tubing/piping would be done with normal tools of the manufacturing process, i.e. wrenches, screwdrivers, allen keys, etc.

The prospective location for assembling and testing the engineering prototype systems is 1601B 63rd St. Emeryville, California, in an existing industrial biotech campus (floorplan of prospective facility has been uploaded to this database). This is a 2900 SQFT open floorplan engineering space equipped with adequate ventilation, electrical service, and office space.

Any chemistry related work would take place at the state of the art life science research facility, Emerystation North, located at 5980 Horton St., Emeryville, California, 94608. Completed in 2001, this facility houses a variety of life science and biotech tenants including Halotechnics. The city of Emeryville, CA was once a booming industrial complex of many types of industries that have mostly left since the 1970s. The site of the project was contaminated by this industrial use and has been redeveloped for biotech companies and new research buildings.

BrightSource Energy would be a subcontractor for this project. They would only conduct computer-based modeling and simulation work that would be done in their existing office suite. They would not be involved in any part of the physical development of the small scale prototype.

Halotechnics has procedures in place for the proper storage of all gases, chemicals, and metal parts in the laboratory. Gases would be disposed by use through analytical machines and then vented to the building ventilation system out to the atmosphere in de minimis quantities. Chemicals would either be used in the small-scale prototype as the molten salt or disposed via the solid state waste container or the liquid waste container, both of which would be picked up by Filter Recycling Services and dealt with properly offsite. Any liquid effluent produced by the proposed project would be disposed into a container that would be picked up for proper disposal by Filter Recycling Services, Inc. Filter Recycling Services is a properly licensed waste transporter, recycler, and operates a fully permitted transfer, storage, and disposal facility (TSDF).

Laboratory safety equipment includes benches with fume hoods as well as vents from the ceiling to which the exhaust of analytical equipment is snorkeled. The hoods also have alarms for poor airflow. Safety protocols are in place that govern lab behavior regarding instruments, chemicals handling, waste disposal, and laboratory operations. There are training procedures for new employees as well as periodic retraining of existing. These protocols are monitored by the EH&S committee at Halotechnics.

Both the proposed and existing facilities are in full compliance with all local community, California State, and Federal environmental regulations regarding airborne emissions, waterborne effluents, external radiation levels, noise control, and hazardous and non-hazardous waste. The Emerystation North facility is permitted by Emeryville Fire Department for storage of hazardous chemicals and gas, as well as hazardous waste generated onsite. The following permits are in place for this facility: California EPA Identification No. CAL000354964 for hazardous waste generation and accumulation. In addition, Halotechnics would obtain the appropriate business license for the 63rd Street facility.

The proposed sites of this project were contaminated by previous industrial use and have been re-developed for biotech companies and new research buildings. However, this proposed project would occur in existing facilities, would not disturb any residual contamination, or cause additional contamination under foreseen operating conditions. Work would be done in a Coastal Management Zone, but the proposed activities do not require a Coastal Zone Consistency Determination.

Based on the information above, this proposed action would qualify for Categorical Exclusions A9, A11, and B3.6.

#### **NEPA PROVISION**

DOE has made a final NEPA determination for this award

Insert the following language in the award:

If you intend to make changes to the scope or objective of your project you are required to contact the Project Officer identified in Block 11 of the Notice of Financial Assistance Award before proceeding. You must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved.

Note to Specialist :

EF2a completed by Rob Smith on 10/24/2011.

**SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.**

NEPA Compliance Officer Signature: Lori Gray / Lori Gray Date: 10/25/2011  
NEPA Compliance Officer

**FIELD OFFICE MANAGER DETERMINATION**

Field Office Manager review required

**NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:**

- Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
- Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

**BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :**

Field Office Manager's Signature: \_\_\_\_\_ Date: \_\_\_\_\_  
Field Office Manager