

PMC-ND
(1.08.09.13)

**U.S. DEPARTMENT OF ENERGY
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY
NEPA DETERMINATION**

RECIPIENT: [Element 16 Technologies, Inc.](#)

STATE: CA

PROJECT TITLE: [Low-Cost Sulfur Thermal Storage for Solar Industrial Process Heat](#)

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002243	DE-EE0009329	GFO-0009329-001	

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

CX, EA, EIS APPENDIX AND NUMBER:

Description:

- A9 Information gathering, analysis, and dissemination** Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)
- B1.31 Installation or relocation of machinery and equipment** Installation or relocation and operation of machinery and equipment (including, but not limited to, laboratory equipment, electronic hardware, manufacturing machinery, maintenance equipment, and health and safety equipment), provided that uses of the installed or relocated items are consistent with the general missions of the receiving structure. Covered actions include modifications to an existing building, within or contiguous to a previously disturbed or developed area, that are necessary for equipment installation and relocation. Such modifications would not appreciably increase the footprint or height of the existing building or have the potential to cause significant changes to the type and magnitude of environmental impacts.
- B3.6 Small-scale research and development, laboratory operations, and pilot projects** Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Element 16 Technologies (Element 16) to develop a novel molten sulfur thermal energy storage (TES) technology. A prototype device would be developed, fabricated, and tested. The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

Proposed project activities would include data analysis, computer modeling, material characterization, design work, TES prototype fabrication, and TES prototype performance testing.

Material characterization would consist of thermal cyclic testing of material sample coupons in molten sulfur. A laboratory-scale testing setup would be assembled for characterization and installed within Element 16's laboratory facility in Arcadia, CA. In this test setup, mini cylindrical pressure vessels measuring approximately 15 in. in length and 2 in. in diameter would contain molten sulfur and sample coupons. The vessels would be fitted into a purpose-built oven measuring approximately 3 ft. x 3 ft. x 2 ft. Various auxiliary devices would control the pressure and temperature of the test setup. Installation of this equipment would not require any physical modifications to Element 16's facility. No additional permits or authorizations would be required.

The TES prototype would consist of a cylindrical metal vessel measuring approximately 20 ft. in length, with an

approximate diameter of 6 ft, as well as various other auxiliary components, including temperature/pressure sensors, pumps, piping systems, and valves. The vessel would be filled with molten sulfur and connected to an existing solar thermal receiver and air-cooling unit. Transport tubes within the vessel would carry thermal oil between the thermal receiver, vessel, and air-cooling unit, and would ensure that the sulfur and oil do not have any direct contact.

TES prototype installation would occur at an existing solar thermal testing facility operated by project partner Hyperlight Energy in Brawley, CA. The TES prototype would be installed outdoors in a designated area that currently houses the solar thermal receiver and air-cooling unit described above. A concrete foundation measuring approximately 100 sq. ft. may be installed to mount the TES prototype vessel. This installation would occur on previously disturbed land that is graded and covered in gravel. No clearing of undisturbed land would be required. New components would be integrated with existing systems via new piping connections. Electrical connections required for the new components are currently in place. No other physical modifications to existing facilities, ground disturbance, or changes to the use, mission, or operation of existing facilities would be required. No additional permits or authorizations would be required.

Once the TES prototype is installed and commissioned, performance testing would assess the TES prototype's capacity to store and discharge heat generated by the solar thermal receiver. Data would be obtained from continuous operation of the integrated system.

All project activities would be coordinated by Element 16. Design, development, and fabrication/assembly activities would be performed at Element 16's research facility in Arcadia, CA and at the manufacturing facility of project partner PCL Industrial Services in Bakersfield, CA. Equipment testing would occur at Element 16's facility and at the solar thermal testing facility of project partner Hyperlight Energy located in Brawley, CA.

The U.S. Fish and Wildlife Service's Information for Planning and Consultation database indicates that the Yuma Ridgways (clapper) Rail and several migratory bird species could potentially occur in the area in which outdoor installation and testing would occur. However, considering that all installation activities would occur within the bounds of a previously developed area that is currently in use for commercial activities and all molten sulfur testing would be performed using a contained, closed circuit system, DOE has determined that the project would have no effect on Endangered Species Act listed species or critical habitats.

Project work would involve the use and handling of potentially hazardous materials, including molten sulfur and oil, industrial solvents, electrically powered equipment, and motorized vehicles (e.g., trucks, forklifts). All such handling would be performed in controlled laboratory and manufacturing environments. To mitigate risks, Element 16 and its project partners would adhere to established institutional health and safety policies and procedures. Protocols would include personnel training, the use of personal protective equipment, engineering controls, monitoring, and internal assessments. Powered equipment and heavy machinery would be outfitted with applicable safety instruments and systems. Molten sulfur and thermal oil would be handled and stored in accordance with established protocols and best practices. Molten sulfur would be stored in hermetically sealed thermal energy storage vessels. Thermal oil would be contained within a closed system. Both substances would continue to be used after the completion of the project and when appropriate, disposed of properly. Element 16 and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Solar Energy Technologies Office

This NEPA determination does not require a tailored NEPA Provision.

NEPA review completed by Jonathan Hartman, 02/08/2021

FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D. To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the

proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal.

The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

The proposed action is categorically excluded from further NEPA review.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: _____


NEPA Compliance Officer

Date: 2/10/2021

FIELD OFFICE MANAGER DETERMINATION

- Field Office Manager review not required
- Field Office Manager review required

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

Field Office Manager's Signature: _____

Field Office Manager

Date: _____