

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



RECIPIENT: Echogen Power Systems

STATE: OH

PROJECT TITLE : Advanced Ice Slurry Generation System for a CO₂-based Pumped Thermal Energy Storage System

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002378	DE-EE0009814	GFO-0009814-001	

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.)

**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 Echogen Power Systems to develop new heat exchanger technologies for supercritical carbon dioxide (CO₂) applications. Three low-temperature reservoir (LTR) technologies would be designed, fabricated, and tested: ice-on-coil (IOC), ice-phobic heat exchanger (IHEX), and super-cooler heat exchanger (SCHE). The project would be completed over three Budget Periods (BPs) with a Go/No-Go decision point between each BP. This NEPA determination is applicable to all three BPs.

Echogen would oversee the project. Subrecipients assisting with design, development, fabrication, and testing activities would be Active Energy Systems in Oak Ridge, TN and Eastern Switzerland University of Applied Sciences, Institute for Solar Technology in Rapperswil-Jona, Switzerland. An additional subrecipient, E3Tec in Hoffman Estates, IL would also assist with design activities and reporting.

Echogen would develop the lab-scale IOC system in which a cold fluid flows through embedded tubes in a static water bath, causing ice to form on the outer surface of tubes for a short period of time. Active Energy Systems and Eastern Switzerland University of Applied Sciences would design, fabricate, and test laboratory-scale IHEX and SCHE systems which are passive Ice-Slurry Generator (ISG) technologies. In these systems, ice is created in the form of small particles that remain in suspension in a liquid phase yielding an ice water slurry. Conceptual designs of commercial-scale (25 – 100 MWe) LTR systems for all three configurations would be completed along with a preliminary techno-economic analysis. The commissioned lab-scale IHEX and SCHE would be shipped to Echogen for further testing and data collection in their CO₂ pumped thermal energy storage (PTES) test loop. Using data obtained through testing, designs of commercial-scale systems for all three LTR technologies would be updated, and a final techno-economic analysis would be completed.

No changes in the use, mission, or operation of existing facilities would be required as part of this project and no additional permits would be required in order to conduct any of the work activities.

Project activities would involve the use and handling of carbon dioxide as a working fluid and large volumes of synthetic lubricants. Any risks associated with the handling of these materials would be mitigated through adherence to established health and safety policies and procedures. 20,000 kg of CO2 would be used at Echogen. Following each test configuration change, approximately 200 kg would be vented to the environment. 20,000 gallons of water would be used for the duration of the testing and an additional 1,350 gallons in a closed loop system. After the testing period, water would be disposed of through city sewage systems. All other waste products would be disposed of by licensed waste management service providers. Echogen 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.

Review completed by Shaina Aguilar on 12/29/21.

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.

DOE has determined that work to be carried out outside of the United States, its territories and possessions is exempt from further review pursuant to Section 5.1.1 of the DOE Final Guidelines for Implementation of Executive Order 12114; "Environmental Effects Abroad of Major Federal Actions."

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: 1/6/2022

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: _____