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(1.08.09.13)

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

**RECIPIENT:** [Leading Edge Crystal Technologies, Inc.](#)**STATE:** MA**PROJECT TITLE:** [Development of a Low-Cost Single Crystal Silicon Substrate Process for >23% Solar Cells](#)

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002064	DE-EE0008971	GFO-0008971-001	

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 [Leading Edge Crystal Technologies \(LECT\)](#) to develop a novel process for the production of silicon wafers. Specifically, LECT would use a crystal growth process, the Float Silicon Method, to produce silicon wafers. A silicon crystal growth furnace would be developed and commissioned for use in the project. 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 consist of conceptual design work, parts procurement, furnace assembly and commissioning, material production utilizing the furnace (i.e. silicon crystal production), material characterization, laboratory-scale silicon semiconductor processing, cost modeling, and stakeholder engagement.

All project activities would be coordinated by LECT and performed in existing, purpose-built laboratory and manufacturing facilities. Furnace assembly, commissioning, material production, and analysis activities would be performed by LECT at its laboratory/manufacturing facility in Gloucester, MA. Silicon wafer processing and solar cell characterization would be performed by the Georgia Institute of Technology (GIT) at its campus in Atlanta, Georgia. Additional silicon wafer characterization would be performed by Lehigh University at its campus in Bethlehem, Pennsylvania.

The crystal growth furnace would be assembled from commercial, off-the-shelf parts and parts procured from qualified, third-party machinists. The furnace would measure approximately 22" X 36" X 36". It would be assembled and operated in a specially designated area within LECT's laboratory space (i.e. growth room). The furnace would be connected to various existing pieces of equipment that are currently installed on a concrete pad external to LECT's facility. These include a chiller, 40 kW of power supplies, a 100 kW backup generator, and a liquid argon microbulk tank.

Modifications would be made to the facility in order to accommodate a hydrogen cooling system which would be connected to the furnace. The cooling system would consist of hydrogen tanks (300 liters or greater) and piping which would feed and vent hydrogen into and out of LECT's facility. The cooling system would be contained in an enclosed, outdoor shelter which would be constructed next to the existing concrete foundation described above. The shelter would require construction of a 10' x 10' concrete foundation, cinderblocks walls, a roof, door, and piping connections. The shelter would be constructed in a previously disturbed area, in what is currently a parking lot.

The National Register of Historic Places' (NRHP) database indicates that there are no historical properties near LECT's facility, where site modifications would occur. Accordingly, DOE has determined that the project would not have the potential to affect historic properties

The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) database indicates that there are two Endangered Species Act (ESA) listed species with the potential to occur in the area; the Northern Long-Eared Bat, and the Small Whorled Pogonia. No critical habitat has been designated for either species. Due to the nature of the project (i.e. installation work occurring in a previously developed, urban area, currently used for commercial purposes), DOE has determined that project activities will have no effect on ESA listed species or critical habitat.

Project activities would involve the use and handling of industrial chemicals, gases, and high-powered machinery operating at elevated temperatures. All such handling would be performed in controlled laboratory/manufacturing environments. Risks associated with the performance of project activities would be mitigated through adherence to established health and safety policies and procedures. Protocols would include personnel training, the use of personal protective equipment, monitoring, and engineering controls. All chemical processing would be performed under fume hoods. The furnace, which would be operated by LECT at its manufacturing facility, would be equipped with safety controls and an emergency back-up generator. The latter would ensure that a closed-loop water system is able to continually operate in the event of a power failure, and in turn, maintain the furnace wall exterior at a safe temperature. Any hazardous waste materials would be handled, stored, and disposed of in accordance with established hazardous waste protocols. LECT 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, 03/13/2020

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: 3/16/2020

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: _____