PMC-ND
(1.08.09.13)

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

RECIPIENT: Purdue University **STATE:** IN

PROJECT TITLE: Multi-Functional Semiconducting Ligand Design for Intrinsically Stable and Scalable Perovskite Solar Cells

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002357	DE-EE0009519	GFO-0009519-001	

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 Purdue University to develop solar perovskite cells with enhanced stability and electronic properties, as compared to the current state of the technology. Purdue University would focus on integrating semiconducting ligands (i.e., molecules that bind to metal atoms) into the cells. The ligands would work to coat the solar cells and to increase energy conversion efficiency and control aspects of energy exchange within the device, resulting in improved stability and energy efficiency, as compared to the current state of the technology. The project would be completed over two Budget Periods (BPs).

Proposed project activities would include data analysis, computer modeling, conceptual design work, material synthesis, characterization, solar cell/mini-module fabrication, and performance testing. Material synthesis would consist of the synthesis of ligands at 10 g and 100 g scales. Material characterization (E.g., chromatography, mass spectroscopy) would be performed on ligands and fabricated cells. All fabrication would be performed at laboratory scales. Solar cells would be fabricated with an approximate active area of 0.1 cm. Mini-modules would be fabricated measuring approximately 100x10 mm2 via slot-die coating and integrating the synthesized ligands. Performance testing would consist of 500 hours of accelerated life testing and 2000 hours of simulated field-condition testing. All testing would be performed in laboratory settings.

Purdue University would perform all project work at purpose-built laboratory facilities at its campus in West Lafayette, IN. Over the life of the project, input materials required for synthesis activities would be utilized at laboratory-scales (< 100 Kg organic compounds and precursor materials). No 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.

Project work would involve the use of industrial chemicals, solvents, and lead-based compounds. All such handling would be performed in controlled laboratory environments where applied chemistry is performed as part of Purdue University's regular course of business. Potential hazards would be mitigated through adherence to established

institutional health and safety policies and procedures. Protocols would include employee training, the use of personal protective equipment, engineering controls, regular project monitoring, and internal assessments. Lead-based compounds would be stored in appropriate nitrogen-filled gloveboxes. Waste materials would be handled and disposed of in accordance with established institutional waste management guidelines. Purdue University 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, 05/27/2021

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: Electronically Signed By: Kristin Kerwin Date: 5/28/2021

NEPA Compliance Officer

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: _____ Date: _____

Field Office Manager