

PMC-ND  
(1.08.09.13)

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

**RECIPIENT:** Energy Materials Corporation**STATE:** NY

**PROJECT TITLE:** High speed, Roll-to-Roll Production of Durable, Low-Cost, Bifacial Perovskite Photovoltaic Modules

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0002064	DE-EE0008972	GFO-0008972-001	GO8972

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.

**B3.15 Small-scale indoor research and development projects using nanoscale materials** Siting, construction, modification, operation, and decommissioning of facilities for indoor small-scale research and development projects and small-scale pilot projects using nanoscale materials in accordance with applicable requirements (such as engineering, worker safety, procedural, and administrative regulations) necessary to ensure the containment of any hazardous materials. Construction and modification activities would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible).

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Energy Materials Corporation (EMC) to develop a solar photovoltaic (PV) mini-module that would incorporate new technologies and manufacturing processes that would allow for increased performance efficiency, as compared to the current state of the technology. As part of the project, EMC would design, fabricate, and test perovskite solar cells (PSCs) and prototype mini-modules, incorporating the new technologies and processes.

The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP. Field testing would be performed as part of this project. Field testing would be initiated during BP2 Task 11 and would continue all throughout BP3. Testing would be performed at site locations that would be selected after BP1, in coordination with DOE. Testing specifications (e.g. PV mounting specifications and integration) would also be determined during the initial stages of the project. Because the testing location and testing parameters are not yet defined, DOE will review BP2 Task 11 and BP3 at a later date, when this information is finalized and submitted for review. This NEPA Determination will review all BP1 activities and BP2 Tasks 1 – 10, 12, and 13.

Proposed project activities would consist of fabrication process development (e.g. deposition/sintering processes, roll-to-roll manufacturing), material synthesis, performance testing (e.g. durability and stability testing of synthesized

PV layers), mini-module component fabrication, mini-module assembly, and computer modeling.

All project activities would be coordinated by EMC and performed at existing, purpose-built laboratory facilities that regularly undertake work similar in nature to that included in the scope of this project. Material synthesis, component fabrication, mini-module assembly, and performance testing would be performed by EMC and the Eastman Kodak Company, at laboratory facilities operated by each entity at the Eastman Business Park in Rochester, NY. Additional fabrication, analysis and testing would be performed at the National Renewable Energy Laboratory (NREL) in Golden, CO. Deposition and material characterization would also be performed by Swift Coat (Tempe, AZ), University of Louisville ('ULRF' – Louisville, KY), Arizona State University ('ASU' – Tempe, AZ), and the SLAC National Accelerator Laboratory (Menlo Park, CA) at laboratory facilities operated by each entity.

No physical modifications to existing facilities, construction of new facilities, ground disturbing activities, or changes to the use, mission, or operation of existing facilities would be required for any of the above activities. No additional permits, licenses, or authorizations would be required.

Project work would involve the use and handling of various hazardous materials, including metals, acids, industrial solvents, and reactive gases. All such handling would occur in controlled, laboratory 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 employee training, the use of personal protective equipment, engineering controls, monitoring, and internal assessments. EMC and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations.

Metal- and metal oxide-nanoparticles would be synthesized and handled throughout the project. These materials can present an inhalation risk if not handled properly. To mitigate against potential risks, these materials would be handled primarily as suspensions in solvents, which do not present any known inhalation risks. These would then be converted into coatings in vacuum chambers. Subsequent handling would also be performed within a vacuum chamber. HEPA filters would be used to collect any free nanoparticles when performing material deposition. Materials containing nanoparticles would be treated prior to disposal, and would be disposed of following established protocols.

Any work proposed to be conducted at a federal facility may be subject to additional NEPA review by the cognizant federal official and must meet the applicable health and safety requirements of the facility.

## NEPA PROVISION

DOE has made a conditional NEPA determination.

The NEPA Determination applies to the following Topic Areas, Budget Periods, and/or tasks:

All BP1 Tasks  
BP2 Tasks 1 – 10, 12, and 13

The NEPA Determination does not apply to the following Topic Area, Budget Periods, and/or tasks:

BP2 Task 11: Performance and stability evaluation of PV devices and functional layers  
All BP3 Activities

Notes:

Solar Energy Technologies Office  
This NEPA determination requires a tailored NEPA Provision.  
NEPA review completed by Jonathan Hartman, 02/12/2020

## 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.

A portion of the proposed action is categorically excluded from further NEPA review. The NEPA Provision identifies Topic Areas, Budget Periods, tasks, and/or subtasks that are subject to additional NEPA review.

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

NEPA Compliance Officer Signature:  \_\_\_\_\_ Date: 2/14/2020  
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