PMC-ND
(1.08.09.13)

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

RECIPIENT: MIT **STATE:** MA

PROJECT TITLE: Low-cost, high-efficiency III-V photovoltaics enabled by remote epitaxy through graphene

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001840	DE-EE0008558	GFO-0008558-001	

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 Massachusetts Institute of Technology (MIT) to develop Gallium arsenide (GaAs) photovoltaic (PV) cells by combining two existing manufacturing processes, remote epitaxy and 2-dimensional layer transfer (2DLT), which allow for reuse of PV substrates, with another process known as Dynamic-hydride vapor phase epitaxy (D-HVPE), which would help lower the costs of production associated with the first two methods. The project would be completed over two Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

Proposed project activities for BP1 would include substrate growth, graphene transfer to GaAs substrates, growth of GaAs cells on graphene-coated GaAs substrates, development of remote epitaxy via HVPE, and exfoliation and fabrication of thin-film GaAs cells. BP2 activities would include development of a substrate reuse process, demonstration of multiple reuse of PV cells from a single substrate, and demonstration of remote epitaxy via D-HVPE. All project activities would be completed at existing, purpose-built laboratory facilities owned and operated by MIT and its project partners, University of Virginia (UVA) and the National Renewable Energy Laboratory (NREL). No changes in the use, mission, or operation of existing facilities would be required. Neither MIT nor any of its project partners would need to obtain any additional permits in order to perform the work activities proposed as part of this award.

Project activities would involve the use and handling of industrial chemicals and compounds, including hydrogen fluoride, hydrogen chloride, and Iron (III) chloride. All such handling would occur indoors, in laboratory settings. Any risks associated with the handling of these materials would be mitigated through adherence to established health and safety policies and procedures. Protocols would include staff training, engineering controls, the use of personal protective equipment, monitoring and internal assessments. MIT and its project partners would observe all Federal, state and local health, safety, and environmental laws and regulations.

The project would include the use of graphene, a carbon-based nanomaterial. Graphene sheets can present an

inhalation risk if they are freestanding without support. For activities in which graphene is not deposited onto a substrate, only graphene sheets supported by nickel films would be used. In all other cases, graphene would be deposited onto substrates, posing no inhalation risk.

NEPA PROVISION

DOE has made a final NEPA determination.

Include the following condition in the financial assisstance agreement:

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.

Notes:

Solar Energy Technologies Office
This NEPA determination requires a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 12/21/2018

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: 12/26/2018

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