

PMC-ND

(1.08.09.13)

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

**RECIPIENT:** Dioxide Materials, Inc**STATE:** FL**PROJECT TITLE:** Electrolyzers For CO2 Conversion from BioSources

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0002203	DE-EE0009286	GFO-0009286-001	GO9286

**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 federal funding to Dioxide Materials to develop laboratory-scale electrolyzers to convert CO2 into a mixture that can be used as a feedstock for gas fermenters.

Proposed project activities would consist of system design development, material characterization, component fabrication (e.g. electrolyzers, membranes, electrodes), and performance testing.

Project work would initially focus on the development of an electrolyzer cell with an active area of approximately 750 cm<sup>2</sup>. Various iterations of the cell would be produced and tested for performance efficiency. Cell membranes measuring approximately 28 cm x 40 cm would also be produced and tested. The cells, membranes, and associated components would be integrated and subjected to iterated operational testing totaling more than 100 hours. As part of this testing, CO2 would be fed to the integrated cells to test feedstock conversion capabilities.

Once initial operation testing is concluded, the project would focus on electrolyzer cell optimization and integration of a test cell to a gas fermenter. Long-term electrolyzer testing would be performed (~1000 hours over multiple 7 day periods). During testing, relevant parameters including electrode structure/composition, catalyst composition, and operating conditions would be modified in order to inform cell optimization. Optimized electrolyzers would then be integrated with existing gas fermenters at the National Renewable Energy Laboratory (NREL) in Golden, CO. The integrated system would be operated to test production capabilities, with anticipated production levels of 8 g/L/h (500 L of ethanol gas produced).

Project work would be performed by a project team coordinated by Dioxide Materials. All project activities would be performed in existing, purpose-built facilities that conduct laboratory research and component fabrication/assembly as part of their regular course of business. Dioxide Materials would perform design work, component fabrication, assembly, and testing of CO2 electrode assemblies and membranes at its facility in Boca Raton, FL. Membrane fabrication would be performed by project partner Faustel at its laboratory facility in Germantown, WI. Electrode development and physical testing would be performed by NREL at its laboratory facility in Golden, CO. Electrode characterization would be performed at Argonne National Laboratory (ANL) in Lemont, IL. No modifications to existing facilities, ground disturbing activities, or changes to the use, mission, or operation of existing facilities would be required as part of this project. No additional permits or authorizations would be required.

Project work would involve the use and handling of industrial chemicals and solvents. Ethanol production would involve the use of an anaerobic bacterium regularly used for gas fermentation. Nanoparticles would be used as catalysts. Handling of these materials would occur in controlled laboratory environments. In order to mitigate against potential hazards, established corporate health and safety policies and procedures would be adhered to. Protocols would include personnel training, the use of personal protective equipment, engineering controls, monitoring, and internal assessments. Appropriate protective gear would be used by personnel handling nanoparticles. All hazardous wastes produced would be stored, handled, and disposed of in accordance with established corporate policy. Dioxide Materials and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations.

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 final NEPA determination.

Notes:

Bioenergy Technologies Office  
This NEPA determination does not require a tailored NEPA provision.  
Review completed by Jonathan Hartman, 11/18/2020

## 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: 11/20/2020

## 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: \_\_\_\_\_