

PMC-ND
(1.08.09.13)

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

**RECIPIENT:** Arizona Board of Regents on behalf of Arizona State University**STATE:** AZ**PROJECT TITLE:** Membrane Carbonation for 100% Efficient Delivery of Industrial CO2 Gases

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001908	DE-EE0008517	GFO-0008517-001	GO8517

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 Arizona State University (ASU) to design, develop, fabricate and test membrane carbonation delivery systems for photo-bioreactors and raceway pond algae cultivation systems. The membrane carbonation delivery systems would boost microalgae growth productivity. The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

BP1 would focus on process and data evaluation, with proposed project activities being limited to data analysis and computer modeling. BP2 would center on lab-scale evaluation and preliminary outdoor evaluation of CO2 delivery. Proposed project activities would include development of techno-economic analysis and life cycle assessment models and characterization of membrane carbonation delivery rates using CO2. The latter would consist of mass-transfer kinetics analyses, exit-gas composition characterization, bleed-valve operation optimization, and lab-scale microalgae cultivation via membrane carbonation. Additionally, membrane modules for outdoor cultivation would be designed and fabricated during this BP. Microalgae cultivation would be scaled up during BP3 to 25 m2 reactors. Proposed project activities would include data analysis, carbonation delivery optimization, and algae cultivation in outdoor ponds using membrane carbonation.

All activities would be performed at existing, purpose-built laboratory facilities that regularly conduct work similar in nature to that included in the scope of this project. Laboratory-scale algal cultivation and testing would be carried out at the Bidesign Institute at ASU's campus in Tempe, AZ. Outdoor cultivation and testing would be conducted at the Arizona Center for Algae Technology and Innovation (AzCATI) at ASU's campus in Mesa, AZ. Outdoor cultivation would be performed in existing raceway ponds at AzCATI measuring approximately 4 m2 and using three additional Infini raceway ponds that would be installed for additional cultivation/testing. The Infini raceway ponds would each have an approximate size of 2 m x 12.5 m and would be installed on existing concrete slabs using available power.

Algal strains and various chemical compounds, to be used as nutrients during cultivation, would be handled throughout the project. The algal strains would produce biogas during cultivation, which would be handled in

accordance with established health and safety regulations. Synthetic and sampled biogas would be handled in quantities below Occupational Safety and Health Administration (OSHA) permissible exposure limits and American Conference of Governmental Industrial Hygienists threshold limit values. Carbon monoxide in flue gas stacks would also be within OSHA and American Society of Heating, Refrigerating and Air-Conditioning Engineers limits. Cultivation with biogas would occur under a fume hood during indoor cultivation and in a well ventilated area during outdoor cultivation. Biogas cylinders would be installed in compressed gas cabinets.

All biomass would be bleached prior to storage and/or disposal. Any biomass to be disposed of would be treated as biological hazardous waste and would be processed by ASU's Environmental Health and Safety Office. Up to 55,000 L of biogas would be transported from City of Mesa's northwest wastewater treatment facility's anaerobic digester. Transportation would be carried out by a service provide certified for transport of hazardous materials.

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, 01/23/2019

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:  _____ Date: 1/24/2019
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