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

RECIPIENT: Colorado State University **STATE:** CO

PROJECT TITLE: Integrating an Industrial Source and Commercial Algae Farm with Innovative CO2 Transfer Membrane and Improved Strain Technologies

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001908	DE-EE0008514	GFO-0008514-001	GO8514

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), 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.
B5.15 Small-scale renewable energy research and development and pilot projects	Small-scale renewable energy research and development projects and small-scale pilot projects, provided that the projects are located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to Colorado State University (CSU) to design, fabricate, and test an enhanced inorganic carbon delivery system utilizing enzymatic membrane technology to transfer carbon dioxide from a gas to water in algal ponds. In parallel, the project would develop variants of marine microalgae capable of higher rates of biocarbonate uptake and metabolism complementary to growth under system conditions, in order to demonstrate increased carbon utilization efficiency and areal productivity as well as generate biomass yield data for conceptual integration of this process into fuel production models.

The proposed project would involve: data analysis; computer modeling; preliminary design, engineering, and fabrication of a carbon transfer unit and optical carbon dioxide monitoring equipment; laboratory research and development to modify algal strains for improved carbon uptake; and, small-scale field testing and deployment. Data analysis, computer modeling, and the design and fabrication of hardware would take place at CSU (Fort Collins, CO) and the National Renewable Energy Laboratory (NREL; Golden, CO). Testing of hardware would take place at CSU, NREL, Qualitas Health Inc. (Qualitas; Imperial, TX), and New Belgium Brewing (Fort Collins, CO). Genetic modification and bench-scale cultivation of wild-type, evolved, and genetically engineered algae would take place at CSU. Additional strain development activities plus the establishment of carbon dioxide monitoring technology on small open test ponds would occur at NREL using existing laboratory and cultivation facilities. No change in the use, mission, or operation of existing facilities would arise from project efforts.

Field deployment and performance assessment of the integrated system would occur at two locations: 1) NBB using high-purity fermentation off-gas from commercial brewery operations; and 2) Qualitas via operation of agribusiness raceways and mini-ponds used for the commercial production of algae biomass. Deployment activities at NBB would involve short-term cultivation trials of wild-type algae in temporarily installed mini-ponds. Activities at Qualitas would include a 6-week continuous cultivation run demonstration in an existing RW0.5 raceway pond plus membrane. The proposed project would involve new mini-pond installations at CSU, NBB, and Qualitas. No new ground disturbance would be involved at any location, as all mini-ponds would be installed on previously developed areas of dedicated research and/or industrial sites. At CSU, two mini-ponds would be installed on an existing concrete pad at the Powerhouse Energy Campus. At NBB, two mini-ponds would be installed on an existing concrete pad adjacent to the brewery and fermentation carbon dioxide lines would be re-routed to the ponds. At Qualitas, existing algae raceway configurations would need to be adjusted to accommodate testing activities, and additional mini-ponds would be installed in an approximately 50 ft. x 120 ft. area of the facility designed for this purpose. No permanent physical modifications to existing facilities would arise out of temporary use by the proposed project. CSU and subrecipients have all applicable permits in place for the proposed activities.

The proposed project would involve the use of genetically modified Nannochloropsis oceanica, which is classified by the Centers for Disease Control and Prevention as a Biosafety Level 1 organism (posing the lowest potential hazard to laboratory personnel and the environment). Prior to the start of strain development, a project protocol would be submitted for review by the CSU Biosafety Committee. No project activities involving the use or development of genetically modified organisms subject to Biosafety Committee oversight would be commenced until such time as the recipient receives all requisite approvals and/or written authorizations to proceed. All project participants would adhere to university protocol and any other regulatory agency rules, requirements, or guidelines pertaining to biosafety precautions. Laboratory activities at CSU and NREL would also involve the use, handling, and disposal of various hazardous chemicals and small quantities of chemical solvent waste. All such work would be conducted according to established Environmental Health and Safety policies and procedures in compliance with federal, state, and local regulations. Algae production experiments and transfer system optimization would require the use of pure, vendor-purchased carbon dioxide. Maximum emissions are projected to be in the range of 0.2 ML for a limited number of optimization tasks; cumulative amounts generated by the proposed project would not have the potential to meaningfully affect atmospheric levels. Cultivations at NBB and Qualitas are not expected to result in air emissions.

Quantities of water used by the project would vary according to the scale of activities at each location. CSU and NBB would use approximately 5,000 L and 2,000 L of water, respectively, in addition to standard amounts of fertilizer and other cultivation media supplements, throughout the course of in-lab bench studies (CSU only) and/or mini-pond experiments (CSU and NBB). CSU would generate approximately 50 L of laboratory chemical waste. Qualitas would use approximately 10,000,000 L of water (including initial fill and evaporation make-up of raceways and mini-ponds) in addition to standard amounts of culture media supplements and harvesting equipment chemicals for deployment activities at their facility. Qualitas is expected to produce approximately 1,500 kg of algae biomass. Wastewater generated by project activities at CSU and Qualitas would not exceed typical facility operations, and would be managed following existing procedures. At CSU, any excess and waste cultures would be properly sterilized prior to discharge to the municipal water treatment system in accordance with final protocol approved by the university Biosafety Committee. At Qualitas Health, all water is recycled and contained on site. New Belgium currently treats wastewater in its own treatment facility and would not require any siting, construction, or major expansion of waste storage, disposal, recovery, or treatment actions/facilities.

Due to the small footprint of proposed mini-pond installations, previously developed nature of proposed field sites, and the scale of project work commensurate with existing operations at these facilities, no adverse impacts to sensitive resources are expected as a result of activities at any location. At the conclusion of the proposed project, a portion of generated strains would be retained for future use. Any new equipment and materials obtained for project-related purposes at CSU and Qualitas would remain in place for other research activities. It is anticipated that equipment installed at NBB would be removed and returned to CSU at the completion of the project.

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

Based on the review of the proposal, DOE has determined the proposal fits within the class of action(s) and the integral elements of Appendix B to Subpart D of 10 CFR 1021 outlined in the DOE categorical exclusion(s) selected above. DOE has also determined that: (1) there are no extraordinary circumstances (as defined by 10 CFR 1021.410(2)) related to the proposal that may affect the significance of the environmental effects of the proposal; (2) the proposal has not been segmented to meet the definition of a categorical exclusion; and (3) the proposal is not

connected to other actions with potentially significant impacts, related to other proposals with cumulatively significant actions, or an improper interim action. This proposal is categorically excluded from further NEPA review.

NEPA PROVISION

DOE has made a final NEPA determination for this award

Insert the following language in the award:

If the Recipient intends to make changes to the scope or objective of this project, the Recipient is required to contact the Project Officer, identified in Block 15 of the Assistance Agreement before proceeding. The Recipient must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved. If the Recipient moves forward with activities that are not authorized for Federal funding by the DOE Contracting Officer in advance of a final NEPA decision, the Recipient is doing so at risk of not receiving Federal funding and such costs may not be recognized as allowable cost share.

Insert the following language in the award:

You are required to:
The Recipient shall not proceed with any project activities involving the use and/or development of genetically modified organisms subject to CSU Biosafety Committee oversight until such time as the Recipient receives all requisite approvals and/or written authorizations to proceed.

Any work proposed to be conducted at a DOE laboratory may be subject to additional NEPA review by the cognizant DOE NEPA Compliance Officer for the specific DOE laboratory prior to initiating such work. Further, any work conducted at a DOE laboratory must meet the laboratory's health and safety requirements.

Note to Specialist :

Bioenergy Technologies Office
This NEPA determination requires a tailored NEPA Provision.
NEPA review completed by Whitney Doss, 10/23/2018

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By: Kristin Kerwin Date: 10/25/2018

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____

Field Office Manager