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(1.08.09.13)

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

RECIPIENT: MicroBio Engineering Inc **STATE:** CA

PROJECT TITLE: Microalgae Commodities Production with a Direct Air Capture Process

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002203	DE-EE0009276	GFO-0009276-001	GO9276

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 MicroBio Engineering (MBE) to develop a novel direct air-capture (DAC) system for algae cultivation applications. A pilot DAC system would be designed and fabricated, which would deliver air-captured CO2 to algal cultures. The pilot DAC would be tested through laboratory and outdoor cultivation of algal strains.

This NEPA Determination is applicable to all project tasks and activities, with the exception of Task 1 (Initial Verification). Task 1 consisted of a technical baseline verification. Data supporting the project goals and projections were collected and presented to DOE. This task was completed prior to NEPA review and consequently, cannot be reviewed as part of this NEPA Determination. All other project activities will be reviewed and discussed in detail below.

Proposed project activities would consist of algal strain characterization, assembly and testing of a pilot DAC system (GTTC), outdoor algae cultivation utilizing the DAC system, and the completion of a techno-economic analysis.

Algal strain characterization would be performed indoors in purpose-built laboratory settings utilizing bench-scale (< 1L) bioreactors. CO2 would be sparged (i.e., used to remove other dissolved gases or volatile liquids) into various algal cultures. The CO2 delivery process would be assessed, as well as the biomass productivity of various algal cultures. Algal cultures to be screened and characterized would be strains requiring biosafety level 1 (BSL-1) health and safety requirements. Laboratories where characterization work would be performed meet BSL-1 requirements. MBE (San Luis Obispo, CA) and its project partners Cyanotech (Kailua-Kona, HI) and the Pacific Northwest National Laboratory ('PNNL' – Richland, WA) would all perform bench-scale characterization at their respective facilities.

The DAC system to be assembled for outdoor testing would consist of equipment for steam generation and CO2 absorption, desorption, and storage. Various vessels, pumps, and valves would connect to the primary mechanical components. An electronics enclosure would house process controls and data monitoring equipment. The integrated system would have approximate dimensions of 15 ft. length x 5 ft. width x 6 ft. height. The DAC would be assembled from both commercial off-the-shelf equipment and custom made hardware. Custom components would be fabricated by a qualified third-party manufacturer. DAC assembly would be performed at the research and development facility of project partner Global Thermostat Technology Center (GTTC) in Brighton, CO.

The DAC system would be readily transportable. Once assembled, the DAC would be integrated into existing outdoor

raceway ponds measuring 1 m3 and 80 m3 at the algae production and processing facility of project partner Cyanotech Corporation in Kailua-Kona, HI. Integration with the outdoor raceway ponds would require very minor facility modifications. These would be fully defined after the project has commenced, as part of a Front-End Engineering Design study. However, it is anticipated that modifications would be limited to the establishment of new electrical connections (e.g., installing new electric outlets), routing preexisting water supply lines, and establishing connections between the DAC system and pre-existing CO2 injections systems. No ground disturbance or changes to the use, mission, or operation of existing facilities would be required. No additional permits or authorizations would be required.

After installation, the DAC would be utilized for outdoor testing. CO2 would be sparged into the raceways for cultivation trials. Approximately ten (10) 50 lb. CO2 cylinders would be used for sparging over the course of the project. Cultivation trials would be performed for over 2,000 hours. Cultivation trials would be performed by MBE and Cyanotech Corporation. Data collected from the trials would then be used by MBE and its project partners to develop a techno-economic analysis.

Project work would involve the use and handling of cultivation media and compressed gases, as well as the operation of laboratory equipment with moving parts. All such handling would be performed in controlled laboratory environments where algae cultivation is routinely performed. Potential hazards 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. Biological waste would be treated prior to disposal. Waste materials be disposed of by qualified waste management service providers. MBE 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.

DOE has made a conditional NEPA determination.

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

Task 2: Project management
Task 3: DAC Pilot assembly, cultivation system integration
Task 4: Alkaliphilic Chlorella Screening, Cultivation, Scale-up
Task 5: Laboratory Strain Parameterization
Task 6: Enhanced Transfer Studies
Task 7: Algae production and products TEA/LCA

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

Task 1: Initial Verification

** Task 1 has been excluded from this NEPA Determination as task activities have been performed and consequently, cannot be included in this NEPA review. However, no further NEPA review is required.

Include the following condition in the financial assisstance agreement:

Facility modifications are limited to the establishment of new electrical, routing preexisting water supply lines, and establishing connections between the DAC system and pre-existing CO2 injections systems. If it is determined that other facility modifications are needed beyond those described here, MicroBio Engineering Inc will submit this information to DOE for review prior to undertaking any of the proposed modifications.

Notes:

Bioenergy Technologies Office
This NEPA determination does not require a tailored NEPA provision.
Review completed by Jonathan Hartman, 05/20/2021

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By: Roak Parker Date: 5/24/2021

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

- [x] 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