

PMC-ND  
(1.08.09.13)

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

**RECIPIENT:**Colorado School of Mines**STATE:** CO

**PROJECT TITLE :** High-Throughput Directed Evolution of Marine Microalgae and Phototrophic Consortia for Improved Biomass Yields

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0001628	EE0008245	GFO-0008245-001	

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.

## Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Colorado School of Mines (CSM) to develop and demonstrate directed evolution approaches on select algae strains to produce quantifiable improvements in algal biomass yields and photosynthetic efficiencies. The proposed project would also design and test phototrophic co-cultures as a mechanism to improve photo utilization, stress tolerance, and pest resistance in outdoor cultures.

The proposed project would involve the use of custom-built solar bioreactors to evolve select algae strains grown indoors under simulated conditions. The evolved strains would then be tested in outdoor, open-pond systems at facilities managed by Global Algae Innovations (GAI) in Lihue, Hawaii. Associated activities would include: data analysis and computer modeling (techno-economic and life-cycle analyses); laboratory research and development to include genetic characterization, whole-genome resequencing, and bench-scale bioreactor testing; and pilot-scale cultivation at GAI to demonstrate biomass productivity.

Indoor desktop- and laboratory-based activities would be carried out at purpose-built research facilities owned and operated by CSM, in Golden, CO, the Pacific Northwest National Laboratory Campus (PNNL), in Richland, WA, and GAI's Lihue-based facilities. Laboratory photobioreactor operations would use less than 10 gallons of water per day. Commercially-available research grade chemicals would be used for preparation of the algal medium, most of which would be consumed during cultivation. All laboratories are restricted access facilities and comply with all applicable health and safety policies and procedures, including supervision by relevant safety managers, proper training for all research personnel, and annual reviews. Additionally, all facilities in which laboratory work would occur follow established chemical management and waste disposal methods in accordance with pertinent Federal, State, and local environmental regulations. No change in the use, mission, or operation of existing facilities would arise out of these efforts.

Outdoor cultivation activities at GAI would be conducted using previously developed open-pond systems. Water from the Lihue ditch system (run-off water from Waialeale) would be used for media, make-up water, and pond maintenance. During sloped pond production, no more than 10,000 gallons per day of water would be used. Commercially-available research grade chemicals, agricultural fertilizers, and nutrients would be used for algal production, most of which would be consumed during cultivation. GAI's facility is a pre-existing, dedicated research and development facility designed specifically for the types of activities being proposed; no physical modifications or

new equipment would be required. The proposed biomass productivity demonstration at GAI would not exceed the scope or nature of past and ongoing work at this location; therefore, no adverse impacts to sensitive resources are expected as a result of project-related work.

Prior to undertaking any project work involving the evolved algal strains, GAI would obtain all necessary State agency permits and/or approvals for the shipment of these materials to Hawaii from project participants located in the mainland United States. GAI would work with the Plant Quarantine Branch of the Hawaii Department of Agriculture to identify and secure any requisite permits, modifications to existing permits, licenses, and/or authorizations for the proposed activities. In addition, PNNL would renew its environmental permits with the State of Washington for the disposal of spent growth medium.

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:


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.

The recipient is also required to submit copies of all permits needed for completion of the activities contemplated under this award, including relevant environmental permits with the States of Washington and Hawaii, and/or written approvals to the DOE Project Officer prior to commencing the covered activities, and must comply with any associated terms and conditions set forth by the State of Hawaii.

Note to Specialist :

Bioenergy Technologies Office  
This NEPA determination requires a tailored NEPA Provision.  
NEPA review completed by Jonathan Hartman, 4/23/2018

#### SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature:  Casey Strickland  
NEPA Compliance Officer

Date: 4/24/2018

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

Field Office Manager

Date: \_\_\_\_\_