PMC-ND

(1.08.09.13)

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

RECIPIENT: Northwestern University **STATE:** IL

PROJECT TITLE: Engineered reversal of the β-oxidation cycle in clostridia for the synthesis of fuels and chemicals

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001637	DE-EE0008354	GFO-0008354-001	GO8354

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 Northwestern University to engineer clostridia to ferment synthesis gas (syngas) from lignocellulosic biomass, into advanced fuels and bioproducts. Fuels, additives and chemical building blocks, including hexanediol (HDO), hexanol and decanol would be produced via reversal of the β-oxidation cycle (r-BOX) at >80L scale. Improvements in the processes surrounding r-BOX would help to advance the fermentation technology from Technical Readiness Level 2 (TRL-2) to TRL-4.

The proposed project would encompass data analysis, computer modeling, preliminary engineering and design, and laboratory scale research and development. Proposed activities would include process modelling and simulation (e.g. molecular modelling), pathway enzyme identification, biosynthetic pathway optimization, development of optimized production strains of clostridia, molecule synthesis and characterization, quantification of production yields, economic modelling and analysis, and biofuels production forecasting.

Northwestern University would oversee all project activities and work with project partners to complete all laboratory work. The proposed project activities would all be carried out in preexisting, dedicated laboratory facilities. No change in the use, mission, or operation of existing facilities would result from any of the proposed project activities. Neither Northwestern University nor any of its project partners would need to obtain any additional permits in order to realize the work activities proposed as part of this award. Laboratory facilities would include Northwestern University's Jewett Laboratory (Evanston, IL), LanzaTech's Research and Development Laboratories (Skokie, IL), and Rice University's Gonzalez Laboratory (Houston, TX). The Georgia Institute of Technology would also participate as a project partner. However, it would not conduct any laboratory work, but rather, would limit its participation to organizing workshop

activities (e.g. conferences and presentations).

Laboratory work at the above-mentioned laboratories would involve the generation and use of recombinant DNA and microorganisms. The strains used throughout the project (BL21 E. Coli and C. Autoethanogenum) would be handled in accordance with the Center for Disease Control and Prevention's Biological Safety Level 1 (BSL-1) containment and safety requirements. Safety precautions include the use of biosafety hoods, sterilization and bleaching, adherence to established bio-waste policies, and the implementation of multiple layers of containment.

Hazardous organic solvents, inorganic acids/bases, and flammable gases would be used for laboratory work. Risks associated with these materials would be mitigated through the application of all relevant safety norms and guidelines. Safety precautions would include proper storage, handling, and disposal of all hazardous materials, adequate ventilation of all laboratory facilities, health and safety training for all personnel involved in laboratory work, and the use of personal protective equipment. Northwestern University, LanzaTech, and Rice University all have established health, safety and waste management procedures in place that would be adhered to. All applicable Federal, State and local health, safety and environmental regulations would also be observed.

Radioactive materials (C-14 Leucine) would be used at Northwestern University's laboratory facilities for quantifying protein concentration. Radioactivity levels in C-14 Leucine would be limited to 50 microcuries (50 µCi). All Federal guidelines applicable to the procurement and disposal of C-14 Leucine would be observed.

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.

Note to Specialist :

Bioenergy Technologies Office
This NEPA determination does not require a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 07/12/2018

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By Casey Strickland Date: 7/12/2018

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