

PMC-ND

(1.08.09.13)

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



RECIPIENT: [The Trustees of Princeton University](#)

STATE: NJ

PROJECT TITLE: [Synergistic Thermo-Microbial-Electrochemical \(T-MEC\) Approach for Drop-In Fuel Production from Wet Waste](#)

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002203	DE-EE0009269	GFO-0009269-001	G09269

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 the Trustees of Princeton University to develop a thermomicrobial-electrochemical (T-MEC) process to convert food waste and resulting wastewater into jet fuel. The project would design, develop, fabricate, and pilot test hydrothermal liquefaction (HTL) reactors and microbial electrolysis (MEC) reactors. These would be integrated, forming the T-MEC process, to show that it can produce a sufficient amount of renewable jet blend stocks for testing using actual food waste obtained from a food processing plant and restaurants.

Proposed project activities would include design and fabrication of HTL and MEC reactors, processing of food waste, testing of fuel samples, and computer modeling. Princeton University would oversee the project. Project partners would be the University of Illinois at Urbana-Champaign (UIUC) and Pacific Northwest National Laboratory (PNNL). HTL reactors would be designed, fabricated, tested, and upgraded at UIUC. MEC reactors would be designed, fabricated, tested, and upgraded at Princeton University. Catalyst development would be performed at PNNL. All components would be sent to UIUC and combined to enable the T-MEC process where further experiments would be conducted.

Food waste for the project would be transported in 1 ton containers from Kraft Heinz in Champaign, IL and several restaurant locations to the HTL reactors at UIUC where a thermochemical conversion process at moderate temperature and high pressure would convert food waste into biocrude oil and wastewater. After verification testing, small scale HTL reactors would be upgraded to a larger scale (fitting on a 14 ft x 8 ft trailer) and would have the capacity to process 1 ton of feedstock and produce 100 liters crude oil and 800 liters post HTL wastewater. These products would be used for the downstream MEC and biocrude oil upgrading.

Catalysts would be developed at PNNL and shipped to Princeton for testing in the MEC reactors. These catalysts would be tested for performance in enabling conversions to take place in the MEC reactors in terms of product recovery, potential loss, longevity, and scaleup potential. At Princeton University Andlinger Center, MEC reactors would be used to treat wastewater with a process in which an electric current is applied in order to ultimately produce clean water and gases (MEC reaction). This syngas would be upgraded to biofuel. Small scale MEC reactors would vary in size with an empty volume of 32 milliliters (4 cm x 4 cm x 2 cm) to 1 liter (20 cm x 10 cm x 5 cm). The pilot size would be designed to hold a volume of 600 liters (1 m x 1 m x 0.6 m). Later in the project, the pilot MEC would be transported to the UIUC campus and connected with the pilot HTL reactor. HTL and MEC reactors would be integrated

into the T-MEC system and operated at UIUC to validate that it can treat approximately 1 ton of food waste and wastewater, running continuously for over 100 hours. The final fuel product would be more than 1 liter bio-kerosene product which would then be characterized according to accepted standards for jet-fuels.

Techno-economic analyses (TEA) and life-cycle analyses (LCA) would be run during the process to guide in system development and technology commercialization. These would be conducted at Princeton and PNNL.

No facility modifications or changes to the use, mission, or operation of existing facilities would be required as part of this project. No additional permits would be required in order to conduct any of the work activities.

The project will include hazards associated with electricity, flammable gases, and operating machinery at high-temperature and high-pressure. Safety precautions will include use of personal protective equipment, engineering controls, and appropriate ventilation. Princeton University and its project partners would adhere to established health and safety policies and procedures and lab safety guidelines. Waste products would include biomass sludge that would be treated and discharged to the sewer system and hydrosolids which would be reused to make soil amendment. Wastewater would be discharged to the local wastewater treatment plant or the sewer system, following federal guidelines. Princeton University 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.

Notes:

Bioenergy Technologies Office

This NEPA determination does not require a tailored NEPA provision.

Review completed by Shaina Aguilar on 1/04/21.

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:

 Electronically Signed By: Roak Parker

NEPA Compliance Officer

Date: 1/5/2021

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: _____
Field Office Manager

Date: _____