

PMC-ND

(1.08.09.13)

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

**RECIPIENT:** Worcester Polytechnic Institute**STATE:** MA

PROJECT TITLE: A Catalytic Process to Convert Municipal Solid Waste Components to Energy

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001926	DE-EE0008513	GFO-0008513-001	GO8513

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 federal funding to Worcester Polytechnic Institute (WPI) to design, develop, and test a hydrothermal (HTL) reactor system for the conversion of food and paper fractions of municipal solid waste (MSW) to an energy-dense bio-oil and purified lignin stream.

The overall project objective would be to generate bench- and pilot-scale data for use in computer models of a fully integrated reactor system, in order to de-risk possible future commercialization of this technology. There would be no full-scale demonstration, commercial deployment, and/or construction of new facilities under this award. The scope of the proposed project would be limited to data analysis, modeling, laboratory research and development (R&D), and short term pilot-scale testing.

The process to be developed would consist of four main unit operations: a separation method to extract lignin from a green waste stream; HTL for converting the combined streams into bio-oil, and; catalytic upgrading and subsequent catalytic reduction of the bio-oil for improved quality. Feedstocks would consist of grass clippings and leaves obtained from a waste hauling company in addition to a food waste surrogate mixture consisting of food components that have been used by the U.S. Military to simulate their food waste streams. Byproducts of the catalytic upgrading process would include a gas purge stream (consisting primarily of carbon dioxide), a char stream (qualifying as a class A bio-solid), and an aqueous phase containing water-soluble organic compounds.

WPI (Worcester, MA) would conduct experiments with MSW food and paper fractions in HTL batch reactors and perform analytical and spectroscopic characterization of products and catalysts. WPI would purchase supplemental laboratory-sized reactors for the purposes of the proposed activities. The new equipment would be similar in volume (approximately 250 mL) to those currently in use at this WPI Department of Chemical Engineering facility. Additional laboratory experiments to include catalytic upgrading of bio-oil and model compounds using existing reactor systems and analytical equipment would occur at the Massachusetts Institute of Technology (MIT; Cambridge, MA). Various other bench-scale testing activities and office-based technical assistance/analyses would be undertaken by Woods

Hole Oceanographic Institute (WHOI; Woods Hole, MA), the University of California, Riverside (UCR; Riverside, CA), and MG Fuels (Northbrook, IL). Subrecipient Mainstream Engineering Corp. (ME; Rockledge, FL) would conduct pilot-scale testing at their dedicated industrial R&D facility.

Laboratory reactions would be run for approximately 100 hours over the course of the project. Pilot-scale testing would entail roughly 10 hours of cumulative operation. Gas emissions from these systems (including the combustion of char product at ME) would be negligible. It is anticipated that the project would produce approximately 5 kg of upgraded bio-oil and minor amounts of lignin solids that would both be retained for future usage and/or analysis. The total quantity of biomass feedstocks to be used would be on the order of approximately 250 kg. Attendant water consumption is expected to be less than 2500 L for all sites combined. Project activities would use a total of approximately 10,000 L each of hydrogen, nitrogen, and air gases. Estimated volumes of chemicals to be used would range from less than 1 L to 1000 L, depending on location. Estimated amounts of solid catalysts to be used would range from 500 g to 1 kg, depending on location. Wastewater containing trace amounts of organics would be discharged to onsite septic systems per routine, permitted procedures. Leftover non-hazardous green waste would be disposed of via municipal systems.

The proposed project would involve the use and handling of various hazardous chemicals. All such handling would occur in-lab following proper hazardous material management practices in accordance with relevant Federal, state, and local environmental regulations. In addition, the proposed project would involve the utilization of high temperature and pressure reactor vessels. Existing university or corporate health and safety policies and procedures would be adhered to at all times by project participants. Hazard mitigation measures would include employee training, the use of personal protective equipment (PPE), engineering controls, monitoring, and regular equipment/facility assessments.

The specific types of materials that would be employed by the proposed project are standard for biomass processing operations; further, the quantities of materials used and produced by project-related activities would not exceed the respective scales of past and ongoing bioenergy R&D at any project location. With the exception of bench-scale reactors to be acquired by WPI, no new equipment would be required to perform the proposed activities, and no equipment would require decommissioning at the conclusion of the project. WPI and subrecipients have all applicable permits in place, and would not need additional permits. No change in the use, mission, or operation of existing facilities would arise out of project efforts. The aforementioned facilities were purpose-built for the type of activities being proposed; therefore, no adverse impacts to sensitive resources are expected as a result of the proposed project.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Bioenergy Technologies Office

This NEPA determination does not require a tailored NEPA Provision.

NEPA review completed by Whitney Doss

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: Casey Strickland** Date: **3/19/2019**
NEPA Compliance Officer

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: _____ Date: _____
Field Office Manager