PMC-ND

(1.08.09.13)

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

RECIPIENT: Lehigh University **STATE:** PA

PROJECT TITLE : Integrated LIBS-RAMAN-AI System for Real-Time, IN-Situ Chemical Analysis of MSW Streams

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002423	DE-EE0009668	GFO-0009668-001	GO9668

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.
B5.15 Small-scale renewable energy research and development and pilot projects	Small-scale renewable energy research and development projects and small-scale pilot projects, provided that the projects are located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Lehigh University (Lehigh) to design, develop, fabricate, and test a system capable of performing rapid characterization of municipal solid waste (MSW) streams by utilizing artificial intelligence (AI) and multiple spectroscopy technologies. Spectroscopy is the process of evaluating the interaction between matter, in this case MSW, and light beams, or lasers. Three types of spectroscopy would be utilized: Fourier-transform infrared (FTRI) spectroscopy, laser induced breakdown spectroscopy (LIBS), and Raman spectroscopy (Raman).

Early award activities would involve the collection of MSW samples from preexisting MSW sources, which would be characterized at Lehigh and Mineral Labs, Inc. (Salyersville, KY) laboratory facilities. If additional assistance would be required for characterization activities, Lehigh would enlist additional laboratories to complete the activities. Such laboratories would have preexisting, active, and routine operations completing similar laboratory activities following existing safety procedures and regulations. Characterization activities would occur in laboratory settings using FTRI spectroscopy and differential scanning calorimetry (i.e., evaluating the heat required to change the temperature of different samples). Characterization data and fractions of the MSW samples would be sent to the Idaho National Laboratory (INL). Although INL is not participating in this award's activities, the material and data could benefit INL's ongoing efforts in maintaining the Bioenergy Feedstock Library. Concurrent award activities would include lab development, lab testing, and development of artificial intelligence (AI) models and algorithms. These activities would focus on the integration of LIBS and Raman spectroscopies. Laboratory development and testing activities would occur at Energy Research Company (ERCo) (Plainfield, NJ) for LIBS and the National Energy Technology Laboratory (NETL) (Morgantown, WV) for Raman. AI development activities would occur at Lehigh (Bethlehem, PA) and the University of Toledo (UT) (Toledo, OH).

If findings from the aforementioned activities indicate LIBS and Raman to be feasible methods of characterizing MSW, activities would progress to the design, fabrication, and testing of a prototype system at ThermoChem Recovery International (TRI) (Durham, NC). The prototype would integrate LIBS and Raman technologies on a mounting fixture which would allow them to operate on MSW passing through a preexisting feed system (via conveyor) and provide a user with the respective data. The technologies would be contained within an enclosure (all dimensions approximately less than two feet) and would be coupled with an optical system (approximately 1-3 feet in length with a 3-4 inch diameter). The technologies would be about 2-5 inches above the waste stream. Tests would involve multiple runs with different feed rates and conveyor speeds. Results from these tests would guide the refinement of the prototype system, including its AI algorithms. Eventually the system would be tested under TRI's normal operating conditions for numerous extended trial periods. Altogether, tests and trials for the installed system would run for hundreds of hours over a period of approximately seven weeks. During testing the system would produce up to 8 pounds of biofuel per hour.

Using the information gathered during prototype testing, a commercial system would be designed and protocols for its use would be developed. A Techno-Economic Analysis (TEA) for the commercial system would be performed. A commercial system would not be fabricated or tested as part of this award.

The facilities at Lehigh, Mineral Labs, ERCo, NETL, UT, and TRI are preexisting purpose-built facilities for the type of work to be conducted for this project. Although equipment installations would occur to perform award activities, facility modifications would not be required to install or operate equipment. Award activities would involve the use of laser equipment and lasers. Award activities would involve the handling and storing of hazardous materials, including chemical reagents and MSW. All such handling and storage would occur within facilities and would follow existing policies and procedures for handling and disposal of these materials. Handling of hazardous materials at facilities would be done in accordance with existing federal, state, and local laws and regulations. Existing university, corporate, and government health, safety, and environmental policies and procedures would be followed at all facilities, including: employee training, proper personal protective equipment (PPE), engineering controls, monitoring, and internal assessments. SpG Consulting, LLC would provide support with intellectual, academic, analytical, and administrative activities, including engineering calculations, data analysis, report writing, and communications.

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 (BETO)
This NEPA determination requires a tailored NEPA Provision.
NEPA review completed by Dan Cahill, 12/28/2021.

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 Date: 12/29/2021

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