

PMC-ND

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



RECIPIENT: North Carolina State University

STATE: NC

PROJECT TITLE: Scaling Up Biocrude Derived Anode Material (BDAM)

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002203	DE-EE0009260	GFO-0009260-001	GO9260

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 North Carolina State University (NCSU) to design, fabricate, and test a novel delayed coker reactor. The reactor would be designed to process bio-oils into graphite and solid carbons for use in battery manufacturing applications. As part of the project, the reactor would be operated for extended periods to assess operational performance. Synthesized carbon products would then be utilized to fabricate electrode cells for performance testing.

Proposed project activities would consist of computer modeling and analysis, biocrude production, biocrude processing and characterization, reactor assembly/testing, and battery fabrication. Each of these activities will be discussed in detail below.

Computer modeling and analysis would be performed throughout the project by NCSU and its project partners. Each of these partners would perform additional task work, which will be described below. The Center for Industrial Ecology at Yale University is the only project partner that would not perform any task activities beyond computer modeling and analysis. Specifically, the Center for Industrial Ecology would perform a life cycle assessment utilizing project data, at its campus in New Haven, CT.

Biocrude production would be performed by NCSU's project partner, Ensyn Corporation at its research facility in Ontario, Canada. Ensyn processes feedstocks and produces biofuels as part of its regular course of business at this location. Biocrude would be produced via conversion of woody feedstock utilizing existing purpose-built equipment. Approximately 10 metric tons of feedstock would be used throughout the life of the project. Biocrude would be produced in 100s of Kg quantities.

The biocrude produced by Ensyn Corporation would then be utilized for characterization and processing. NCSU and Birla Carbon USA would each perform material characterization (e.g., fraction analysis, spectroscopy, etc.) and biocrude processing at their research facilities in Raleigh, NC and Marietta, GA, respectively. Biocrude processing would consist of the synthesis of solar carbon products (e.g., graphite and needle coke) at laboratory scales (~10 g samples). NCSU would produce graphite and hard carbon samples utilizing existing purpose-built equipment at its facility, where it conducts material research as part of its regular course of business. Birla Carbon would perform graphitization utilizing existing equipment at its facility, where it processes carbon products as part of its regular course of business.

The delayed coker reactor to be developed as part of the project would be designed by NCSU and its project partners and fabricated by a qualified third-party manufacturer. The reactor would be built at pilot-scale, measuring approximately 8 ft wide by 6 ft deep by 8 ft tall. Primary components would include a heated reservoir, a pump to spray oil into the coker reactors, two vessels, and a condensation system. The integrated unit would be installed first at Ensyn's facility in Ontario, Canada, where it would be used for operational testing. It would then be transported to the National Renewable Energy Laboratory (NREL) in Golden, CO, where it would also undergo operational testing. At both locations, the integrated pilot reactor would be transported on a skid and brought indoors via existing bay doors. The pilot reactor would be installed indoors and connected to existing facility infrastructure (e.g., electrical outlets, exhaust connections). No facility modifications would be required at either location.

Between the two locations, the pilot reactor would be operated for at least 500 hours. Biocrude would be fed to the reactor to produce solid carbon samples. Approximately 450 Kg of biocrude would be used as feedstock over the life of the project. Organic vapors produced during operations would be condensed from the exhaust of the reactors. The remainder of the exhaust gases would be plumed into existing plant exhaust. At both Ensyn and NREL, NCSU and its project partners would characterize the biocrude produced.

The solid carbon samples produced by the reactor would be further refined into battery components by the Battery Innovation Center at its research center in Newbery, IN. Coin cell batteries would be produced using these components and tested for performance efficiency.

All project activities would be coordinated by NCSU. No physical modifications to existing facilities, ground disturbance, or changes to the use, mission, or operation of existing facilities would be required for any of the activities described above. No additional permits or authorizations would be required.

Project work would involve the use and handling of industrial chemicals/solvents and pressurized gases. All such handling would be performed in controlled laboratory environments that handle these materials as part of their regular course of business. To mitigate potential hazards, NCSU and its project partners would adhere to established institutional health and safety policies and procedures. Protocols would include employee training, the use of personal protective equipment, and the observance of engineering controls and monitoring for chemical handling and material disposal. NCSU 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 Jonathan Hartman, 06/09/2021

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.

