

PMC-ND  
(1.08.09.13)

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



**RECIPIENT:** Clemson University

**STATE:** SC

**PROJECT TITLE:** Lignin Fractionation and Valorization: Focusing on both Value and Quality

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0001916	DE-EE0008502	GFO-0008502-001	G08502

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 Clemson University to develop processes to increase the strength of lignin-based carbon fibers, increase lignin substitution into polyurethane (PU) and polyisocyanurate (PIR) foams, and synthesize activated carbons (AC) using residual lignin. Lignin would be isolated and purified using the Aqueous Lignin Purification with Hot Acids (ALPHA) process. The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

Proposed project activities for BP1 would establish the viability of project processes. Verification would consist of bench-scale laboratory activities including lignin recovery from pretreatment liquors/lignin cakes, lignin purification/fractionation, and lignin processing. BP2 would focus on developing processes for conversion of hybrid-poplar and corn-stover lignin into the targeted co-products (e.g. carbon fibers, PU/PIR foams, and AC). Proposed activities would include synthesis of alkaline pretreatment liquors/lignin cakes, ALPHA processing, molecular analysis of lignin fractions, co-product synthesis, and techno-economic analysis (TEA)/life-cycle assessment (LCA) modeling. BP3 would focus on increasing the quality of the co-products produced in BP2, including the carbon fibers, foams and activated carbons, as well as the lignin substitution into these products. All project activities in BP3 would build on previous BP2 activities.

Clemson University would coordinate all project activities and would perform a number of laboratory experiments at its facilities in Clemson, SC, including lignin recovery, ALPHA processing, co-product synthesis, and TEA/LCA analysis. Michigan State University would perform lignin characterization and PU foam synthesis/testing at its campus in Lansing, MI. Montana State University would perform lignin stream generation and characterization at its campus in Bozeman, MT. Oak Ridge National Laboratory (ORNL) and the National Institute of Standards and Technology (NIST) would each perform molecular-level lignin dispersion characterization (via small angle neutron scattering measurements) and data analysis at their facilities in Oak Ridge, TN and Gaithersburg, MD, respectively.

Project activities would be performed at existing, purpose-built laboratory facilities operated by Clemson University and/or its project partners. No change in the use, mission or operation of existing facilities would be required, nor would any additional authorizations or permits be required to complete project activities.

Proposed project activities would include the use and handling of industrial solvents, acids, bases, and reagents, as well as laboratory equipment (e.g. vessels, reactors, mixers and furnaces) operating at elevated temperatures and

pressures. Any risks associated with the handling of these materials/equipment would be mitigated through adherence to established health and safety policies and procedures at each of the participating entities. Project work would be overseen by each institution's respective health and safety office, which would enforce the proper handling, storage, and disposal of any potential hazardous materials. Clemson University and its project partners would observe all applicable Federal, state, and local health, safety and environmental rules and regulations.

#### NEPA PROVISION

DOE has made a final NEPA determination.

Include the following condition in the financial assistance agreement:

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.

Notes:

Bioenergy Technologies Office

This NEPA determination requires a tailored NEPA Provision.

NEPA review completed by Jonathan Hartman, 01/25/2019

#### 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:



Casey Strickland

NEPA Compliance Officer

Date:

1/25/2019

#### 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: