

PMC-ND

(1.08.09.13)

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

**RECIPIENT:** University of Kentucky**STATE:** KY

PROJECT TITLE: Sulfur Profiling in Pine Residues and Its Impact on Thermochemical Conversion

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002029	DE-EE0008909	GFO-0008909-001	GO8909

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 University of Kentucky (UK) to analyze the sulfur profiles of biomass feedstocks and assess sulfur's relationship to the thermochemical conversion process. The research would be used to develop sulfur mitigation strategies and improve thermochemical conversion technologies/methodologies.

As part of the project, pine residues from various species would be procured from project partners/suppliers and characterized. Sample feedstocks processed from the residues would then be subjected to thermochemical conversion experiments in order to evaluate sulfur's evolution throughout the process. A database would be compiled based on the information acquired from testing, and sulfur mitigation strategies would be developed based on the results.

Specific project tasks and associated activities are detailed below:

Task 1: Initial DOE Verification – This task would involve the collection of baseline data on sulfur profiling and sulfur mitigation methods (e.g. mechanical separation). An initial batch of pine residue would be provided by Idaho National Laboratory (INL) and used to verify sulfur profiling and mechanical separation methods. Preliminary project planning/reporting would be performed as part of this task. Verification activities and project planning would be performed by UK at its campus in Lexington, KY and the INL at its facilities in Idaho Falls, ID.

Task 2: Establish a Sulfur Profile Library and Correlative Model – As part of this task, pine samples would be procured, mechanically separated into various anatomical fractions, and characterized (e.g. characterization of composition and sulfur content). Mechanical separation would be performed at INL and at Red Rock Biofuels ('RRB' – Fort Collins, CO). A feedstock library would be developed from the anatomical fractions created through the separation process. A multivariate analysis would be performed on the pine samples and fractions. Characterization and analysis would be performed at UK and INL.

Task 3: Determine the Fate of Sulfur during the Thermochemical Conversion – As part of this Task, customized equipment (e.g. pyrolysis unit, fluid-bed reactors) would be used to analyze sulfur evolution during thermochemical conversion processes. This task work would be performed at UK.

Task 4: Test Effectiveness of Preprocessing Sulfur Mitigation Strategies – Two biomass preprocessing/sulfur mitigation strategies would be tested and contrasted: mechanical separation and bioleaching. Each of these methods would be evaluated in terms of its effectiveness for removing sulfur from pine residues. Mechanical separation strategies would be assessed at INL. Bioleaching strategies would be assessed by Kansas State University (KSU) at its campus in Manhattan, KS.

Bioleaching would involve the use of microorganisms for sulfur removal. All microorganisms would be limited to those requiring biosafety level 1 (BSL-1) protocols. These microorganisms would be handled in a BSL-2 laboratory, adhering to established biosafety regulations. Spent cultures would be autoclaved prior to disposal.

Task 5: Techno-economic Analysis (TEA) and Life Cycle Analysis (LCA) – TEA and LCA modeling would be performed. The analysis results would then be used to inform process development (e.g. sulfur mitigation and thermochemical conversion) and optimization. This task would be performed at the facilities of INL and RRB.

Task 6: Predictive Model Setup and Validation – This task would consist of the development of a product distribution model for biomass feedstocks with varying sulfur profiles. The predictive model would be used to optimize mitigation strategies. The model would be tested through pyrolysis/gasification experiments. Modeling/analysis under this task would be performed by UK in conjunction with its project partners INL, RRB and KSU. The model would then be validated at a laboratory at Mississippi State University (Starkville, Mississippi).

All project activities would be coordinated by UK. Pine residue samples would primarily be procured from INL and RRB, though other suppliers would provide samples from existing stocks as well. Neither UK nor any of its project partners would collect pine residue at field locations for the project. All laboratory work/analysis would be performed at existing, purpose-built laboratory facilities. No physical modifications to existing facilities, construction of new facilities, ground disturbing activities, or changes to the use, mission, or operation of existing facilities would be required. Likewise, no additional permits or authorizations would be needed for the completion of project activities.

Project work would involve the use and handling of sulfur-containing gases and liquids. All such handling would occur in controlled, laboratory environments. Risks associated with the performance of project activities would be mitigated through adherence to established health and safety policies and procedures. Protocols would include personnel training, the use of personal protective equipment, monitoring, and internal assessments. Equipment would also be used to reduce the risk of a sulfur-containing gas release, including fume extractors and fume hoods. This equipment would be regularly inspected to ensure proper functionality.

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, 01/28/2020

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:  _____ Date: 1/29/2020
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