

PMC-ND

(1.08.09.13)

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

**RECIPIENT:** North Carolina State University**STATE:** NC

PROJECT TITLE: Renewable Natural Gas from Carbonaceous Wastes via Phase Transition CO₂/O₂ Sorbent Enhanced Chemical Looping Gasification

| | | | |
|--|--------------------------------------|----------------------------|-------------------|
| Funding Opportunity Announcement Number | Procurement Instrument Number | NEPA Control Number | CID Number |
| DE-FOA-0002044 | DE-EE0008809 | GFO-0008809-001 | GO8809 |

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 create renewable natural gas from biomass through an intensified gasification process. The project team would develop and synthesize a sorbent material and design and construct a gasifier to convert biomass. Syngas produced from biomass would go through a methanation process to produce pipeline-quality renewable natural gas. Life cycle and techno-economic analyses of the process would be conducted.

Biomass would be collected from Raleigh C&D Processing Facility, Brownfield Road C&D Landfill, Greenway Waste Solutions of Apex, North Carolina Agricultural and Technical State University (NC A&T) Poultry Research Unit, Mountaire Farms of North Carolina, and Perdue Farms Inc. This would include approximately 75 kg of wood from construction and demolition waste and approximately 75 kg of chicken litter. Woody biomass waste would be sent to NCSU Pulp and Paper Lab in Raleigh, NC for analysis and pretreatment. Chicken litter would be sent to NC A&T in Greensboro, NC for analysis and pretreatment.

Oxide sorbents to be used in the gasification process would be designed, synthesized, characterized, and evaluated using existing lab equipment at the NCSU Sustainable Energy Research Lab in Raleigh, NC. Once the optimal design is identified, the sorbent would be scaled up to produce two 20 kg batches. At a dedicated lab at Particulate Solid Research Inc (PSRI) in Chicago, IL, in collaboration with NCSU, the gasification cold flow model would be designed, operated, and validated. This would include gasification and regeneration reactors using model particles such as glass beads to mimic biomass wastes and validate achievement of suitable solids circulation rate ranges, solids hold up, gas/solids residence times, and solids residence time distributions. This model would be tested to ensure it can perform 24 hours of stable and continuous operation. Results would be used to inform the hot unit design. PSRI would then finalize, fabricate, and construct the gasification hot model design, which would be approximately 10 feet high by 3 feet in diameter. This would include the gas injection systems, steam generators, valves, controls, product analysis devices, and preheating and cooling systems. This gasifier, as well as the pre-treated biomass, would be transported to the NCSU Sustainable Energy Research Lab where it would be operated to perform conversions. It would undergo 100 hours of testing, where it would convert biomass to syngas and syngas to renewable natural gas. Yale University Center for Industrial Ecology in New Haven, CT would run life cycle analysis and cost benefit analysis throughout the project

All work would occur in purpose-built facilities. Excluding routine electrical and exhaust work to house the gasifier at

NCSU, no changes in the use, mission, or operation of existing facilities would be required as part of this project and no additional permits would be required in order to conduct any of the work activities.

Project activities would involve construction and operation of gasifier models, work under high temperatures, the use and handling of hazardous chemicals such as nitrate salts, metal oxides, ethylene glycol, and citric acid. Any risks associated with these activities would be mitigated through adherence to established health and safety policies and procedures. Protocols would include personnel training and safety reviews, fume hoods, and the use of personal protective equipment. All waste products would be disposed of by licensed waste management service providers. North Carolina State University and its project partners would observe all applicable Federal, state, and local health, safety, and environmental regulations.

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 Shaina Aguilar on 4/20/21.

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:


NEPA Compliance Officer

Date: 4/20/2021

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: _____