

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



RECIPIENT: GAS TECHNOLOGY INSTITUTE

STATE: IL

PROJECT TITLE : R-GAS™ Advanced Gasification Pre-Pilot Demonstration for Biofuels (BioR-GAS)

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002396	DE-EE0009755	GFO-0009755-001	GO9755

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 the Gas Technology Institute (GTI) to demonstrate production of bio-fuel from biomass and/or sorted municipal solid waste (SMSW) at a target price and with a reduction of greenhouse gas emissions compared to petroleum derived equivalents. The project would include biomass selection and characterization, biomass and SMSW pre-processing, feed system testing, gasification, and outreach.

The project would begin with an initial verification process to evaluate baseline data and project targets. Project activities would be conducted to identify the optimal combination of feedstock type (biomass or SMSW), particle size, and pre-processing approach for gasification. The type of biomass to be used during experiments would be chosen from woody, herbaceous, or agricultural residue. Biomass and SMSW would be broken down into two different particle sizes (200 micrometers and 1000 micrometers). Each particle size would be pre-processed using three different techniques (only one pre-processing technique would be used for SMSW). In total, 8 different feedstock/particle size/pre-processing combinations would be tested. The pre-processing techniques employed would be torrefaction, steam explosion, and non-thermal drying. The torrefaction process heats biomass slowly at a low temperature in an inert or oxygen-deficit environment to create a solid product with lower moisture and higher energy content. Steam explosion heats the biomass in a closed vessel under high pressure for a short period of time. The pressure is quickly released causing an explosive effect on cells which softens the structure and facilitates digestibility for gasification. Non-thermal drying occurs without heat (e.g., high pressure, ultrasound, or osmotic dehydration). SMSW would only be processed using non-thermal drying. The 8 different combinations would be tested using bins under atmospheric pressure, a pressure-transfer vessel, and a pressurized feed vessel. The above described work would all be laboratory scale.

Based on capital and operating cost for pre-processing and performance metrics related to pressurization and flow within the gasification unit, the top 3 performers would be selected. The 3 selections would then be tested in a gasifier using 2 different reactor lengths (3-foot and 6-foot) for 48 hours each, resulting in 6 tests total. Ultimately, one biomass/pre-processing/particle size/reactor length would be selected for testing in GTI's gasifier. A total of 500 hours of testing would be conducted using the gasifier. This would include a 100-hour continuous duration test in which the ability of the gasifier to run for at least 100 hours continuously at the targeted flow rate would be verified. Performance results would be used to design a commercial scale plant.

A techno-economic analysis and lifecycle assessment would be completed to determine whether the cost and greenhouse gas emissions reduction targets can be met at a commercial scale.

This project would also include diversity and inclusion educational programs for GTI's employees and an outreach program to high school students in an underserved community.

GTI in Des Plaines, IL would oversee the project. Ekamore in Cookeville, TN and Idaho National Lab (INL) in Idaho Falls, ID would supply approximately 250,000 pounds of prepared biomass feedstock and SMSW sourced through a supplier. A portion of the biomass would be sent to INL for torrefaction and steam explosion pre-processing and characterization. Pre-processing would be conducted using existing equipment in INL's Process Development Unit (PDU) including a low-speed bale processor to break up bales of biomass; magnets, rock traps, and air and gravity classifiers to remove contaminants and sort the biomass; rotary shear mills and riffle splitters to reduce the biomass to the necessary size; and rotary and low temperature belt dryers to dry the biomass. Ekamor would also conduct pre-processing (non-thermal drying) and would perform pulverization of SMSW and biomass. GTI would characterize biomass and SMSW, test the feed system, and perform gasification of selected biomass feedstocks. Integrated feed system/gasification testing would be completed at GTI's R-GAS pilot facility using an existing gasifier.

The R-Gas pilot plant at GTI would be reconfigured for use with biomass feedstock. This is a change in use as the R-Gas pilot plant has been previously used only for gasification of coal and natural gas. The necessary modifications would be determined based on results of feedstock preparation tests but would include minor line additions and modifications to the injector assembly. Aside from this, there would be no other changes in the use, mission, or operation of existing facilities required as part of this project and no ground disturbance or additional permits required in order to conduct any of the work activities.

Project activities would involve the use and handling of gas mixtures, solid materials, and liquid products that could contain hazardous materials. Any risks associated with the handling of these materials would be mitigated through adherence to established health and safety policies and procedures. Protocols would include employee training, the use of personal protective equipment, monitoring, engineering controls, and internal assessments. Roughly 65,000 pounds of char, ash, and fines and 200,000 pounds of water waste would be generated. The water would be tested to validate that it is clean enough to dispose of through the sewage system. All other waste products would be disposed of by licensed waste management service providers. GTI 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 Shaina Aguilar on 1/13/22.

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**
NEPA Compliance Officer

Date: 1/13/2022

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: _____