

PMC-ND

(1.08.09.13)

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

**RECIPIENT:** The University of Alabama**STATE:** AL

PROJECT TITLE: Innovation and Optimization of the Szego Mill for Reliable, Efficient, and Successful Up-Scaling of the Deacetylation and Mechanical Refining (DMR) Process for Biofuel Production

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002203	EE0009256	GFO-0009256-001	

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.

B1.31 Installation or relocation of machinery and equipment Installation or relocation and operation of machinery and equipment (including, but not limited to, laboratory equipment, electronic hardware, manufacturing machinery, maintenance equipment, and health and safety equipment), provided that uses of the installed or relocated items are consistent with the general missions of the receiving structure. Covered actions include modifications to an existing building, within or contiguous to a previously disturbed or developed area, that are necessary for equipment installation and relocation. Such modifications would not appreciably increase the footprint or height of the existing building or have the potential to cause significant changes to the type and magnitude of environmental impacts.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to University of Alabama (UA) to optimize and scale up a previously developed industrial milling technology (i.e., Szego Mill) for use in the production of hydrolysate from corn stover. A previously assembled, laboratory-scale Szego Mill would be used as the basis for system design improvements. UA would assess the operations of the existing unit and then design, fabricate, and test small and larger pilot-scale prototypes, with increased production capacity, as compared to the existing laboratory-scale device.

The Szego Mill, which would be the focus of the project, consists of a stationary piece of equipment used for grinding materials. The mill's components include an upright cylinder used for receiving input materials, a rotary system for grinding, a stand, drive, and an electric motor. Currently, a laboratory-scale Szego Mill (SM-160) exists at the National Renewable Energy Laboratory (NREL) in Golden, CO. This would be used for initial component and process characterization activities. The existing unit weighs approximately 100 kg and has approximate dimensions of 2 ft. height, 2 ft. length, and 1 ft. width. The two pilot-scale prototypes would be developed based on component testing, operational assessments, and computer modeling. Each pilot-scale prototype would be larger than the existing laboratory-scale mill. The two prototypes will be discussed further below.

Proposed project activities would consist primarily of conceptual design work, component wear testing, prototype assembly, and operational testing. Specific tasks include the following:

Task 1: This task would consist of baseline data validation and validation experiments. UA would share data with the DOE.

Task 2: For this task, UA would perform a failure analysis on the components of the existing SM-160 mill at NREL. This would include operating the assembled mill at NREL to collect processing data to be analyzed by UA. At its

laboratory space in Tuscaloosa, AL, UA would also perform tests to identify candidate materials for incorporation into the pilot scale versions. This would include wear testing on steel samples to screen candidate steel materials for incorporation into the scaled prototypes. It would also include testing processes to increase wear resistance (i.e., laser peening and cold spray deposition) using sample material coupons. Existing laboratory equipment would be used for component and process testing.

Task 3: This task would consist of computer modeling and simulations of the mechanical performance of the Szego Mill prototypes. UA and its project partner General Comminution (GCI) would run computer simulations and use the data obtained to formulate design optimizations for both small and larger pilot-scale prototypes. Work activities performed by GCI would be limited to computer-based research and would not include any physical experimentation. GCI would perform computer-based research at its office facilities in Toronto, Canada.

Task 4: This task would consist of computer modeling and simulations of biomass comminution (i.e., the fragmentation of biomass materials that would result from processing using the Szego Mill). UA and GCI would use the data obtained from these simulations to develop new roller designs for both the small and larger pilot-scale Szego Mill prototypes.

Task 5: Conceptual design work from previous tasks would be applied to the fabrication of two (2) small pilot-scale Szego Mills (SM-280). The SM-280 mills would each weigh approximately 200 kg and have an approximate height of 4 ft. The mills would be fabricated to specification by a qualified, third-party manufacturer. One of the SM-280 mills would be installed as a stand-alone unit (i.e., the unit would not be incorporated into a process line) at UA's laboratory space and utilized for analysis of the mill's physical and mechanical properties. No modifications to UA's facilities would be required for installation of the SM-280 unit. No additional permits or authorizations would be required.

The other SM-280 mill would be installed at NREL for operational testing. The SM-280 mill would be integrated into an existing process line that currently utilizes the laboratory-scale Szego Mill (SM-160). Existing equipment in the process line would remain in place and the Szego Mill units would be swapped. Installation of SM-280 prototype system would consist of component assembly, anchoring the assembled system to the floor in a designated area in accordance with manufacturer specifications, and integration of auxiliary systems and components (e.g., feeding/discharge system, variable frequency drive, electrical and control systems, etc.). No other modifications would be required at NREL's facilities. No additional permits or authorizations would be required.

For operational testing at NREL, the SM-280 mill would be utilized to process corn stover feedstock. Testing would be carried out for a minimum of 200 cumulative hours. The processed material would be characterized for its potential to yield targeted end-products through fermentation processes.

Task 6: Based on the data from previous tasks, UA and NREL would develop the conceptual design and specifications for a larger pilot-scale Szego Mill (SM-320). The SM-320 mill would have an approximate weight of 300 kg. The SM-320 would have approximate dimensions of 5 ft. height, 4 ft. length, and 2 ft. width and would have a 1 - 5 ton/day processing capacity. The device would be fabricated to specification by a qualified, third-party manufacturer. The mill would be incorporated into NREL's existing process line, in the same manner as the SM-280, described in Task 5.

For operational testing, the SM-320 mill would be utilized to process corn stover feedstock. Testing would be carried out for a minimum of 500 cumulative hours, with at least 100 hours of continuous operation. The processed material would be characterized for its potential to yield targeted end-products through fermentation processes. Data generated would be utilized to develop techno-economic and life cycle analysis models.

In total, approximately 30 tons of corn stover would be used for testing, over the lifetime of the project, including testing performed under Tasks 5 and 6.

Project work would include the use and handling of chemical solvents, metallic powders, laser energy sources, pressurized gases, and radiation generating equipment for use during material characterization. All such handling would be performed in controlled, purpose-built laboratory facilities that regularly work with these materials as part of their routine course of business. Potential hazards would be mitigated through adherence to established institutional policies and procedures, including the use of appropriate personal protective equipment. Biomass waste generated through fermentation processes would be treated properly before disposal. UA 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, 03/01/2021

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.

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.

DOE has determined that work to be carried out outside of the United States, its territories and possessions is exempt from further review pursuant to Section 5.1.1 of the DOE Final Guidelines for Implementation of Executive Order 12114; "Environmental Effects Abroad of Major Federal Actions."

The proposed action is categorically excluded from further NEPA review.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature:  Roak Parker Date: _____
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