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

RECIPIENT: The Ohio State University **STATE:** OH

PROJECT TITLE: Simulation-Driven Design Optimization and Automation for Cordwood-Fueled Room Heaters

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002203	DE-EE0009283	GFO-0009283-001	GO9283

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 Ohio State University (OSU) to develop automated control technologies for incorporation into wood burning stoves. The automated control technologies would be designed to improve combustion efficiency and reduce emissions. Simulation techniques would also be developed to optimize stove performance efficiency. Prototype stoves would be fabricated based on project design work and incorporating the automated control technologies developed. These prototypes would be tested in-lab.

Project work would occur in an iterated fashion. Performance testing would inform conceptual design work, which would in turn, inform further testing. Task work is detailed below. It should be noted that the tasks would not be performed sequentially or in a step-wise fashion. As a result, earlier tasks reference later tasks, as many of these tasks would be performed continuously throughout the project.

Task 0 – Project Verification: This task would consist of the verification of benchmark data reported in the initial award application. Verification would be performed by an independent engineer. OSU would share baseline data and reproduce laboratory experiments documented in the initial award application. Design and modeling planning documents would also be submitted.

Task 1: This task would consist of iterated laboratory-based performance testing to be conducted throughout the duration of the project. Performance testing would be performed using both commercial off-the-shelf stoves (COTS) provided by New Buck Corporation and prototype stoves to be developed as part of Tasks 12 – 14 (described below). In total, six (6) stoves would be utilized for testing activities; four (4) COTS stoves and two (2) prototype stoves. The COTS stoves would be used for testing at OSU's campus in Columbus, OH and at the campus of its project partner University of Buffalo (UB), in Buffalo, NY. OSU and UB would each receive two of the COTS stove; one catalytic model and one non-catalytic model. The prototype stoves would be assembled for testing at UB's laboratory facilities. Performance testing would assess the operation of individual components of the stoves, automation software, and system-level calibration. Baseline performance data would be generated from operation of the stoves.

Task 2: OSU and UB would utilize the performance data collected from operating the COTS and prototype stoves to inform automated control development. Computer models would be generated based on the data. Once the automation system is developed in Task 14, it would also be tested utilizing the prototype stoves at UB's facilities.

Task 3: After the prototype stoves have been fully assembled (Tasks 12 – 13) and tested in-lab (Tasks 1 – 2), they would be shipped to an independent third-party laboratory for Environmental Protection Agency certification testing.

Task 4 – 9: These tasks would consist of computer-based development of particulate matter (PM) emissions and combustion models. Existing data from literature review and data generated from the performance testing in Tasks 1 and 2 would be used for model design and development. Oak Ridge National Laboratory (ORNL) would lead modeling efforts, with assistance from OSU and UB. ORNL would perform literature reviews, develop the modeling framework, develop and implement computational fluid dynamics simulations, and evaluate model performance. OSU and UB would assist in all of these efforts. UB would lead the effort to integrate the combustion and PM emissions models.

Task 10: This task would consist of the development of baseline predictive models for wood stove operations. Systems dynamic and control inputs would be simulated. Modeling would also incorporate previous combustion models. OSU would lead predictive modeling efforts and perform Task 10 activities, with input from its project partners.

Task 11: This task would consist of conceptual design work for the fabrication of the two wood stove prototypes. Both a catalytic and a non-catalytic prototype design would be developed. OSU and UB would both participate in conceptual design work in consultation with manufacturing partner New Buck Corporation.

Tasks 12 - 13: These tasks would consist of the fabrication of the catalytic and non-catalytic wood stove prototypes. Manufacturing drawings would be prepared and two (2) protype devices would be fabricated by New Buck Corporation at its manufacturing facility in Spruce Pine, NC. The prototypes would be based on existing commercial models produced by New Buck Corporation. Control hardware would be integrated into each model, including the automatic actuators and electronic sensors developed as part of Task 14 (below). Control software/algorithms would also be embedded into each device to regulate operations.

New Buck Corporation regularly produces wood stoves as part of its routine course of business. New Buck Corporation would adhere to established corporate health and safety policies and procedures when fabricating the prototypes.

Task 14: This task would consist of the development of automation systems for the two prototype stoves. Control requirements, testing plans, and automation system specifications would be developed, as well as control software to be embedded in the prototype stove hardware. Automation system components, including actuators and sensors, would be integrated into the prototype stoves fabricated as part of Task 13. Control systems would be tested both virtually and using the physical stoves. Both OSU and UB would participate in automation system development and testing.

Tasks 15 – 16: These tasks would consist of industry stakeholder engagement, dissemination of research results, and the development of information workshops. Engagement would occur in person, through presentations, and via internet-based platforms. OSU would lead and coordinate stakeholder engagement with its project partners.

All project activities would be performed at existing, purpose-laboratory and manufacturing facilities. Work at OSU's facilities in Columbus, OH would consist of computer based modeling/analysis and performance testing with wood burning stoves. Work at UB's facilities in Buffalo, NY would also consist of computer based modeling/analysis and performance testing with wood burning stoves. Performance testing at UB would require the installation of a new flue system for the two wood stoves, in order to remove combustion exhaust from the lab. No other physical modifications to existing facilities, ground disturbance, or changes to the use, mission, or operation of existing facilities would be required. No additional permits or authorizations would be required. Work at ORNL would consist solely of computer based modeling/analysis. No physical experiments would be performed at this location. Fabrication of wood burning stoves would be performed at the dedicated manufacturing facility of New Buck Corporation in Spruce Pine, NC

Project work would involve the use and handling of powered equipment and the operation of wood burning stoves. All such handling would be performed in controlled research facilities that perform this work as part of their regular course of business. Personnel performing project work would be trained to do so. Baseline stoves used for testing would meet all applicable US standards. Wood ash produced by the project would be stored and disposed of properly, in accordance with established institutional waste management protocols. OSU 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, 04/07/2021

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.

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 Date: 4/7/2021

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

- [x] 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