

FY 2021 Bioenergy Technologies Office Multi-Topic RFI (DE-FOA-0002386)

DATE: August 20, 2020
SUBJECT: Request for Information (RFI)

Description

The U.S. Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Bioenergy Technologies Office (BETO) is requesting information on research opportunities related to residential wood heater technology advancement and bioprocessing separations development to help inform its research priorities and funding strategies.

Background

In 42 USC 16232, Congress gave DOE the following instructions:

The Secretary shall conduct a program of research, development, demonstration, and commercial application for bioenergy, including—

- (1) biopower energy systems;
- (2) biofuels;
- (3) bioproducts;
- (4) integrated biorefineries that may produce biopower, biofuels, and bioproducts;
- (5) cross-cutting research and development in feedstocks; and
- (6) economic analysis.

(c) Biofuels and bioproducts--The goals of the biofuels and bioproducts programs shall be to develop, in partnership with industry and institutions of higher education—

- (1) advanced biochemical and thermochemical conversion technologies capable of making fuels from lignocellulosic feedstocks that are price-competitive with gasoline or diesel in either internal combustion engines or fuel cell-powered vehicles;
- (2) advanced biotechnology processes capable of making biofuels and bioproducts with emphasis on development of biorefinery technologies using enzyme-based processing systems;

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(3) advanced biotechnology processes capable of increasing energy production from lignocellulosic feedstocks, with emphasis on reducing the dependence of industry on fossil fuels in manufacturing facilities; and

(4) other advanced processes that will enable the development of cost-effective bioproducts, including biofuels.

Residential Wood Heater Technology Advancement background: Wood is an abundant and renewable source of fuel for residential heat. Wood heaters are used in approximately 10% of U.S. households with 2% using wood as the primary heat source. However, emissions from residential wood heaters are a significant national air pollution source and health issue. These emissions contain fine particulate matter (PM) along with other pollutants including carbon monoxide (CO), volatile organic compounds (VOCs), toxic air pollutants (e.g., benzene and formaldehyde), and black carbon (BC). Improvements in wood heater technology are needed to continue improving the efficiency and reduce emissions in order to ensure the responsible use of renewable wood feedstocks.

Bioprocessing Separations Development background: Chemical separations underpin many industrial chemical processes. For example, separations followed by downstream processing provide additional value streams beyond petroleum-derived fuels. In the bioprocessing industry, separations can account for up to 50% of the cost of producing biomass-based chemicals and fuels, representing a large barrier to their economical production. Despite this complication, developing separations technology has primarily been tackled as a process development challenge, rather than as a challenge suited for research and development. Additional investments in the R&D of separations technologies are needed to help lower the barrier to producing cost-competitive, biomass-based chemicals and fuels.

Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to residential wood heater technology advancement and biomass process stream separations. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications.

Specifically, BETO is seeking information related to the following two topic areas:

Topic 1. Residential Wood Heater Technology Advancement

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to overcoming the technical barriers and challenges in the design of clean, efficient residential scale wood heaters. EERE is specifically interested in information on identifying the critical technology gaps and resources

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required to significantly reduce emissions and improve efficiency of residential wood heaters. Gaps of interest include but are not limited to the stove design, automation, catalyst development, retrofit technologies for older wood heaters, sensor technology, and stove performance testing methods.

Topic 2. Bioprocessing Separations Development

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to overcoming the technical barriers and challenges facing bioprocessing separations. Since improved separations may substantially reduce the production cost, separations technologies are of particular interest for processes spanning biochemical and thermochemical approaches. EERE is currently supporting the Bioprocessing Separations Consortium (three year Bioprocessing Separations Report here: <https://publications.anl.gov/anlpubs/2020/04/159222.pdf>) as well as other projects to address some of these technology gaps. This RFI seeks to gain additional perspectives relating to separations technology needs closely relating to the work ongoing within the BETO portfolio excluding mechanical separations for plastics. EERE specifically seeks information identifying the critical technology gaps and research needs required to enable more efficient separations technologies in core BETO mission areas. Some example research needs include but are not limited to:

- identifying relevant industrial processes in need of new or improved separations technologies;
- effective separations technologies that could be paired with existing relevant processes;
- analysis pipelines to underpin separations development.

Disclaimer and Important Notes

This RFI is not a Funding Opportunity Announcement (FOA); therefore, EERE is not accepting applications at this time. EERE may issue a FOA in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a FOA. There is no guarantee that a FOA will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a FOA regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will

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not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

Proprietary Information

Because information received in response to this RFI may be used to structure future programs and FOAs and/or otherwise be made available to the public, **respondents are strongly advised to NOT include any information in their responses that might be considered business sensitive, proprietary, or otherwise confidential.** If, however, a respondent chooses to submit business sensitive, proprietary, or otherwise confidential information, it must be clearly and conspicuously marked as such in the response.

Responses containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

If your response contains confidential, proprietary, or privileged information, you must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

Pages [List Applicable Pages] of this response may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this RFI DE-FOA-0002386. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source.

In addition, (1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: “Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure” and (2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

Evaluation and Administration by Federal and Non-Federal Personnel

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Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to EERE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Categories and Questions

Category 1: Residential Wood Heater Technology Advancement

Technological Barriers

1. What are the critical technical hurdles for improving performance of stoves for new installations (e.g. combustion chamber design, combustion air management, controls, mixing, sensors, etc.)?
2. What are the critical technical hurdles for improving performance of stoves already installed in homes (e.g. combustion chamber design, combustion air management, controls, mixing, sensors, etc.)?
3. What practical and new techniques are used to significantly reduce transient emissions (startup, shutdown, load changes)?
4. What practical and new techniques are used to measure transient emissions that could be implemented in laboratory or field testing?
5. How can new exhaust emission control technologies be developed and practically deployed?
6. How could integrated hybrid systems, in which biomass heaters are combined with other technologies such as heat pumps, solar, and high efficiency gas and liquid-fired appliances, be a route to reduced emissions? What are the technology barriers to this approach?
7. How could field measurement methods be improved to ensure that biomass-appliances do not create local air quality issues in long-term use?
8. What stove features commonly encourage end-users to purchase new or replace a wood heater? Or, what stove features are commonly attractive to the end-user?
9. What advantages or disadvantages would continuous field performance data provide for advancing stove designs?

Tools and Capabilities

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1. How are trial-and-error test methods used to improved stove performance and advance stove design (i.e. development by implementation of incremental change and testing)?
2. Is access to performance testing facilities a barrier to development?
3. What in-house test methods are relied upon to validate and facilitate wood heater development?
4. How much could rapid performance measurement methods shorten R&D test cycles?
5. What specific test methods would be of interest to your enterprise?
6. How are modeling and simulation tools being applied to improve wood heater designs?
7. How could modeling and simulation tools be improved to meet your needs?
8. What are the fundamental modeling gaps to enable broader use of modeling and simulation such as Computational Fluid Dynamics (CFD) to improve wood heater design?
9. How are current measurement methods meeting your needs for evaluating performance and emissions from wood heaters? What could be done better?
10. What performance/emissions measurements are most challenging to obtain? What makes obtaining these measurements challenging?
11. What are three primary challenges your enterprise faces for advancing stove designs?

Category 2: Bioprocessing Separations Development

Technology Barriers

1. What are the critical technical hurdles for developing new bioenergy-related separations approaches (e.g. process modeling, compositional analysis, rapid *ex situ* screening to select separations technologies, etc.)?
2. Please describe any existing separations technologies used in industry, outside the bioenergy industry, that could be applied to bioprocesses (biochemical and/or thermochemical).
3. What are the critical technical hurdles for improving performance of existing bioenergy separations technologies (e.g. scalability, cost, process modeling, thermodynamic data, liquid-liquid extractions, membrane filtration, etc.)?
4. What relevant processes may benefit from separations technologies (thermochemical and biochemical processes, as guided from process modeling or product toxicity, catalyst poisoning, etc.)?
5. What technologies are amenable to recovering organic acids or other intermediates from anaerobic digesters (as opposed to using anaerobic digestion for the production of biogas)?
6. How can liquid-liquid extractions be improved for bioprocessing applications?
7. How can condensed-phase separations be improved?
8. How can continuous separations or in-situ product recovery systems be improved (particularly for cost, efficiency, etc.)?

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9. What decisions drive the development of new separations versus adapting existing technologies in industry?

Tools and Capabilities

1. How are separations technologies selected and optimized for a process, and at what stage of process development?
2. Is access to a range of separations technologies a barrier to development? If so, please describe how such access constitutes a development barrier.
3. Are there standard methods to validate and characterize a separations process? If so, what are key process and performance parameters in comparing technologies against one another?
4. How could separations-related modeling and simulation tools be improved to meet your needs?
5. What are three primary challenges your enterprise faces for incorporating a bioprocessing separations process?

General Bioenergy-related Separations Challenges

1. Please describe any additional separations challenges related to the BETO mission not covered by Categories 1 and 2 above.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to FY21MultiTopic@ee.doe.gov no later than 5:00pm (ET) on September 21, 2020. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) attachment to the email, and no more than 6 pages in length, 12 point font, 1 inch margins. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if applicable. Respondents may answer as many or as few questions as they wish.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name;

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- Company / institution contact;
- Contact's address, phone number, and e-mail address.

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