

DE-FOA-0001394: Request for Information Building Envelope Infiltration Diagnostic Technologies

DATE: August 17th, 2015

SUBJECT: Request for Information (RFI)

DESCRIPTION: The United States (U.S.) Department of Energy (DOE) Building Technologies Office (BTO) is seeking information from the public on diagnostic technologies that can be used to identify infiltration^a through the envelope, including in and around fenestration, of residential and commercial buildings. In particular, BTO is interested in the current state-of-the-art in infiltration diagnostic technologies, forthcoming research and development (R&D) advances that could reduce cost or improve performance, and the potential market implications of improved infiltration diagnostics.

BACKGROUND: BTO's mission is to improve the efficiency of existing and new buildings in both the residential and commercial sectors through the development of energy-efficiency technologies and practices. With this mission in mind, BTO aims to reduce building-related energy costs by developing and widely deploying tools and technologies to reduce building energy use by 50% by 2030^b at a cost less than that of the energy saved.

The U.S. buildings sector accounted for approximately 41% of United States primary energy consumption in 2010; more energy than any other end-use sector. Residential and commercial buildings were responsible for 22 quadrillion Btu (quads) and 18 quads of energy, respectively. This RFI is focused on technologies that can detect and quantify infiltration through the building envelope. Of the 40 quads of primary energy used by U.S. residential and commercial buildings in 2010, approximately 4 quads, or 10% of total energy use in buildings, can be attributed to losses through the building envelope due to air infiltration.

Infiltration diagnostic technologies can be used to establish the extent of infiltration in an existing building or verify the performance of new construction. Ideally, infiltration diagnostic technologies would meet the following criteria:

- suitable for all building types and sizes,
- usable in occupied buildings,
- accurate regardless of outdoor weather conditions,
- low-effort for setup and teardown, and
- able to quantify both the location and extent of infiltration.

^a Throughout this document, "infiltration" is used to refer to both infiltration and exfiltration through the building envelope.

^b The targeted energy use reduction in 2030 is relative to the 2030 baseline energy use predicted in the 2010 *Annual Energy Outlook* released by the Energy Information Administration (EIA).

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There are two (2) principal existing infiltration diagnostic technologies: (1) blower door testing and, (2) tracer gas methods. Neither of these methods meet more than three of the ideal criteria listed. Blower door tests are well-established, but are not suitable for large buildings, and provide only aggregate, building-level results. Tracer gas testing can provide better spatial resolution, though it is still insufficient to locate individual leaks. Both methods require that buildings under test be vacated, since activity within the building can affect the results. Infrared imaging can also be used to help establish the location of infiltration, but at present, imaging results cannot quantify the magnitude of infiltration for the whole building or individual leaks. None of these technologies are suitable for quantifying infiltration for large commercial buildings.

Given the shortcomings of existing infiltration diagnostic technologies, and the significant domestic energy use associated with infiltration, BTO is interested in gathering information about the future R&D opportunities and potential market impacts of improved diagnostic technologies. BTO also seeks information about current state-of-the-art technologies, in case the assessment in the previous paragraph omits key information about the capabilities of commercially available infiltration diagnostic technologies.

PURPOSE: The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on questions related to infiltration diagnostic technologies. This information will be used by BTO for strategic planning of the broader windows and opaque envelope technologies R&D portfolio. More information on the current portfolio can be found at <http://energy.gov/eere/buildings/windows-and-building-envelope>. This is solely a request for information and not a Funding Opportunity Announcement (FOA). EERE is not accepting applications.

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 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.

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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-0001394. 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: 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:

Information is sought in response to the following questions related to the current state-of-the-art of infiltration diagnostic technologies, and research frontiers and potential market impact of improved infiltration diagnostics.

Category 1: Current State-of-the-Art Technologies

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1. What technologies represent the current state-of-the-art in infiltration diagnostics? For each technology, please specify as much of the following as possible:
 - building types^c and sizes (in gross sq. ft.^d) where it can be used;
 - time required to conduct a complete diagnostic test, both including and excluding set-up and tear-down time;
 - typical equipment capital cost and per-test equipment, labor, and other costs, as a function of building size and type, if applicable;
 - type of results that can be obtained (e.g., location and/or quantity of infiltration);
 - accuracy of results (e.g., +/- 0.05 ACH50);
 - sources of error in test results, and methods, if any, for accounting for or correcting those errors; and
 - any notable limitations or shortcomings on the circumstances when the test can be used (e.g., can only be performed when the building is unoccupied).

Category 2: R&D Frontiers

2. What are appropriate performance metrics (i.e., ways of measuring or evaluating the performance of a technology) and targets (i.e., quantitative values for those metrics) for characterizing and comparing different diagnostic technologies?
3. The Background section above includes a list of qualitative capabilities that describe an “ideal” infiltration diagnostic technology. What additional capabilities or criteria, if any, are missing from that list?
4. Regarding current infiltration diagnostics R&D:
 - a. What infiltration diagnostic technologies are currently under research or investigation?
 - b. What advantages are these technologies intended to have over those that are commercially available?
 - c. Do these technologies add any capabilities of an ideal technology listed in the Background section that current technologies lack?
 - d. What are the limitations of these technologies (e.g., cost, speed, complexity, accuracy) or what additional research is required before they will be commercially available?
5. What infiltration diagnostic technologies currently under development might be suitable for large buildings or buildings under construction or major renovation? What are the remaining R&D challenges that must be resolved before these technologies could be commercially available?

^c Residential building types include single-family detached, single-family attached, multi-family/apartment, and mobile homes. Commercial building types include education, food sales, food service, outpatient or inpatient health care, lodging, shopping or strip malls, mercantile (other than malls), small/medium/large office, public assembly, public safety, religious worship, service, and warehouse and storage.

^d Gross square feet, for the purposes of this RFI, is defined as the entirety of the plan area enclosed by a building's exterior walls, including elevator shafts, stairwells, hallways, atriums, closets, and other ancillary spaces.

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6. Are there intermediate innovations or key enabling technologies that require R&D before improved infiltration diagnostics are possible? What are these enabling technologies or innovations?
7. What R&D opportunities remain for improving the performance or reducing the cost of existing infiltration diagnostic technologies? To what extent can existing diagnostic technologies be improved?

Category 3: Market Characteristics, Needs, and Barriers

8. What are market-acceptable equipment costs, labor costs, other costs, and time requirements, as a function of gross sq. ft., for conducting infiltration tests? Please provide separate responses specific to residential and/or commercial buildings.
9. What effects could improved infiltration diagnostic technologies have on interest in and adoption of products that can reduce infiltration (e.g. air barriers)? How might the influence of improved infiltration diagnostics differ between the new construction and retrofit markets?
10. What market barriers or other challenges, if any, prevent the wider use of existing state-of-the-art infiltration diagnostic technologies?
11. What market opportunities would be created by commercially available improved infiltration diagnostic technologies? What specific capabilities are required from these improved diagnostic technologies to unlock the market opportunities identified?

REQUEST FOR INFORMATION RESPONSE GUIDELINES: Responses to this RFI must be submitted electronically to BuildingEnvelopeRFI@ee.doe.gov no later than 5:00pm (ET) on **September 16th, 2015**. Responses must be provided as a Microsoft Word (.docx) or Portable Document Format (.pdf) attachment to the email. Responses should be no more than 3 pages in length with 12 point or larger font and 1 inch margins. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if possible. 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;
- Company / institution contact;
- Contact's address, phone number, and e-mail address.

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