

## DE-FOA-0002118: Request for Information (RFI): “Research and Development Opportunities for Building Energy Modeling”

DATE: April 17, 2019  
SUBJECT: Request for Information (RFI)

### Description

The United States (U.S.) Department of Energy (DOE) Building Technologies Office (BTO) is seeking input from the public about its [Research and Development Opportunities for Building Energy Modeling](#) (BEM). In particular, BTO is interested in feedback on planned initiatives and their prioritization, on program scope, and on data-sets, metrics and targets for assessing program effectiveness and impact.

### Background

BTO’s overarching goal is 30% reduction in building energy use intensity (EUI) by 2030 relative to a 2010 baseline. Such deep and sustained reductions reduce costs for consumers, help mitigate grid stress and improve electricity reliability, and support building and system resiliency. BTO aims to achieve this outcome by advancing a range of direct physical technologies including lighting, envelope and fenestration, HVAC, refrigeration, and water heating as well as a range of supporting or enabling technologies including sensors and controls, sub-meters, and building energy modeling (BEM).

BEM—physics-based software simulation of building energy use—is a versatile, multipurpose tool that is used in new building and retrofit design, green certification, qualification for tax credits and utility incentives, and real-time building control. BEM is also used in large-scale analyses to inform policy decisions. Emerging use cases include control design and optimization and model-driven predictive control. In support of its office-wide goals, BTO aims to increase the effective use of BEM in a range of use cases, with specific focus on design where it has the greatest direct impact. BTO’s multi-year program plan (MYPP)<sup>1</sup> targets use of BEM on 90% of new commercial floor-area by 2030 according to the AIA 2030 Commitment program.

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<sup>1</sup> <https://www.energy.gov/eere/buildings/downloads/multi-year-program-plan>

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DOE has supported research, development, and deployment of BEM—and has itself been an active user of BEM—since the 1970s. BTO’s current BEM program<sup>2</sup> funds and manages the development and distribution of two significant software packages:

- EnergyPlus<sup>3</sup> is a state-of-the-art BEM engine capable of modeling low-energy designs and HVAC systems, in addition to more conventional buildings.
- OpenStudio<sup>4</sup> is a software development kit (SDK) for EnergyPlus that simplifies application integration, workflow automation, and large-scale analysis. OpenStudio also includes a graphical model editing application, although funding, management, and support of this part of the project will transition away from DOE by April of 2020<sup>5</sup>.

It distributes these under a commercial-friendly non-exclusive open-source license. BTO encourages companies to embed the software into applications and services, add features and content, provide commercial training and support, and generally serve the specific needs of a diverse set of BEM user communities. BTO is committed to supporting EnergyPlus and OpenStudio long-term to provide certainty to commercial vendors and their clients. The transparency and impartiality conferred by open-source and by EnergyPlus’ comprehensive documentation is also important for use cases that support codes and standards and financial incentives.

In addition to EnergyPlus and OpenStudio, BTO also supports the development of Spawn-of-EnergyPlus, a next-generation BEM engine that also supports building control workflows, the Radiance lighting engine, and the THERM detailed envelope assembly heat transfer engine. The most recent addition to BTO’s suite of BEM engines is URBANopt, a district modeling platform that supports co-simulation of multiple buildings, shared “district” thermal systems, electrical infrastructure, and DERs. In line with its new focus on good grid citizenship, BTO is in the early stages of augmenting its tools to support analysis for building-based grid-services.

Beyond software, BTO funds the maintenance and expansion of ASHRAE Standard 140<sup>6</sup>, a method of test for BEM engines. In 2016, it initiated a four-year project<sup>7</sup> to use national lab test facilities to generate high-resolution empirical data sets to validate selected BEM calculations at

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<sup>2</sup> <http://energy.gov/eere/buildings/building-energy-modeling-0/>

<sup>3</sup> <http://energy.gov/eere/buildings/downloads/energyplus-0/>

<sup>4</sup> <http://energy.gov/eere/buildings/downloads/openstudio-0/>

<sup>5</sup> <https://www.openstudio.net/new-future-for-openstudio-application>

<sup>6</sup> <https://www.energy.gov/eere/buildings/ashrae-standard-140-maintenance-and-development>

<sup>7</sup> <https://energy.gov/eere/buildings/downloads/lab-rfp-validation-and-uncertainty-characterization>

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a finer granularity. Testing and validation improve BEM accuracy, help establish BEM software requirements<sup>8</sup>, and increase BEM stakeholder confidence.

Finally, BTO BEM program partners with organizations like the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)<sup>9</sup>, the American Institute of Architects (AIA)<sup>10</sup>, and the International Building Performance Simulation Association (IBPSA)<sup>11</sup> to support the BEM community. BTO sponsors hackathons, design competitions, and student travel to BEM conferences. It also collaboratively develops online resources for modelers like the UnmetHours<sup>12</sup> peer-to-peer question-and-answer site and the AIA's 2030 Commitment Design Data Exchange<sup>13</sup> site.

These “core” activities are reviewed regularly by outside stakeholders to ensure its portfolio continues to move industry forward. BTO supplements them with competitive awards that fund BEM research and deployment. These help BTO balance its portfolio, address market needs, and explore new directions. An up-to-date listing of BTO's current BEM project portfolio is available on the BTO website<sup>14</sup>.

## Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on BTO's BEM program and its future directions and priorities. To clarify these, BTO has developed a report that is structured around six focus areas (the BEM value proposition, predictive accuracy of BEM, core modeling capabilities, workflow integration and automation, the BEM data ecosystem, and BEM professionals). The report identifies barriers to the increased adoption of BEM and proposing a set of initiatives to address them. BTO is requesting feedback on each of these barriers, the associated initiatives, as well as barriers and initiatives that have not been identified. BTO is also requesting feedback on datasets, metrics, and targets for assessing the impact and progress of the BEM industry and its own BEM program.

## 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

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<sup>8</sup> <https://energy.gov/eere/buildings/qualified-software-calculating-commercial-building-tax-deductions>

<sup>9</sup> <http://www.ashrae.org/>

<sup>10</sup> <http://www.aia.org/>

<sup>11</sup> <http://www.ibpsa.org/>

<sup>12</sup> <http://unmethours.com/questions/>

<sup>13</sup> <http://2030ddx.aia.org/>

<sup>14</sup> <https://energy.gov/eere/buildings/building-energy-modeling-project-portfolio/>

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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.

### **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-0002118. The

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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.

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## Request for Information Categories and Questions

**Category 1:** Metrics, benchmarks, targets, and data sets for tracking the use of BEM in various building energy efficiency projects. Methods of attributing energy-efficiency to BEM in various applications.

- (1) The AIA 2030 Commitment dataset is an example of a building-project level data set that can be used to track the use of BEM in new construction and retrofit design. This dataset has the advantages that it is “living”, is attached to an existing reporting program, and captures information about projects that do not use BEM in addition to projects that do. What other building project-level datasets can be used—either as is or augmented—to track BEM, in either this use case or other use cases?
- (2) The number of professionals with Building Energy Modeling Professional (BEMP) certification is an example proxy metric for BEM use, and the ASHRAE BEMP listing an example of a dataset that supports this metric. What other metrics and associated datasets can be used as BEM proxies?
- (3) BTO currently uses AIA 2030 floor area modeled with EnergyPlus as well as number of third-party applications and services using EnergyPlus as metrics to assess its own program. What are appropriate metrics and datasets for BTO to use to assess the impact of its own program?
- (4) What are appropriate 2025 and 2030 targets for existing or new BTO BEM metrics?
- (5) For a given use-case, comparison of projects that use BEM to projects that do not serves as a first-order assessment of the contribution of BEM to energy-efficiency. However, this is a not entirely satisfying method that implicates additional variables including project emphasis on energy efficiency, practitioner expertise and past experience, and other constraints. What other analytical methods exist that can be used to attribute energy-efficiency to different use cases of BEM in a more rigorous, nuanced way?

**Category 2:** Focus areas

- (1) BTO has identified six focus areas for BEM: value proposition (Topic 1, Section 3), accuracy (Topic 2, Section 4), core capabilities (Topic 3, Section 5), workflow integration and automation (Topic 4, Section 6), data ecosystem (Topic 5, Section 7), and support

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for BEM professionals (Topic 6, Section 8). Are any areas missing? Are any focus areas extraneous?

- (2) Which are the two most important areas for BTO to focus on?

**Category 3: Barriers**

- (3) Within each focus area, BTO has identified a set of barriers. Are any barriers missing? Are any barriers extraneous?
- (4) Across all six focus areas, which five (5) barriers are the most critical for BTO to address?

**Category 4: Initiatives**

- (5) Within each focus area, BTO has proposed a set of initiatives to address the identified barriers. Are any initiatives extraneous? Are any missing?
- (6) Across all six focus areas, which fifteen (15) initiatives are the most critical for BTO to pursue?

**Category 5: Stakeholder engagement and feedback mechanisms**

- (7) BTO currently uses several mechanisms to engage stakeholders such as BEM professionals, BEM software vendors, energy-efficiency program administrators, researchers, and others and to gather feedback about its BEM program. These mechanisms include the BTO website, the annual BTO Peer review, Conference presentations, and regular meetings with IBPSA-USA. How could these mechanisms be improved?
- (8) Are there any additional engagement and feedback mechanisms BTO should explore?
- (9) What other stakeholder groups does BTO need to engage in shaping its BEM program?

**Category 6: Other feedback**

- (10) Please provide any other feedback.

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## Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to [BTO\\_BEM\\_RDO@ee.doe.gov](mailto:BTO_BEM_RDO@ee.doe.gov) no later than 5:00pm (ET) on June 3, 2019. 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 10 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. Within the Report, Topics, Barriers, and Initiatives are numbered. In your response, please include these numbers in your responses. Respondents may answer as many or as few questions as they wish.**

BTO 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:

- Institution name and website
- Institution type (e.g., university, utility, non-profit organization, small business, etc.)
- BEM stakeholder type (e.g., developer, user, client)
- Institution contact name and email address

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