Shaping Tomorrow's Built Environment Today

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President

Reply to: ASHRAE Headquarters
1791 Tullie Circle NE
Atlanta, GA 30329-2305

February 20, 2015

Ms. Sonia Punjabi
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Building Technologies Program
EE-5B
1000 Independence Avenue SW.
Washington, DC 20585-0121

RE: ASHRAE Comments on Request for Information on the Development of a Common Definition for Zero Energy Buildings (Docket No. EERE-2014-BT-BLDG-0050)

Dear Ms. Punjabi:

ASHRAE, founded in 1894, is an international organization of over 53,000 members. The Society and its members focus on building systems, energy efficiency, indoor air quality and sustainability within the industry. Through research, standards writing, publishing and continuing education, ASHRAE shapes tomorrow's built environment today.

As DOE seeks to develop a common definition for Zero Energy Buildings (ZEBs), ASHRAE encourages the Department to consider the following:

Recommendations

Recommendation I: Do Not Remove the Word "Net" from the Term "Zero Energy Building", and Instead Educate Consumers and Stakeholders on the Concept of Net Zero Energy Building.

While ASHRAE is sensitive to the need for clarity to consumers and other stakeholders, we do not agree with the Department's proposal to remove the word "net" from the term "Zero Energy Building", as such a move eliminates the technical accuracy of the term and does not simplify the

underlying concept, and is likely to confuse building owners since all buildings use energy, even those which are deemed zero energy by DOE's proposed definition. To clarify, in order to "zero out" energy use in a building, there must be "pluses" (production) and "minuses" (consumption) that result in a net effect. Furthermore, the removal of the word "net" would likely foster confusion throughout the federal government, as federal laws, Executive Orders, and programs reference or in some way use the term "zero-net" or "net-zero" energy buildings, as indicated in the examples below:

- The term and definition of "zero-net-energy commercial building" is contained in Section 422 of the Energy Independence and Security Act (P.L. 110-140).
- Section 2 (g)(i) Goals for Agencies, and Section 19 (o) definition of "zero-net-energy building" in Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance.
- U.S. Department of Commerce's Net-Zero Energy, High-Performance Buildings Program[1].

Instead, ASHRAE recommends that DOE retain the term "Net Zero Energy Building", and provide education to consumers and other stakeholders to help them better understand this concept. Graphical representations are often the best means to describe concepts. The graphic shown as Figure 1 in the definition document that accompanied the RFI is helpful, and the similar graphics found in ANSI/ASHRAE Standard 105-2014 Standard Methods of Determining, Expressing and Comparing Building Energy Performance and Greenhouse Gas Emissions[2], and ANSI/ASHRAE/IES Standard 100-2015 Energy Conservation in Existing Buildings[3], can be used for educational purposes.

Recommendation II: Define "Net Zero Energy Building" Using Site Energy, With Sub-classifications Based on Source Estimates, Building Energy Cost, and Building Emissions

In line with ASHRAE's Vision 2020 document, the Society encourages the Department to adopt the following definition of net zero energy building:

"A net zero energy building (NZEB) is a building that produces as much energy as it uses when measured at the site. On an annual basis, it produces or consumes as much energy from renewable sources as it uses while maintaining an acceptable level of service and functionality. NZEBs can exchange energy with the power grid or other building energy supply grids or systems (e.g., natural gas, propane, etc.) as long as the net energy balance is zero on an annual basis."[4]

ASHRAE recognizes the potential appeal of using source energy, as DOE proposes in its definition of Zero Energy Building, since source energy estimates can provide a better representation of the total impacts of energy use and consumption. However, the Society believes that the multiple and varying weighting factors and algorithms required for estimating source energy conversions are often inconsistent and ultimately cloud and complicate understanding. Since source energy conversion factors vary widely from place to place and across time, the use of fixed national average conversion factors could lead to inconsistent estimates of consumption.

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[1] http://www.nist.gov/el/building_environment/heattrans/netzero.cfm

[2] For additional information on ASHRAE Standard 105, visit https://www.ashrae.org/standards-research--technology

[3] For additional information on ASHRAE Standard 100, visit https://www.ashrae.org/standards-research--technology

[4] ASHRAE. *Vision 2020: Providing Tools by 2020 that Enable the Building Community to Produce Market-Viable NZEBs by 2030*. January 2008. http://www.ashrae.org/File%20Library/docLib/Public/20080226_ashraevision2020.pdf

Thus, in this case the best method for determining if a building is a NZEB is to look at the energy crossing the boundary at the site of the building; hence "site" energy is the best choice to use.

It should be noted that an effective zero source energy building definition would begin with the site energy consumption and convert this energy by the use of actual source consumption by the utility serving the building on an annual basis. If a building's owner and manager feels it is in their best interest to conserve the source energy consumed by their utility then they can use the net source energy definition to shape their decision-making for energy efficiency improvements to their building.

Similar to DOE's proposal for variations or sub-classifications of zero energy buildings, such as Zero Energy Campus, Zero Energy Portfolio, and Zero Energy Community, ASHRAE agrees that different definitions are required to meet the needs of various stakeholders and building configurations. ASHRAE encourages the Department to adopt the following sub-classifications of NZEBs for buildings[5].

Net Zero Source Energy Building: A building that produces as much energy as it uses compared to the energy content at the energy source(s) on an annual basis. The system boundary is drawn around the building, the fuel production, distribution and delivery systems, any fuel refineries, the electric generation, transmission and distribution systems, and the energy consumed in getting the fuel source to the power plant.

Net Zero Energy Cost Building: A building that receives as much income from the sale of excess energy to the utility as it spends for energy on an annual basis, exclusive of all base charges and demand charges.

Net Zero Energy Emissions Building: A building that avoids discharging into the atmosphere as much mass of undesirable emissions as its utility discharges in the production of energy delivered to the building.

These three definitions proposed by ASHRAE are different ways of accounting for the performance of a single building based upon its fuel mix and usage pattern.

ASHRAE recognizes that the three sub-classifications proposed by DOE address the impact of buildings as members of a community rather than addressing the performance of buildings acting individually. Exploiting the synergy among buildings and exploiting the diversity of energy usage schedules among buildings in a group arguably leads to greater benefits to the entire community than producing a set of net zero energy buildings that are exporting energy and importing energy all on the same schedule. Extending the source, size, and cost definitions to these other classifications of energy usage would impart the same benefits of clarity and understanding as for individual buildings.

DOE notes in its RFI that it expects the definition and guidelines proposed for Zero Energy Buildings to be used by federal programs and projects. **ASHRAE opposes federal mandates, whether through legislation or Executive Order, that would require the use of DOE's**

[5] These definitions are drawn from ASHRAE's *Vision 2020* document, available at http://www.ashrae.org/File%20Library/docLib/Public/20080226_ashraevision2020.pdf

proposed definition of Zero Energy Buildings and the associated variations and guidelines, as we feel it would not be in the best interest of the building industry, given the varying needs of stakeholders and the current lack of consensus. The most productive use for this series of definitions is to provide a common understanding of the concept of building energy efficiency among and between government and non-government organizations so that they can work cooperatively towards energy independence and security.

Recommendation III: Oppose the Inclusion of Renewable Energy Credits in Definitions of Zero or Net Zero Energy Buildings

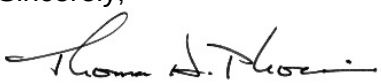
Renewable Energy Credits (RECs) are interesting tools with many potential uses to promote sustainability in the delivery of energy to buildings, however they should not be included in either a primary definition or sub-classification of zero or net zero energy buildings.

As DOE correctly notes in its document "A Common Definition for Zero Energy Buildings", due to physical constraints, not all buildings will be able to be net zero energy; a condition affecting multi-story buildings in urban areas in particular. While it may be tempting to mitigate this apparent inequity by allowing such buildings to purchase RECs, and thus be deemed "REC-Zero Energy Buildings", this would only dilute the definition of NZEBs and create confusion within the industry without adding substantive value. Such a definition may also encourage building projects which might invest in efficiency measures that would be incorporated into the building or its equipment to make those investments instead in RECs, which would forego the energy savings to be derived from a more efficient building and place upward pressure on the cost of RECs for all other market participants. By preserving the core definition of NZEB, building owners, managers, consumers, and other stakeholders will be encouraged to focus on energy efficient investments and behaviors to help bring their building as close to net zero energy as possible

Conclusion

ASHRAE hopes that these comments are helpful as DOE proceeds towards the development of a common definition of a net zero energy building, and not substantially change the way this term has been used in the marketplace for so many years now. We look forward to responding to any questions or comments the Department may have. Please feel free to contact Mark Ames, ASHRAE's Senior Manager of Federal Government Affairs, at mames@ashrae.org or 202-833-1830.

Sincerely,



Thomas H. Phoenix
ASHRAE Society President