



National Institute of
BUILDING SCIENCES

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Cyrus Nasser
U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Federal Energy Management Program
Mail Stop EE-2L
1000 Independence Ave., SW
Washington, DC 20585-0121

RE: Comments to Department of Energy on EE-RM/STD-02-12 / RIN 1904-AC13

Dear Mr. Nasser,

The National Institute of Building Sciences is pleased to provide comments on the proposed rulemaking “Energy Efficiency and Sustainable Design Standards for New Federal Buildings.”

As you know, the National Institute of Building Sciences, authorized by public law 93-383 in 1974, is a nonprofit, nongovernmental organization that brings together representatives of government, the professions, industry, labor and consumer interests to identify and resolve building process and facility performance problems. The Institute serves as an authoritative source of advice for both the private and public sectors with respect to the use of building science and technology.

Our comments are as follows:

Definitions

Where specific examples of building systems or components are indicated (e.g., “life-cycle cost” and “major renovation”), it is important to recognize the building envelope, including exterior walls, glazing and roofs. While it is generally considered a passive component of the building, the envelope can have significant impacts on building energy use and indoor environmental quality. Its contributions to the building’s achievement of agency goals must be evaluated and included in any life-cycle cost assessment.

Life-Cycle Cost Effective

In defining “life-cycle cost-effective,” it is important to require the use of sustainability measures if their life-cycle cost is *equal to or better than* the baseline cost. As indicated elsewhere in the rule, some of the benefits from sustainability measures are not easily quantifiable, so equivalency should require implementation of sustainability measures. We therefore recommend the following changes in both §433.2 and §435.2:

Life-cycle cost-effective means that the building, energy or water systems in the building, components of those energy or water systems, and conservation measures as defined in 10 CFR 436.11 in the proposed building or major renovation have the same or a lower life-cycle cost than the life-cycle costs of the corresponding systems and measures in the baseline building, as described by 10 CFR 436.19, or has the same or a positive estimated net savings, as described by 10 CFR 436.20; or has a savings-to-investment ratio estimated to be greater than or equal to one, as described by 10 CFR 436.21; or has an adjusted internal rate of return, as described by 10 CFR 436.22, that is estimated to be greater than or equal to the FEMP discount rate.

Leased Buildings

The Notice of Proposed Rulemaking (NOPR) indicates the Department of Energy's (DOE) consideration of excluding existing buildings leased by federal agencies from the criteria contained in this rule. It is important to note that Executive Order 13514 requires 15 percent of existing owned and leased buildings to meet the Guiding Principles by 2015. As agencies engage in activities to meet the Guiding Principles in all buildings they occupy, applicable guidance should be in place to facilitate these activities. While it is impractical for agencies to pay for improvements to leased space with a life-cycle cost based on the standard pay-back term, agencies should be encouraged to invest in improvements that prove life-cycle cost effective over the term of the lease. Existing buildings leased by agencies should be included in the definition for "federal building" with this caveat.

Sustainable Design Principles

Paragraphs (c) and (d) of §433.6 and §435.6 appear to be incongruent with the intent of the rule. New construction that does not meet the thresholds indicated in paragraph (b) should still receive guidance relative to integrated design and commissioning contained in paragraph (e) and should utilize such requirements to the extent that they are life-cycle cost effective.

This NOPR is in response to requirements that the Department develop federal building performance standards that include "sustainable design principles." The proposed rule defines sustainability very narrowly and does not consider the building's responsiveness to hazards (both natural and human-induced), its resilience, or accessibility to people with disabilities. These issues can have significant influence on the long-term viability of a building, resources and materials used, and the ability of occupants to be functional and productive. Further, agencies have additional requirements (either by Executive Order or legislation) to address other building attributes. Some of these requirements are listed below:

- Americans with Disabilities Act
- National Historic Preservation Act
- Public Buildings Act
- National Environmental Policy Act
- E.O. 13006: Historic Properties
- E.O. 12977: Security Standards
- E.O. 12941/12699: Seismic Safety
- Presidential Memorandum on Disposing of Unneeded Federal Real-Estate

Guidance is necessary to assure that agencies meet all requirements through a holistic and integrative process that recognizes and addresses the interactions and potential conflicts.

Potable Water Use

Reducing the consumption of potable water use indoors and outdoors is a critical component of sustainability as it not only impacts the use of water as a resource, but also energy use. However, the principles enumerated in the proposed rule (§433.6 and §435.6) do not address the water-saving requirements for decorative water features either inside or outside of the building. Additionally, indoor irrigation or other watering of plantings with potable water should be addressed within the rule.

Moisture Control

With respect to moisture control within federal buildings, establishment of a control strategy is necessary. The Department should provide guidance to agencies on how to develop and implement such a strategy. Publications like the recently completed ASHRAE “Indoor Air Quality Guide: Best Practices for Design, Construction and Commissioning” and resources from the Institute’s Building Enclosure Technology and Environment Council should be included as references for moisture control. Additionally, guidance on achieving high-performance indoor environmental quality attributes beyond just air quality should be provided including acoustics, thermal comfort, lighting, and ergonomics.

Materials

The materials specified in a building’s design are critical to its ultimate sustainability. When technologies and services are available that reduce environmental impact from materials, they should be utilized. This includes the use of substances that do not contribute to depletion of the ozone layer—however, when Ozone Depleting Substances (ODS) alternatives are evaluated for potential use within mechanical systems it is important to examine all characteristics of the substance including global warming potential, efficiency, safety, and availability.

During construction, discarded construction and demolition materials should be recycled or salvaged to limit their impact. Use of a local operator has been identified as a requirement without defining “local.” Such a definition will allow determination of whether such a requirement is practicable or life-cycle cost effective. Additionally, recycled materials should be used where possible to limit the impact of producing virgin materials.

Education and Training

Proper training for both operations and maintenance (O&M) staff and building occupants is critical to meeting the long-term sustainability requirements identified in the NOPR and within the Guiding Principles. Wherever practical, O&M staff and building occupants should participate—particularly during commissioning. We recommend including education and training as a component of the sustainable design criteria, as achievement of the sustainability requirements is predicated on the participation of O&M staff and building occupants.

Major Renovations

Within the NOPR, the application of sustainable design principles is limited to “major renovations” that have project costs of at least \$2,500,000 or require a prospectus. By limiting application only to projects over this threshold, a significant segment of the built environment is ignored (even projects that could

still be included under the definition of major renovation), and potential cost savings and opportunities for increased energy and water savings are missed. Therefore, any renovation that meets the threshold amount or is subject to a prospectus should be considered a major renovation and subject to the sustainability requirements. While the Department cannot require use of sustainable design principles under existing legislative authority for major renovations less than the threshold amount or for renovations that cannot be classified as major, we hope that the Department would consider mechanisms for expanding the sustainable design requirements to these cases. We will work with Congress to extend sustainable design principles to all renovation activities.

Additionally, the definition of major renovation must extend beyond consideration of just energy efficiency and should include opportunities for increased water efficiency and to meet indoor environmental quality (IEQ) requirements.

Green Building Certification Programs

While we appreciate the Department's recognition that anticipated performance under a rating system should correlate to the actual performance of the building, it is important to note that discrepancies can be based on a variety of reasons. Understanding those reasons and making necessary adjustments should be required before any discussion of de-certification occurs. Particular reasons for potential discrepancies are discussed below:

- The first year of a building's operation is likely to be a poor indicator of the energy use under designed conditions—both occupants and building operations and maintenance personnel are just getting acclimated to the building systems and other nuances. Mechanical and other equipment also are undergoing adjustments to assure efficient operations and to meet occupant comfort and health needs. Further, the commissioning process often requires evaluation of the building in use to identify potential issues (this is likely to require at least some portion of the initial year).
- Most certification systems base their recognition for energy use on building energy models, with underlying assumptions on operating hours, number of occupants, climate and weather, building use, and other characteristics. It is extremely unlikely that such assumptions reflect the actual criteria exhibited at any point in the building's life-cycle.
- At this time, modeling is not an exact science. The cumulative impact of numerous building systems is largely unknown. Modeling inputs and results for innovative design solutions and technologies tend to lag significantly, resulting in outputs with considerable uncertainty.
- Demonstration of proper O&M of the building is not included in green building ratings for new construction. However, how a building is operated and maintained can have a significant impact on the energy and water performance of the building. If sufficient resources are not available for such O&M, and the O&M team does not receive proper training, the initial design features can quickly degrade impacting energy and water performance.
- Building occupants, their habits, and the equipment they bring into the building ultimately affect the energy use within the building. However, the design team does not have the ability to accurately determine the impact of variability in human behavior. Greater focus on the social sciences and their role in predicting occupant behavior is necessary.

Rather than de-certifying buildings thought to underperform relative to initial energy use estimates, the Department should encourage federal agency participation in the development of the rating systems and provide such buildings as potential case studies to inform future refinements to the systems. Investments

aimed at advancing social sciences and building modeling capabilities should be encouraged. We recommend requiring agencies that have found discrepancies between certification levels and operation to develop a plan for evaluation of the discrepancies and identify opportunities to address any gaps. Also, agencies should make use of ongoing green building certification programs focused on O&M and long-term maintenance to determine their long-term achievement of sustainability requirements.

While de-certification is probably not a prudent option at this time, we commend the Department for focusing on the need for ongoing verification and demonstration of performance. However, agencies must have the resources in place to allow maintenance of the benefits instituted in the design. This includes provisions for ongoing training of facility O&M staff.

The minimum levels of certification to be achieved under a green building system should reflect all existing requirements on federal agencies—whether due to legislation, regulation, memoranda of understanding, or executive orders. While specification of a minimum level is required, it is essential that specific thresholds for criteria within those levels be established.

Certification levels are usually determined by the number of points earned in specific categories (e.g., energy, water, site design) and the points are aggregated to produce a certification level. Two buildings with the same level of certification can have varying levels of energy or water use (which may meet the level of certification requirement, but not necessarily the specific category legal requirements). If legal requirements for specific criteria are in place, the necessary level of achievement under the rating system in each of those categories must be identified to assure that the underlying legal requirements are met.

Additional Codes and Code-Intended Standards

In addition to the codes and code-intended standards cited under section II.C of the NOPR narrative, we recommend considering the Green Plumbing and Mechanical Code Supplement developed by the International Association of Plumbing and Mechanical Officials (IAPMO).

Life-Cycle Costing and Extent Practicable

Within the rule, buildings are separated into those that must use life-cycle cost effectiveness as a limiting factor and those with requirements to the extent practicable. While these distinctions appear required based on the underlying legislation, they are not always clearly indicated in the rule. Subsections 433.6(b) and (c) and 435.6(b) and (c) make these distinctions, but within the individual requirements some call for determination of life-cycle cost effectiveness (i.e., §433.6(f)(1) and §435.6(f)(1)).

Synergies and Whole Buildings

To determine whether a technology or practice is life-cycle cost effective, the rule requires looking at individual solutions, but not the entire rule. The likelihood of synergies from multiple solutions is recognized, but often such synergies are largely unknown or cannot be sufficiently modeled (see the discussion on modeling above). Guidance should be provided on how to determine such synergies and the research and development needs to achieve accurate determinations in the future.

Agencies also should be required to look at the life-cycle cost of the building as a whole and all features that contribute to sustainability goals. If the life-cycle cost of the whole building is equal to or less than

the baseline building, all considered attributes should be implemented. This will provide the greatest opportunity to construct sustainable buildings and also allow consideration of non-cost benefits (e.g., habitat protection) or costs not currently considered (e.g., potential future cost of greenhouse gas emissions). Rather than encouraging a component-by-component approach to sustainability, agencies should be encouraged to look at the sustainability of the building as a whole.

Quantifying Externalities

The Department identifies the need to quantify externalities associated with sustainable features that are not necessarily quantified today. Understanding the benefits of addressing the total costs of these externalities is critical to determining the true life-cycle cost of design options. However, DOE is not necessarily the entity that should determine the benefits from such actions. Agencies such as the Environmental Protection Agency (EPA) and the National Institute of Standards and Technology (NIST) have expertise and experience in such endeavors and should make such determinations.

First Cost Limits

In the discussion regarding “to the extent practicable,” the Department proposes to limit allowable costs to 3 percent of the total first costs. Such a limit seems arbitrary and does not provide for the potential benefits that are not necessarily cost based. Additionally, first cost should never be the basis for decision-making in building design and construction—cost considerations should be determined using life-cycle cost. While good design and knowledgeable building professionals often can produce sustainable buildings with little to no increased cost, a 3 percent cap could provide a disincentive for creativity and innovation in building design. Limits on first cost should not be a consideration in how federal agencies procure buildings. The focus for determining “extent practicable” should be focused on the other determinations identified: functional objectives, availability of materials, and life-cycle cost. In order to recognize benefits not necessarily included in life-cycle costs, we agree that net increases above life-cycle costs be allowed unless such costs are exorbitant. Numerical limits should not be placed on such net increases—agencies should be able to provide sufficient justification within the construction documents and to relevant Congressional Committees. It is important to note that new buildings and major renovations subject to the “extent practicable” requirements are subject to Congressional oversight—appropriate levels of spending for projects should be determined by Congress, not agencies.

Commissioning

The Institute agrees that building commissioning is a key part of the design, construction, and operation of a high-performance building. In order to assure that such commissioning is done in a thorough and consistent manner, we recommend citing ASHRAE Guideline 0 as the recommended process utilized for commissioning activities. The Guideline is developed through a consensus-based process and is widely accepted within the industry. Standards and guidelines developed by other organizations that focus on specific systems and components use ASHRAE Guideline 0 as their underlying process.

Beyond the commissioning practices identified in the proposed rule (§433.6(e)(2) and §435.6(e)(2)), to be effective, the commissioning agent also should provide training to building occupants and O&M personnel and recommendations for a long-term commissioning strategy. In addition to the periodic re-commissioning required for some federal facilities, ongoing commissioning should be required to assure systems continue to operate at ideal conditions. The Department, in conjunction with the General Services Administration, should develop specific guidance on the commissioning process,

commissioning agent qualifications, and requirements for federal agencies. Such guidance will assist building managers in setting expectations for the commissioning process and allow for consistent results. Best practices for engaging contract O&M providers in the commissioning process also should be developed.

Protecting and Conserving Water

In the NOPR, the Department recognizes that many technologies and practices designed to reduce energy use within a building depend on water. However, the NOPR does not appear to recognize the energy required to make use of such water (pumping, treatment, etc.). Agencies should be encouraged to include such considerations as part of their life-cycle analyses. The source of water can have a significant impact on the overall sustainability of the building. The rule does require designers to make use of graywater, captured rainwater, condensate, or other non-potable sources in order to reduce potable water use, but as currently written, they would not receive any credit for the likely savings in energy required to transport and treat potable water (and the related utility or other costs for such water).

Particularly in the case of outdoor water use, agencies should consider water reduction strategies based on landscape choices (e.g., native plantings that do not require irrigation, bioswales, or rain gardens). Opportunities to impact energy efficiency and security through landscaping also should be identified and considered as part of any life-cycle cost analysis.

Metering and Baselines

Water meters would be required under the proposed rule, but no guidance is given as to whether this is meant to be a whole building meter or sub-system meters. In order to have the greatest impact on and the opportunity to more closely manage water use, meters should be installed as close to individual points of use as practical. Such a metering requirement also should extend to outdoor uses of water.

Adopting the requirements for water use reduction in the Guiding Principles, DOE cites use of estimates of water use by building type provided by FEMP. It is important to note that these estimates are nearly 15 years old—changes in water using technologies have occurred since then and should be considered. These types of estimates should be used as a baseline of last resort. Actual water use in a facility should be used when available. Similar building types, vintages, and uses within a region often can provide insight into the water use of a particular facility. However, information such as renovation history, building management practices, and mechanical systems also must be considered. Hopefully, as agencies take steps to reduce water consumption they have methods in place to measure such reductions. Such measurement methods should be in place before any efficiency actions are undertaken and can serve as a data source for determining a baseline.

Conclusion

We appreciate the Department's reference to the resources available from the National Institute of Building Sciences' Whole Building Design Guide, particularly in the area of integrated design (§433.6(e)(1)(i) and §435.6(e)(1)(i)).

As Congress directed in our enabling legislation, federal agencies are encouraged to accept, use, and comply with technical findings of the Institute and to engage the Institute in their building and

construction related programs. We look forward to engaging with federal agencies as they work to implement high-performance building requirements.

Respectfully Submitted,

A handwritten signature in black ink that reads "Henry L. Green". The signature is written in a cursive style with a large, stylized initial "H".

Henry L. Green, Hon.AIA
President