American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

Testimony of
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To the
U.S. House of Representatives
Subcommittee on Government Management, Organization, and Procurement
Committee on Oversight and Government Reform
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Hearing on: "Green Building Practices in the Federal Sector: Progress and Challenges"

Chairwoman Watson, Ranking Member Bilbray, and members of the Subcommittee, thank you for the opportunity to speak to you today about standards and opportunities for the federal government to optimize building efficiency. My name is Lynn Bellenger, and this year I am president of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, better known as ASHRAE.

Founded in 1894, ASHRAE is an international nonprofit technical engineering society of over 52,000 members in more than 140 countries. Our members represent the breadth of professionals involved in the built environment from consulting engineers and architects to manufacturer's representatives and academics.

ASHRAE fulfills its mission of advancing heating, ventilation, air conditioning and refrigeration (HVAC&R) to serve humanity and promote a sustainable world through research, standards writing, publishing and continuing education. We are acknowledged experts on energy in buildings and indoor air quality.

The purpose of today's hearing is to examine the federal government's role in greening buildings. ASHRAE has long-partnered with the federal government on this very issue, working to reduce energy waste, while developing and constantly improving energy-efficiency standards and advanced guidance. In the 1970s during this nation's first modern energy crisis, the federal government approached ASHRAE to develop a standard to address the energy use of buildings.

This standard became ANSI/ASHRAE/IESNA Standard 90.1--Energy Standard for Buildings Except Low-Rise Residential Buildings.

Standard 90.1 now serves as both the federal building standard, and the national reference for state adopted commercial building codes through the Energy Independence and Security Act (EISA), the Energy Conservation and Production Act (ECPA), and the Energy Policy Act of 2005 (EPAct).

In our efforts to help the federal government and private sector find innovative solutions that will optimize building performance, through the High-Performance Building Congressional Caucus Coalition (HPBCCC), ASHRAE has taken the lead role in raising awareness in Congress, breaking down the barriers that have so often divided the building professions, bringing the building community together, and increasing awareness about the major impact that buildings have on our health, safety, and welfare. Over the past two years the HPBCCC has held 27 briefings for federal policymakers on a wide range of building-related issues, and it is one of the most active caucuses on the Hill.

As we enter a new era of economic awareness and energy sensitivity, many factors draw attention to energy use—concerns about our energy sources, rising energy costs, and the impacts of climate change. It is important, now as ever, to ensure that the funds the federal government spends go to projects that will improve energy efficiency, preserve the delicate environment, and save taxpayer dollars.

The impact of our nation's buildings is surprisingly large. Our nation's buildings account for 40 percent of our primary energy use—more than either transportation or industry. Buildings are responsible for 72 percent of the electricity consumption and 39 percent of the total U.S. carbon dioxide emissions. The CO_2 emissions from US buildings alone approximately equal the combined emissions of Japan, France, and the United Kingdom for transportation, industry, and buildings.

The federal government is the nation's largest energy consumer and greenhouse gas emitter. This position gives the government both a great opportunity and a great responsibility. By incorporating high-performance building practices into new and existing buildings, the federal government can save taxpayer dollars and reduce its environmental footprint.

Going forward, maximizing building efficiency and sustainability will require a fundamental shift in how buildings have been approached – from design to operation. Working together toward a whole building approach that fully considers how each system and building component will interact--instead of each discipline focusing on their own area of expertise – will be an essential element of ensuring that taxpayer dollars are well-spent.

Building Modeling
My presidential theme is "Modeling a Sustainable World." Building modeling represents one of the most powerful tools for optimizing building performance, and it is an area worthy of increased support from Congress. Today, we have the tools to create a virtual model to consider options in size, shape and appearance. But more than just a visual representation, our models can simulate energy performance, assess daylighting options and predict thermal comfort.

Integrated Building Design
To exploit the full capability of modeling tools, we must transform our design approach from a sequential process — where one discipline completes its work and hands off the design to the next — to a collaborative integrated building design process — where all of the disciplines involved in the building design and construction work as team from the beginning to evaluate options and optimize the design.

Our biggest challenge is implementing integrated design into daily practice. The traditional sequential approach misses the rich opportunities for optimizing building performance through a collaborative approach throughout the design process. It is going to require a cultural shift in our industry to transform the design process, and it's a shift that has to occur if we are going to reach our goal of net zero energy buildings.

To help expand awareness throughout the federal government of the potential benefits of increased energy savings that can be achieved through integrated, whole building design, we recommend creating a new demonstration program with selected, geographically diverse federal buildings. A report on the success and challenges of such a demonstration program would yield useful lessons learned that could be applied and expanded to other federal buildings, as well as buildings in the private sector.

In addition, Congress can help improve the use and implementation of integrated design in federal buildings by supporting the development of a core curriculum for federal personnel performing operations and maintenance, energy management, safety, and design functions through the Federal Buildings Personnel Training Act (H.R.5112).

Standard 189.1: A New Foundation for Green Building Standards
Earlier this year, in our continuing efforts to push the envelope on building efficiency, and in collaboration with the Illuminating Engineering Society of North America (IES) and the U.S. Green Building Council (USGBC), ASHRAE published Standard 189.1 – the first code-intended commercial green building standard in the United States. Standard 189.1 also serves as a compliance path of the International Green Construction Code (IGCC), published by the International Code Council.

Standard 189.1 represents a revolutionary new step for building standards, as it provides a long-needed green building foundation for those who strive to design, build and operate green

buildings. From site location to energy use to recycling, this standard will set the foundation for green buildings through its adoption into local codes. It covers key topic areas similar to green building rating systems, including site sustainability, water use efficiency, energy efficiency, indoor environmental quality and the building's impact on the atmosphere, materials and resources.

The energy efficiency goal of Standard 189.1 is to provide significant energy reduction over that in ANSI/ASHRAE/IESNA Standard 90.1-2007. It offers a broader scope than Standard 90.1 and is intended to provide minimum requirements for the siting, design and construction of high performance, green buildings. For this reason, ASHRAE recommends authorizing a pilot program with a select group of geographically diverse federal buildings to examine the effects of requiring all new federal buildings, by 2020, to meet the IGCC, and include ASHRAE Standard 189.1 as a compliance path of the IGCC. This will help the federal government meet the objectives of Executive Order 13514 of ensuring that beginning in 2020, all new federal buildings are designed to achieve zero-net-energy by 2030. A report on the success and challenges of such a demonstration program would also yield useful lessons learned that could be applied and expanded to other federal buildings, as well as buildings in the private sector.

Advanced Energy Design Guides: Going Beyond the Minimum

In addition to Standard 189.1 and 90.1, ASHRAE currently has several initiatives in place to provide guidance to those who wish to go beyond the minimum requirements and to encourage greater development and deployment of technologies and best practices that can move the market toward increasingly more energy efficient buildings.

These tools include the Advanced Energy Design Guides (AEDGs) which provide prescriptive means for achieving 30 percent savings over Standard 90.1-1999. These guides are developed in partnership with the Department of Energy and other members of the building community.

AEDGs are available for a wide variety of buildings, including small office buildings, small retail buildings, K-12 school buildings, small warehouses, highway lodging, and small hospitals and healthcare facilities. Over 250,000 copies have been downloaded and provided to practitioners and decision makers.

A recent market assessment of the AEDGs, conducted by the Energy Center of Wisconsin, found that the guides are in line with ASHRAE's objective of achieving 30 percent energy savings over the minimum requirements of Standard 90.1-1999.

The assessment also found that more than 70 percent of ASHRAE members who have used the guides view them as credible and useful design resources, and that the recommendations by climate zone and how-to tips are particularly useful. Almost all participants in the assessment agree that they would use the guides on future projects. The assessment found that users feel the guides serve as independent and credible third-party sources of information, are easy to understand and provide practical, application-oriented recommendations for reducing building energy use.

Development is currently underway on AEDGs that achieve 50 percent savings, and are targeted for completion in 2012. Following the 50 percent guides, AEDGs for achieving net zero energy consumption will be produced.

Congress can help federal buildings move beyond the minimum energy efficiency requirements by encouraging federal buildings to use ASHRAE's forthcoming AEDGs for achieving 50 percent energy savings over Standard 90.1, and the subsequent zero-net-energy guides.

Certification

In partnership with the APPA and GSA, ASHRAE has also developed an operations and performance management professional certification program to recognize practitioners who have demonstrated a well-rounded understanding of the knowledge of the management of facility operations and maintenance and their impact on HVAC&R systems' performance. Recommissioning and retrocommissioning are important tools to ensure buildings and equipment are operating as they were designed. ASHRAE has several guidelines that lay out the methodologies for completing the commissioning process.

In addition to commissioning, ASHRAE's credential programs also include certification for high-performance building design, building energy modeling, and healthcare facility design professionals.

To help improve the energy efficiency of federal buildings, ASHRAE recommends that those hired to design federal buildings be encouraged or required to hold ASHRAE certifications.

Revealing Building Energy Use: ASHRAE's Building Energy Quotient Label

Studies have shown that a building designed and constructed to be energy efficient, may still be wasteful if not used or managed properly. Alternatively, even buildings that are not designed for optimum efficiency may actually exceed their designed savings if tenants and operators are aware of energy use and how to reduce their energy consumption.

For this reason, it is important to educate building tenants, owners, and operators on how their building is performing, and Congress can help in this regard.

Seeking to fill the critical information gap between the design and operation of buildings, ASHRAE has developed the Building Energy Quotient (Building EQ) labeling program.

The Building EQ program includes both As Designed (asset) and In Operation (operational) ratings for all building types, except residential. The most visible component of the program is the label itself, which allows the general public, tenants, building owners, prospective owners, and operations and maintenance personnel to quickly and easily view how energy efficient a building is in operation compared to its design through an easily understood letter grade and color scale.

The operational rating is determined through an on-site assessment, during which the building owner is provided with building-specific information that can be used to improve his/her building. Documentation on previous energy efficiency upgrades and commissioned systems is also included. With information on both the asset and operational rating, building owners can make side-by-side comparisons which could further reconcile differences between designed and measured energy use.

Congress can help close the gap between the designed and operational energy use of federal buildings by requiring all new and existing federal buildings to put in place, within three years, an energy performance information program that measures both designed and in operation performance. The information yielded from this program would be used to reconcile differences between designed and in operation building energy use, and help optimize federal building performance. Such a requirement and program may be modeled after section 281 of the American Clean Energy Leadership Act in the Senate (S.1462).

Summary and Recommendations for Optimizing Building Efficiency and Meeting Future Needs

In closing, I offer the following comments and recommendations for Congress to consider in its efforts to optimize the performance of the federal building stock.

As the nation's largest energy consumer and greenhouse gas emitter, the federal government is in a unique position to both improve building performance and save taxpayer dollars, while preserving the environment. Over the years significant progress has been made in the federal, commercial, and residential sectors, and we are poised to embark on a new era of energy efficiency and taxpayer dollar stewardship that will lead us to net-zero energy buildings.

The recommendations below represent a starting point in this endeavor. Much work remains, and as a national and world leader in developing cutting-edge building standards, ASHRAE looks forward to opportunities for working with Congress and the Executive Agencies as we all move toward a more sustainable tomorrow.

I offer the following recommendations to assure that we meet the future demands placed on federal buildings:

- Adequately fund the federal agencies that advance the development and enforcement of energy standards and guidelines, including the Department of Energy, National Institute of Standards and Technology, Environmental Protection Agency, and the General Services Administration which serves as a leader in the implementation of leading edge technologies and practices.
    - Specifically, help improve federal, commercial, and home building efficiency by continuing support for funding increases for the Building Technologies, and the Federal Energy Management programs.

- Support the research and development necessary to develop and deploy cost effective technologies necessary to achieve our nation's energy goals. This includes the technologies envisioned under the Net-Zero Energy Commercial Building Initiative established in EISA. Additionally, sufficient investment must be made in R&D for renewable energy technologies such as solar, wind, water, biomass, and geothermal. These renewable energy technologies will be critical components of the design and construction of net zero energy buildings—funding for their development must parallel their importance to their role in net zero energy buildings.

- Continue to support the utilization of voluntary consensus standards in regulation and codes as recognized by The National Technology Transfer and Advancement Act of 1995 (P.L. 104-113) (NTTAA) and OMB Circular A-119.

- Support integrated design and whole-building systems thinking by supporting the development of a core curriculum for federal personnel performing building operations and maintenance, energy management, safety, and design functions through the Federal Buildings Personnel Training Act (H.R.5112).

- To help improve the energy efficiency of federal buildings, ASHRAE recommends that those hired to design federal buildings be encouraged or required to hold ASHRAE certifications.

- Require all new federal buildings and all existing federal buildings to put in place, within three years, an energy performance information program that measures both designed and achieved (in operation) performance. The information yielded from this program would be used to reconcile differences between designed and in operation building energy use, and help optimize federal building performance. Such a requirement and program may be modeled after section 281 of the American Clean Energy Leadership Act in the Senate (S.1462).

- Encourage federal buildings to use ASHRAE's forthcoming AEDGs for achieving 50 percent energy savings over Standard 90.1, and the subsequent net zero energy guides to help federal buildings move beyond the minimum energy efficiency requirements.

- Authorize a pilot program with a select group of geographically diverse federal buildings to examine the effects of requiring all new federal buildings, by 2020, to meet the IGCC, and include ASHRAE Standard 189.1 as a compliance path of the IGCC. This will help the federal government meet the objectives of Executive Order 13514 of ensuring that beginning in 2020, all new federal buildings are designed to achieve zero-net-energy by 2030. A report on the success and challenges of such a demonstration program would also yield useful lessons learned that could be applied and expanded to other federal buildings, as well as buildings in the private sector.

- Examine the potential benefits and increased energy savings from integrated whole building design through a new demonstration program with selected, geographically diverse federal buildings. A report on the success and challenges of such a demonstration program would yield useful lessons learned that could be applied and expanded to other federal buildings, as well as buildings in the private sector.

Thank you again for the opportunity to address the Subcommittee. Please feel free to contact me or ASHRAE's Washington, DC Office should you require any additional information on buildings related issues.

Attachment 1

ASHRAE Standard 90.1: Its Development and Its Future

Another opportunity for improving the energy efficiency of federal buildings is continuing support for ASHRAE Standard 90.1.

ASHRAE is celebrating 35 years of Standard 90.1, and as I noted earlier, now serves as both the federal building standard, and the national reference for state adopted commercial building codes through the Energy Independence and Security Act (EISA), the Energy Conservation and Production Act (ECPA), and the Energy Policy Act of 2005 (EPAct).

As an American National Standards Institute (ANSI) approved standard, the development of Standard 90.1 adheres to rigorous principles based on consensus, openness, balance, transparency, and due process. In fact, ASHRAE is one of the very few ANSI Audited Designators which means we have established and maintain a consistent record of successful voluntary standards development.

The Standard is developed by a committee made up of technical experts representing different aspects of the building community including product manufacturers, energy efficiency advocates, academics, government, building owners, utilities, and consulting (or design) engineers and architects. Once the committee reaches consensus on a draft of the standard, it is open for a period of public comment. Once comments are received, the committee must attempt to resolve all comments before presenting the standard to the ASHRAE Board of Directors for publication. Both within the ASHRAE structure and the ANSI structure there are opportunities for appeal for anyone who feels that their comments regarding the standard are not adequately addressed.

Both Congress and the Executive branch have recognized the value of voluntary consensus standards by requiring their use in regulations when consistent with agency policy and appropriate for agency purposes (National Technology Transfer and Advancement Act of 1995 (P.L. 104-113) (NTTAA) and OMB Circular A-119).

Standard 90.1 addresses many aspects of buildings that contribute to the overall energy use attributable to a building. These include:

- Building envelope or shell: includes required insulation values, window characteristics and allowable air leakage
- Heating, ventilation and air-conditioning: includes equipment efficiency requirements
- Service water heating: includes equipment efficiency requirements
- Lighting: includes allowable power use by lighting for particular space uses

Congress can help improve federal, commercial, and home building efficiency by continuing support for funding increases for the Building Technologies, and the Federal Energy Management programs.