**U.S. House of Representatives**
**Committee on Science, Space, and Technology**
**Subcommittee on Investigations & Oversight**

# HEARING CHARTER

## "The Science Behind Green Building Rating Systems"

Tuesday, May 8, 2012
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

## Purpose

On Tuesday May 8, 2012, the Subcommittee on Investigations and Oversight will hold an oversight hearing to examine the scientific record that green building ratings systems are based upon. The federal government through the General Services Administration (GSA)and the Department of Energy (DOE) invests federal resources in green buildings through federal research and development funding and construction choices. Several laws and executive orders impose energy and environmental requirements upon these federal buildings. In addition, several private sector developed green building rating systems and codes seek to encourage or mandate similar goals upon the private and public sector including Green Globes, the Leadership in Energy and Environmental Design (LEED) system, and ASHRAE 189.1.

Under Section 433 of the Energy Independence and Security Act of 2007, the DOE and GSA are required to determine every five years which, if any, third-party green building rating system(s) should be adopted for federal buildings or whether a federally developed system should be used instead.[1]

DOE and GSA are currently working to determine the preferred third-party building rating system to be used by the federal government for the next five years with a decision expected later in 2012 or early in 2013. A recent study to compare third-party green building rating systems was conducted by Pacific Northwest National Lab (PNNL) and was just released last week[2]. In light of the ongoing DOE research and ongoing decision process, the Subcommittee on Investigations and Oversight is holding a hearing to review the work of the Department of Energy to examine the science behind green building rating systems.

## Background

[1] The Energy Secretary makes the ultimate determination although the Secretary of Defense does have authority under Section 433 to set a separate standard for privatized military housing.
[2] *Green Building Certification System Review*, PNNL-20966.

Buildings currently account for almost 40% of total energy consumed in the U.S. For electricity specifically, buildings account for over 70% of nationwide electricity usage.[3] For both total energy and electricity specifically, usage is divided roughly equally between commercial and residential buildings. As a large owner, operator, and developer of commercial buildings, the federal government has invested resources in methods to reduce energy usage in its own buildings as a model for private sector building owners and operators to do the same. Reductions in federal energy usage allow federal resources to be directed elsewhere on programmatic needs and/or a reduced need for taxpayer dollars for operational expenses.

With limited federal funds, ensuring that spending is made in the most cost effective effort is critical. Long-term investments in reducing energy usage in public and private buildings typically requires a larger initial investment in design and/or materials such as greater amounts of insulation and more efficient heating and cooling systems. Investments with a shorter payback period are favored. For example, assume that an additional federal investment of $1 million dollars in a new courthouse for more energy efficient windows than are typically used reduces annual energy usage by $100,000. This investment of taxpayer dollars would have a 10-year payback period. In contrast, assume the same investment of $1 million had been spent on thicker insulation reducing energy usage by $250,000 per year. This would result in a shorter 4-year payback period. On a dollar for dollar basis, the investment in insulation in this hypothetical example would be a more effective use of taxpayer funds than the same investment in windows.[4]

**Existing Federal Efforts and Programs**

Federal attention to energy savings began to increase sharply after the oil crisis of the 1973 although it has not been a consistent effort. The Energy Conservation and Production Act of 1976 (ECPA) contained provisions mandating that the Department of Housing and Urban Development create a uniform energy standard for residential and commercial buildings.[5] The Department of Energy was created shortly afterwards in 1977 to focus on the nation's energy usage.[6] Authority for federal energy standards was transferred from HUD to DOE in the legislation creating DOE. To study building technologies and how they can reduce energy usage, DOE utilized several national labs including the National Renewable Energy Laboratory and the Pacific Northwest National Laboratory. DOE has an Assistant Secretary of Energy Efficiency and Renewable Energy (EERE) whose responsibilities encompass federal energy standards[7]. EERE also oversees the Federal Energy Management Program (FEMP) that works with existing federal building managers to improve their building's energy performance.[8]

Under ECPA, DOE was directed to develop building standards for public and private sector buildings. These standards were to be mandatory for all buildings nationwide. On November 28, 1979, DOE issued a notice of proposed rulemaking in the Federal Register containing these

[3] 2011 Buildings Energy Data Book, DOE EERE.
[4] Note that since each federal building is unique, what is a better investment in energy efficiency in Alaska may not be the same for an investment in energy efficiency in Texas.
[5] Titles III and IV of P.L. 94-385.
[6] P.L. 95-91.
[7] See www.eere.energy.gov. Dr. Kathleen Hogan, the Assistant Secretary of Energy for EERE is one of the hearing witnesses.
[8] *See* www1.eere.energy.gov/femp.

proposed building energy performance standards.[9] 1800 comments were received and there was strong opposition to the proposed rules. [10] Over the next several years, Congress significantly scaled back the legislative mandate to develop mandatory standards for all buildings and replaced it with a mandate to create voluntary standards for federal buildings. [11]

In 1992, the Environmental Protection Agency (EPA) created the voluntary labeling system called Energy Star to identify items with increased energy efficiency.[12] Initially focused on identifying energy efficient personal computers and printers, the Energy Star system has expanded to identify energy efficient home products such as dishwashers, windows, light bulbs, etc… in addition to buildings that use less total energy. Management of the Energy Star program is now split between the EPA and DOE depending upon which product is being rated. Green building rating systems often encourage or even mandate the use of Energy Star rated products.

With continuing increases in energy costs, Congress enacted the Energy Policy Act (EPACT) in 2005 that reinstated mandatory residential and commercial building energy standards by requiring states to adopt them as part of their building codes.[13] However, no penalties were imposed upon states that chose to not meet these requirements. Additional legislation in 2007, the Energy Independence and Security Act (EISA), expanded the focus of the government to more than reductions in energy savings by adding other energy and environmental goals such as reduced water usage, increased use of recycled products, and a preference to build on already developed locations.[14]

EISA contained several provisions that specifically addressed federal green buildings. Section 433 mandated the Secretary of Energy in consultation with the Administrator of the GSA and the Secretary of Defense choose a certification system and level for federal buildings. The first decision was to be made within 90 days of enactment with reviews occurring at least every five years thereafter. The initial decision was to adopt the LEED rating system developed by the U.S. Green Building Council (USGBC).

## Private Sector Domestic Green Building Certification Systems

### ASHRAE 189.1

In 1975, the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) developed Standard 90 that identified minimum energy efficiency standards for commercial buildings. Continuously updated as new technology was developed, Standard 90 became known as ASHRAE 90.1 standard that is now updated every three years. The most recent version is ASHRAE 90.1 (2010). ASHRAE 90.1 is used as the basis for U.S. domestic building codes concerning energy efficiency.

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[9] 44 Federal Register 68120.
[10] D.L. Shankle, J.A. Merrick, and T.L. Gilbride, "A History of the Building Energy Standards Program," PNL-9386, Pacific Northwest Laboratory, February 1994, p. 1-3.
[11] Ibid.
[12] See www.energystar.gov/index.cfm?c=about.ab_history for additional information about the history of Energy Star.
[13] Section 101 of P.L. 102-486.
[14] P.L. 110-40.

In 2011, ASHRAE developed Standard 189.1, *Standard for the Design of High-Performance, Green Buildings Except Low-Rise Residential Buildings*, that expanded upon its earlier work in Standard 90.1. ASHRAE partnered with the American National Standards Institute (ANSI) and the U.S. Green Building Council to develop Standard 189.1. Instead of focusing solely on energy efficiency, Standard 189.1 focuses on energy efficiency, water usage efficiency, indoor environmental quality, site sustainability, and building impact.

To determine the increased savings of Standard 189.1, NREL compared it to the existing 2007 version of the 90.1 standard. NREL determined that energy savings were increased by an average of 29.7% by using Standard 189.1 instead of Standard 90.1[15]. The specific amount of energy savings varied depending upon the type of building. For example, NREL determined that warehouses would experience an energy savings of up to 42% under Standard 189.1 while outpatient healthcare facilities would only experience a 15% energy savings.[16]

**Green Globes**

Introduced in the U.S. in 2004, the Green Globes system grew out of Canadian building standards. Green Globes is a standard accredited by the American National Standards Institute (ANSI). This accreditation means that the development of the standard meets the requirements of the National Technology Transfer and Advancement Act. This Act provides for a formal government preference for private sector standards that have been developed by bodies such as ANSI. The National Institute of Standards and Technology (NIST) also recognizes ANSI as the U.S. representative on the International Organization for Standardization (ISO), the leading international body for standards of all types.

The Green Globes rating system uses a point based system for building design and construction choices that results in a building earning one to four leaves based upon the number of points earned to signify its meeting of key Green Globe standards. Choices viewed as "green" earn more points than those that are not viewed as such. Although it has not been used as widely as the LEED system, Green Globes has been used by several federal agencies. For example, in 2009, the Department of Veterans Affairs (VA) entered into a partnership with Green Globes to utilize its rating system on 21 VA hospitals to assess their energy and environmental status. Green Globes has highlighted its efforts at the Portland, Oregon hospital, an 11 story, 1.5 million square foot building. According to Green Globes, the VA's use of the Green Globes system resulted in a 99% rating under the Energy Performance category of Green Globes which led to significant energy savings.[17]

Green Globes certification costs depend upon the size of the building, but they are capped around $25,000 per building plus the cost of hiring an independent assessor to travel to the site to undertake his or her review for new construction projects. This amount does not include additional design or construction costs resulting from choices made to earn points. One of the biggest differences between Green Globes and LEED systems is the requirement by Green Globes that an independent assessor be used to assess whether a building is performing properly, not just designed properly. This extra step by Green Globes is highlighted by its supporters as a

[15] NREL Technical Report TP-550-47906 accessible at www.nrel.gov/docs/fy10osti/47906.pdf
[16] Ibid.
[17] Green Globes Case Study accessible at www.nrel.gov/docs/fy10osti/47906.pdf.

way to ensure that the extra costs of Green Globe certification are recaptured by lower building operating costs.

**Leadership in Energy and Environmental Design (LEED)**

The Leadership in Energy and Environmental Design (LEED) green building standard is overseen by the U.S. Green Building Council (USGBC). Founded in 1993, the USGBC released the first version of the LEED rating system in 2000 for new construction projects.[18] The USGBC has subsequently updated and expanded its rating systems to cover other types of building projects including:

- Major renovations
- New Construction
- Existing Buildings: Operations & Maintenance
- Commercial Interiors
- Core & Shell
- Schools
- Retail
- Healthcare
- Homes
- Neighborhood Development

Building owners seeking LEED certification for their projects submit construction plans and other required information to the USGBC in order to earn points in several categories ranging from natural lighting, encouragement for hybrids and alternative forms of commuting, reduced water usage, and energy efficient heating and cooling equipment. Depending upon the number of points earned, a building is considered LEED certified at the lowest level of Certified or higher levels of Silver, Gold, and Platinum when more points are earned. LEED certification costs are dependent upon building size and are capped at no more than $30,000 for new construction projects.

The leadership of the USGBC is composed of a 16 member Board of Directors with self-selected categories including a seat for local and state governments currently held by an employee of the Pennsylvania Governor's Green Council. Several federal employees serve in various capacities within the USGBC rating development system. At the highest level, Don Horn, the Deputy Director of GSA's Office of Federal High-Performance Green Buildings, serves as the Federal Liaison to the USGBC Board of Directors.

The USGBC rating systems are updated on a regular basis and are adopted after they are voted on by USGBC members. Voting for the 2012 updates of several of its rating systems will occur in June with eligible voters coming from its dues-paying corporate, individual, and public sector members.[19]

**Living Building Challenge**

[18] A LEED factsheet can be found at www.usgbc.org/ShowFile.aspx?DocumentID=3330.
[19] See www.usgbc.org/DisplayPage.aspx?CMSPageID=2602 for more details.

The Living Building Challenge system was founded in 2006. Since it is a newer green building rating system in comparison to Green Globes and LEED, the usage of the Living Building Challenge system has been much lower with less than 100 certified projects in the United States. It does not appear that any federal buildings have been rated under this rating system, but it was considered robust enough to be studied in detail by PNNL as a possible replacement for LEED over the next five years.

Currently at version 2.1 released in May 2012, the Living Building Challenge determines rankings based upon achievements in the seven categories of site, water, energy, health, materials, equity, and beauty. These categories are called "petals." Somewhat similar to Green Globes and LEED, within each "petal" are several subcategories in which various criteria must be met. Certification costs are also similar with a maximum cost of $25,000.

## Issues

### Reliance upon and preferences for specific third parties building standards

EISA allows the government to use a federally or private sector developed standard as the preferred option for federal buildings. DOE has studied energy savings technologies and has the expertise to develop its own standards if it chooses to create them. However, as noted before, federal law gives preference to private sector developed standards that are ANSI accredited. However, the private sector green building standard used for the past five years by the federal government was not accredited in this manner.

DOE has worked with a variety of outside entities to research and develop standards. For example, the USGBC has designated a Federal Liaison to its Board of Directors, Don Horn, who is the Deputy Director of GSA's Office of Federal High-Performance Green Buildings. At one point, he may have served as an actual USGBC Board Member. Given that GSA plays such a critical role in determining which green building rating system is used by the federal government (and therefore received federal funds for certification costs), there are concerns over whether all rating systems should have a similar liaison if they desire.

Local and state government often look to, and rely upon, federal government research and decisions as a model for their own regulations. Local communities do not have the resources to conduct in-depth reviews to the extent that federal laboratories do. Federal adoption or preferences for specific building rating systems indirectly sets a precedent for local and state action. Green Globes and LEED have both sought adoption of local and state green building codes. In some cases, state and local governments have adopted a LEED only requirement or preference in their building codes over the opposition of Green Globes that has sought more neutral public policies.[20] Although local and state sovereignty issues are not a topic for this hearing, Committee oversight of DOE and GSA actions will have an impact at the state and local level.

### Federal reviews of private sector developed green building rating systems

[20] A list of green building regulatory requirements can be found at www.usgbc.org/DisplayPage.aspx?CMSPageID=1852.

On May 3, 2012 GSA released a review of green building certification systems conducted by DOE's Pacific Northwest National Laboratory. DOE reviewed 14 green building certification systems including 8 systems that were only available internationally in specific countries. Of the six remaining rating systems, only three were deemed worthy of detailed consideration – Green Globes, LEED, and the Living Building Challenge. These three systems were then compared with federal regulations, federal law, and executive orders related to green buildings.

PNNL's survey identified the various areas in which these three rating systems matched existing federal priorities. All three building rating systems reflect self-selected energy, environmental, and social goals in some manner. The Living Buildings Challenge that allows ratings to be earned based upon such categories as "democracy and social justice", "human scale and humane places", and "beauty and spirit" arguably has the most focus on social goals compared to purely energy savings goals.

Only the Green Globes system follows ANSI approved methods that meet the OMB definition of "consensus" to ensure that all concerns about its proposed standards are addressed.[21] Since GSA and DOE do not require any third party rating system it chooses to meet this definition, it is unclear whether those that do not such as LEED and the Living Building Challenge lack widespread support outside of their membership community.

**Do green building rating systems save taxpayer dollars?**

Although it has been widely assumed that the private sector green building rating systems reduce operating costs, there has been little peer reviewed research into confirming this to be the case. The USGBC released a non-peer reviewed study in 2007 conducted by the New Buildings Institute that concluded a 25 to 30% lower energy use for LEED certified buildings.[22] This study was criticized by some who felt that the buildings surveyed did not adequately represent existing LEED buildings.

Professor John Scofield who will be testifying at the hearing conducted a peer reviewed study that identified several concerns with the USGBC sponsored study.[23] Among the concerns were that the LEED system focused too much on building design, rather than building performance. A well designed building will not save as much energy as it could if it is not tested and run properly. Professor Scofield advocates more usage of an Energy Star like system to reduce federal energy usage.

**Preferences for or against specific types of materials**

Green building standards often give additional points to buildings that include or do not include certain types of materials. For example, current LEED standards grants an additional point for use of wood that is Forest Stewardship Council (FSC) certified. Other timber certification standards exist including American Tree Farm Standard (ATFS) certified and Sustainable

[21] OMB Circular A-119 sets the federal definition of "consensus."
[22] The New Buildings Institute study can be found at www.usgbc.org/ShowFile.aspx?DocumentID=3930.
[23] Professor Scofield's study can be found at www.oberlin.edu/physics/Scofield/pdf_files/Scofield%20IEPEC%20paper.pdf.

Forestry Initiative (SFI) certified.[24] By only allowing a point to be earned for wood that is FSC certified, ATFS and SFI wood is less desirable among builders seeking LEED certification.

This has led to complaints by companies that manufacture or distribute non-FSC certified wood that they are losing business to FSC certified timber companies. They state that there is no scientific basis to give preference to FSC certified wood over ATFS and SFI certified wood. Efforts to change or eliminate this preference in the LEED system by these timber certification entities have not been successful so far, further raising questions about how much consensus exists within the LEED system. A timber industry witness with concerns over this preference for FSC certified wood in LEED will testify at the hearing.[25] The Governor of Maine signed an Executive Order in December 2011 that essentially prohibited the use of LEED for state buildings due to its preference for FSC wood.[26]

Under a proposed version of several updated LEED standards for 2012 related to new construction, points could be earned by avoiding the use of certain chemicals regardless of whether they are present in a warehouse, data center, school, or healthcare setting which have very different human population levels and exposure profiles. It is unclear what science, if any, this proposal is based upon.[27] LEED 2012 is still in draft form so it is unknown whether this proposed addition to the LEED rating system will actually be made. Similar to complaints from the non-FSC timber certification entities, chemical industry interests have stated that t their concerns have also been ignored due to the lack of a consensus process and that there is a lack of a scientific basis for such a proposal.

## Witnesses

Panel I:
**Dr. Kathleen Hogan,** Deputy Assistant Secretary for Energy Efficiency, Office of Energy Efficiency and Renewable Energy, DOE

**Mr. Kevin Kampschroer,** Director of the Office of Federal High-Performance Green Buildings, GSA

Panel II:
**Mr. Ward Hubbell**, President, U.S. Green Building Initiative

**Mr. Roger Platt,** Senior Vice President, Global Policy and Law, U.S. Green Building Council
Professor John Scofield, Oberlin College

[24] Additional information about these standards can be found at www.sfc.org, www.treefarmsystem.org, and www.sfiprogram.org respectively.
[25] The USGBC has stated that it does not ban the use of non-FSC certified wood. Although this is technically true, under a point based rating system there is significant business pressure to earn as many points as possible thereby lowering interest in using materials that would not earn a point.
[26] The text of the Maine Executive Order can be found at www.maine.gov/tools/whatsnew/index.php?topic=Gov_Executive_Orders&id=323510&v=article2011.
[27] Version 3 of proposed 2012 LEED MR Credit: Avoidance of Chemicals of Concern.

**Dr. John Scofield,** Professor of Physics, Oberlin College

**Mr. Victor Olgyay,** Principal Architect, Built Environment Team, Rocky Mountain Institute

**Mr. Tom Talbot,** CEO, Glen Oak Lumber and Milling of Wisconsin

# Appendix A
# Definition of a High Performance Green Building from Section 401 of EISA

(13) HIGH-PERFORMANCE GREEN BUILDING.—The term ‘‘high-performance green building’’ means a high-performance building that, during its life-cycle, as compared with similar buildings (as measured by Commercial Buildings Energy Consumption Survey or Residential Energy Consumption Survey data from the Energy Information Agency)—

(A) reduces energy, water, and material resource use;

(B) improves indoor environmental quality, including reducing indoor pollution, improving thermal comfort, and
improving lighting and acoustic environments that affect occupant health and productivity;

(C) reduces negative impacts on the environment throughout the life-cycle of the building, including air and water pollution and waste generation;

(D) increases the use of environmentally preferable products, including biobased, recycled content, and nontoxic
products with lower life-cycle impacts;

(E) increases reuse and recycling opportunities;

(F) integrates systems in the building;

(G) reduces the environmental and energy impacts of transportation through building location and site design that support a full range of transportation choices for users of the building; and

(H) considers indoor and outdoor effects of the building on human health and the environment, including—

(i) improvements in worker productivity;

(ii) the life-cycle impacts of building materials and operations; and

(iii) other factors that the Federal Director or the Commercial Director consider to be appropriate.