

**STATEMENT OF**

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**U.S. DEPARTMENT OF ENERGY**

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**COMMITTEE ON SCIENCE AND TECHNOLOGY**

**U.S. HOUSE OF REPRESENTATIVES**

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Chairman Baird, Ranking Member Inglis, Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss the U.S. Department of Energy's (DOE) Building Technologies Program activities and the enormous potential for energy savings in the buildings sector. I have included, as an appendix to this testimony, an update on the Department's progress in implementing sections of the Energy Policy Act of 2005 (EPACT 05) and the Energy Independence and Security Act of 2007 (EISA), as requested by the Subcommittee.<sup>1</sup>

In 2008, the Nation's 114 million households and more than 74 billion square feet of commercial floor space accounted for nearly 40% of U.S. primary energy consumption, as well as:

- 73% of electricity and 34% of natural gas consumption,
- Energy bills totaling \$418 billion, and
- 39% of Carbon Dioxide, 18% of Nitrogen Oxide, and 55% of Sulfur Dioxide emissions.

Additionally, construction and renovation accounted for 9% of GDP, and eight million people were employed in the sector.<sup>2</sup>

The Department is committed to improving energy efficiency in buildings from advances in building technologies and systems, to energy codes for new construction, to weatherization retrofits and promotion of efficient appliances. The Administration continues to renew and build upon these efforts. I would like to give a broad overview of the Building Technologies Program and highlight some of its ongoing activities.

## **DOE's Building Technologies Program**

The Building Technologies Program develops technologies, techniques, and tools, as well as minimum performance standards, for making residential and commercial buildings more energy efficient, productive, and affordable. The program's current goal is to create technologies and design approaches that enable net-zero energy buildings<sup>3</sup> at low incremental cost by 2020 for residential buildings and 2025 for commercial buildings. The program expects that efficiency technologies and designs will have application to buildings constructed before 2025, resulting in incremental reductions in energy use throughout the sector.<sup>4</sup>

The research and development (R&D) activities of DOE's Building Technologies Program are fully aligned toward enabling the widespread construction of net-zero energy residential and commercial buildings by 2020 and 2025, respectively. The Commercial Buildings

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<sup>1</sup> EPACT 05 was codified into law as Pub. L. No. 109-58; EISA as Pub. L. No. 110-140.

<sup>2</sup> DOE, *2008 Building Energy Data Book*.

<sup>3</sup> A net-zero energy building is a residential or commercial building with greatly reduced needs for energy through efficiency gains (60 to 70 percent less than conventional practice), with the balance of energy needs supplied by renewable technologies.

<sup>4</sup> DOE, *2008 Building Technologies Multi-Year Program Plan*, <http://www.eere.energy.gov/buildings/publications/pdfs/corporate/myp08complete.pdf>.

Integration subprogram conducts systems integration R&D, works with national energy alliances on best practices, engages national accounts with research technical assistance to achieve deep energy retrofits and design of high performance new building prototypes, and provides targeted mass procurement and technology solutions to the industry.

The Residential Integration subprogram works through the Building America public-private partnership to develop high performance residential sub-systems and whole house energy improvements, and testing them on a community scale. In addition, the Residential Integration subprogram is implementing the Builders Challenge to deploy the results of the R&D activity, and is implementing DOE's portion of the Home Performance with Energy Star program to spur deep retrofits in homes throughout the nation.

Equipment and component research is designed to fill identified gaps in technical performance and/or cost reduction needed to fully achieve the net zero energy cost and performance goals of the Commercial and Residential subprograms. Component and equipment research is conducted on Solid State Lighting; Heating, Ventilation, Air Conditioning, Refrigeration and Water Heating; Solar Heating and Cooling; Thermal Envelope and Windows; and Design Tools.

The Appliances and Commercial Equipment Standards Program develops test procedures and energy conservation standards for residential appliances and commercial and industrial equipment. The Program develops regulations that manufacturers must adhere to in making energy efficiency claims as well as in manufacturing products for sale in the United States. These regulations apply to products manufactured in the United States as well as those imported into the United States.

The Department's Building Technologies Program and its partners strive to integrate energy efficient technologies into the marketplace through technology validation and market introduction activities such as Builders Challenge, Building Energy Codes, EnergySmart Hospitals, EnergySmart Schools, ENERGY STAR®, Solar Decathlon, and the Utility Solar Water Heating Initiative (USH<sub>2</sub>O).<sup>5</sup>

I would like to underscore certain successes within Building Technologies Program, from net-zero energy commercial buildings to efficient appliances for consumers that have contributed to technological advancements and significant energy savings.

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<sup>5</sup> More information is available on each of these programs at the following links:  
Builders Challenge: <http://www1.eere.energy.gov/buildings/builderschallenge.html>  
Building Energy Codes: <http://www1.eere.energy.gov/buildings/energycodes.html>  
EnergySmart Hospitals: <http://www1.eere.energy.gov/buildings/energysmarthospitals/>  
EnergySmart Schools: <http://www1.eere.energy.gov/buildings/energysmartschools.html>  
ENERGY STAR®: <http://www1.eere.energy.gov/buildings/energystar.html>  
Solar Decathlon: [http://www1.eere.energy.gov/buildings/solar\\_decathlon.html](http://www1.eere.energy.gov/buildings/solar_decathlon.html)  
Utility Solar Water Heating Initiative (USH<sub>2</sub>O): <http://www1.eere.energy.gov/buildings/ush2o/>

## **Commercial Buildings Initiative**

Launched in August 2008, the Net-Zero Energy Commercial Building Initiative (CBI) is the umbrella initiative that will guide and coordinate public and private partnerships to advance the development and market adoption of net-zero energy commercial buildings (NZEBs). CBI works with researchers at DOE National Laboratories, as well as with public and private partners, to achieve the goal of marketable NZEBs by 2025.

In support of the CBI, DOE's key commercial buildings research includes whole building system integration, indoor environmental quality, control strategies and diagnostics, space conditioning, and process and miscellaneous equipment. Another major area is the development of technology solutions for achieving 30-50% savings at the building system level (lighting, heating, and cooling). The first technology solution, Commercial Lighting Solutions web tool design aid, launches in May 2009. We expect that designs for retail building that use this tool could save 30-40% on energy use compared with ASHRAE/IESNA Standard 90.1-2004.

Working with industry representatives and partners is critical to achieving the goal of marketable net-zero energy commercial buildings by 2025. We are engaged with building industry leaders through energy alliances and research partnerships to move us toward that goal. The key CBI alliances and partnerships include:

- Commercial Building Energy Alliances – Informal associations of commercial building owners and operators who work to significantly reduce energy consumption and carbon emissions. Currently, alliances exist for retail, commercial real estate, and hospitals.
- Commercial Building National Accounts (NAs) – Companies and organizations partnering with DOE to conduct cost-shared research, development, and deployment. NAs will construct buildings that achieve savings of 50% or retrofit buildings that achieve 30% savings above ASHRAE/IESNA Standard 90.1-2004, and deploy this knowledge through their portfolios. In FY 2008, 23 National Account partners agreed to work with DOE. Another 100 National Accounts are planned in FY 2009.
- High-Performance Green Building Consortium – DOE-selected building industry groups that work with DOE to accelerate the commercialization of high-performance building technologies by disseminating information on new technologies within the commercial building community. A high-performance commercial building offers improved energy, economic, and environmental performance compared to standard practice. See the appendix for progress on related sections of EISA.

## **Building Energy Codes and Standards**

The Department works closely with the American Society of Refrigeration and Air-Conditioning Engineers (ASHRAE) on its standard 90.1 and with the International Code

Council (ICC) on its International Energy Conservation Code (IECC) in response to Title III of the Energy Conservation and Production Act, as amended (42 U.S.C. 6831 et seq.).

In 2007, DOE challenged ASHRAE to upgrade standard 90.1 to be 30% more stringent than its 2004 edition by 2010 and has been actively engaged in the ASHRAE standards process by providing technical assistance to support the upgrade of standard 90.1. ASHRAE reports that it is on track to achieve the 30% goal.

The Department has also joined many stakeholders in the International Energy Conservation Code process to upgrade the 2006 edition of the IECC by 30% by 2012. Significant progress has been made in the 2009 edition, upgrading it by about 15%. The Department is an active participant in the codes development process by providing engineering, economic and energy analyses of improvements to the code as well as specific code proposals.

## **Appliance Standards**

In the 1970s, there was a debate over whether to set energy conservation standards for consumer products, including refrigerators. Many were concerned that standards would be too expensive to meet and that they would lead to higher prices for consumers. The Appliance Standards Program was established with the passage of the Energy Policy and Conservation Act of 1975 (EPCA), which designated test procedures, conservation targets, and labeling requirements for certain major household appliances. The Act has been amended several times, changing the conservation targets to mandatory standards and adding many additional products to eventually include a broad range of residential and commercial products. As amended, the appliance standards requirements are among the broadest and most stringent of any country in the world. Once the standards passed, manufacturers put their engineers to work developing new products to meet the standards. Manufacturers were successful and developed new, energy efficient products that met the requirements.

For example, today, refrigerators cost less than they did before DOE's ENERGY STAR, research, and energy conservation standards programs. Yet, today's refrigerators are larger, have more features and use less than one-third as much energy as those earlier designs. DOE estimates DOE's programs have contributed to a decrease in refrigerator energy consumption on the order of 0.25 quads compared 1975, even though the number of refrigerators grew by 35%. This energy savings is equivalent to the amount produced by 58 coal power plants.<sup>6</sup>

President Obama showed his interest and expectations for the Appliance Standards Program just 17 days after his inauguration. The President visited DOE and set out his expectations for the Appliance Standards Program in a memorandum to Secretary Chu. The memorandum requests that the Department take all necessary steps to finalize legally required energy conservation standards rulemakings as expeditiously as possible and consistent with all applicable judicial and statutory deadlines. The Department is committed to fulfilling the

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<sup>6</sup> Source: 1975 to 2005 energy use – DOE refrigerator standards rulemaking data developed by Lawrence Berkeley National Laboratory; 2015 projection – EIA's *Annual Energy Outlook 2005*; number of households – Buildings Energy Data Book Table 2.1.1.

President's request, and the Secretary has reinforced the importance of this program through expressing his support in ensuing public statements.

### **Builders Challenge and Home Performance with ENERGY STAR**

The goal of Builders Challenge is to build 220,000 new high-performance homes by 2012. These homes exceed the energy efficiency of ENERGY STAR Homes by approximately 20%. To date, more than 1,000 homes have been qualified as meeting the Builders Challenge and 200 builders have agreed to build to meet the Builders Challenge in the future.

Home Performance with ENERGY STAR (HPwES) focuses on significantly increasing energy efficiency in existing homes. HPwES promotes improvements through home performance contracting, which includes comprehensive whole-house assessments. HPwES is implemented by utilities, state energy offices, and not-for-profits that recruit and train home improvement contractors. Qualified contractors conduct a comprehensive assessment using diagnostic equipment. Based on this assessment, contractors offer a prioritized list of solutions; they then complete the needed renovations or work closely with other participating contractors. Common improvements suggested are sealing air leaks and ductwork, adding insulation, improving the heating-cooling system, and upgrading lighting. To date, more than 50,000 assessments and 15,000 installations have been completed since 2002.

### **Buildings Efficiency and Economic Recovery**

The Department's Building Technologies Program is planning to address research focused on the systems design, integration and control of buildings for both new and existing buildings with Recovery Act funding. This project will move beyond component-only driven research and address the interactions among the many different aspects of buildings, approaching it as a whole, in order to progress development of integrated, high performance buildings. Buildings need to be designed, built, operated, and maintained as an integrated system in order to achieve the greatest potential of energy efficient and eventually net zero-energy buildings. High performance buildings will apply technology to improve the internal built environment through managing energy use, improving comfort, safety and environmental factors through integrating all the various systems of the building.

The Recovery Act places significant focus on buildings and building energy codes.<sup>7</sup> The act provides \$3.2 billion for Energy Efficiency and Conservation Block Grants for such activities as the enforcement of building energy codes; conducting building audits; establishing financial incentives for efficiency; and installing LEDs. It provides \$5 billion for Weatherization assistance and \$3.1 billion for the State Energy Program.

In response to Recovery Act requirements, the overwhelming majority of governors have advised the Secretary that they have take actions to ensure, within the authority of the governor's office, the implementation of the 2009 International Energy Conservation Code or

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<sup>7</sup> See Section 410 of the American Recovery and Reinvestment Act of 2009.

equivalent for residential buildings, and Standard 90.1-2007 for commercial buildings. They have provided similar assurances that the state will implement a plan to achieve 90% compliance with their new codes by 2017. The relevant State Energy Program solicitation has been issued, and comprehensive applications from the states are due May 12, 2009.<sup>8</sup>

DOE is gearing up to provide technical assistance to the States to implement these new codes and to implement, enforce, and evaluate compliance.

The Department is committed to improving energy efficiency through innovative R&D, public outreach, and collaborative partnerships. Improved energy efficiency in buildings generally is a fast, low risk, and economical way to reduce energy consumption and associated environmental emissions, including greenhouse gases. We look forward to working with Congress to continue to realize short-term energy and cost savings, and to contribute to the goal of achieving net-zero energy residential and commercial buildings in the future.

Thank you for the opportunity to appear before you today, and I am happy to answer any questions.

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<sup>8</sup> See <http://www.energycodes.gov/news/arra/>.