

STATEMENT OF
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BEFORE THE

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SUBCOMMITTEE ON ENERGY AND AIR QUALITY
UNITED STATES HOUSE OF REPRESENTATIVES

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Mr. Chairman, members of the Subcommittee, thank you for the opportunity to discuss the potential for increased energy efficiency in new and existing buildings to reduce greenhouse gas (GHG) emissions. Despite today's focus on the cost of time on the road, Americans spend virtually their entire week working, eating, studying, recreating, and sleeping in a residential or commercial building.

The building sector represents 40 percent of the nation's primary energy consumption – 72 percent of electricity and 55 percent of natural gas – exceeding any other sector of the U.S. economy, including transportation and industry.¹ In 2007, GHG emissions from the built environment were 2,317 million metric tons or 39 percent of total U.S. emissions.²

Unlike automobiles whose life is comparatively short, buildings can last for decades. The median lifetime for commercial buildings is 65-80 years. Twenty-five percent of American homes were built before 1950 and overall, almost three-quarters of our nation's 88 million buildings were built before 1979.³ Some were designed and constructed for limited service, and many will eventually require either significant retrofits or replacement. EERE estimates that an additional two million new buildings will be built between now and 2010, depending on economic conditions.⁴ Together, aging buildings and new construction represent a tremendous opportunity to transform how we design, build, and operate buildings in order to decrease energy consumption in the built environment and reduce GHG emissions.

¹ Energy Information Administration. Annual Energy Outlook 2008, March. 2008, Table A2

² Energy Information Administration., Annual Energy Outlook 2008, March 2008, Table A18

³ U.S. Department of Energy buildings data book: <http://buildingsdatabook.eren.doe.gov/docs/2.2.5.pdf>

⁴ EERE estimate based on information in Energy Information Administration Annual Energy Outlook 2008, March 2008, Tables A5 and U.S. Department of Energy buildings data book, Table 2.2.5

Energy efficiency is the quickest, least costly and lowest risk path to achieving sustained reductions of GHG emissions. Efficiency bolsters the nation's economic competitiveness and enhances our security. Significantly, robust and evolving arrays of energy efficient technologies are market-ready today at attractive rates of return with enormous untapped potential. In fact, in a 2007 report, McKinsey Global Institute identified energy savings from *existing* technologies sufficient to cut the growth in global energy consumption by half or more over 15 years.

Increasing the efficiency of new and existing buildings provides the nation with a tremendous opportunity to reduce *both* energy consumption and the GHG emissions, improving the environment and reducing energy costs for citizens and businesses. DOE's estimates of the cumulative avoided greenhouse gases associated with the FY 2009 Building Technologies Program ranges from 330 to 517 MMTCO₂ in the year 2020 and 1611 to 2141 MMTCO₂ in the year 2030, as reported in its official Congressional Budget Request.⁵

Our goal is to promote cost-effective, reliable, market-available policies, practices and technologies that will permanently reduce the trajectory of U.S. energy demand growth and the carbon footprint of the built environment, concurrent with economic growth. Our efforts are focused in six key areas:

1. Model Building Codes
2. Appliance Standards and Lighting

⁵ <http://www.cfo.doe.gov/budget/09budget/Content/Volumes/Volume3a.pdf>

3. Research and Development
4. Civic Infrastructure
5. Public Education and Outreach
6. Utility Efficiency

I will briefly describe our work in these areas, with a focus on the opportunities they afford for reducing GHG emissions in new and existing buildings.

Model Building Codes

In order to provide a solid basis for efficiency improvement in the buildings sector we are working to evaluate and strengthen building energy codes.

Residential. To ensure that all new homes become more energy efficient, DOE has long participated in the development of the International Code Council's (ICC) International Energy Conservation Code (IECC). The ICC, a voluntary, consensus-based industry standards development organization, updates the IECC every three years. The Department's current goal is a residential energy code that is 30 percent more efficient than the 2006 IECC. The ICC is currently considering code proposals that have the potential to improve the residential code by 18 to 22 percent when the next IECC update is published in 2009.

Commercial. In the commercial sector, DOE is also partnering with the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) to develop model building

codes that are 30% more efficient by 2010 for all new commercial buildings compared with 2004 standards. ASHRAE and DOE have signed a Memorandum of Understanding to demonstrate their mutual commitment to work together toward this goal. Additionally, the MOU includes commitment by ASHRAE and DOE to improving the efficient use of energy, promoting viable and widespread use of renewable energy sources, and minimizing the impact of energy use on the environment.⁶

Design Guides. As it is much more cost-effective to realize profound improvements in building performance at the time of construction than to retrofit homes or buildings, we encourage and are helping states to adopt and implement these code changes. We are also expanding assistance available to states and local governments and working with the private sector to develop 30 percent and 50 percent “beyond code” design guides to encourage maximum efficiency in buildings nationwide.

We are working ultimately to enable builders and the construction industry to increase production of net-zero energy buildings – grid-connected buildings that, over the course of a year, produce as much energy as they use – and make it more profitable for them to do so. In February, Secretary Bodman launched the Builders Challenge, a voluntary national energy savings program calling on the U.S. homebuilding industry to build 220,000 high-performance, energy efficient homes by 2012. A high-performance home would use at least 30 percent less energy than a typical new home built to meet criteria of the 2006 International Energy Conservation Code. Homes qualifying will meet a 70 or better on a new EnergySmart Home

⁶ ASHRAE Press Release, <http://www.ashrae.org/pressroom/detail/16399>

Scale, or E-Scale, that will be affixed to the homes allowing buyers to understand at a glance the energy performance of that home.

To date, 185 builders and 99 other partners have already pledged to build an estimated total of 10,000 high-performance homes. Ultimately, DOE aims to see 1.3 million homes of this high standard constructed by 2030. Significantly increasing the energy efficiency of homes is essential to achieving the DOE goal that, by 2020, a consumer will have the opportunity to buy an affordable net-zero energy home. The Builders Challenge establishes a framework for continuous improvement that will help propel the market toward zero-energy performance.

Appliance Standards and Lighting

DOE's second area of focus is ensuring that consumers and businesses have energy efficient choices in energy consuming equipment, appliances and lighting. This can be achieved by making appliance standards more stringent, and by accelerating the market penetration of advanced lighting, equipment and appliances.

I am proud to say we have met 100 percent of our appliance standards targets since we committed to a new schedule for them in January 2006. The Department is currently working on nine standard rulemakings affecting 18 products. By this time next year we will have initiated another four rulemakings, affecting at least 5 additional products. This represents a pace substantially more aggressive than at any prior time in our history.

We have also taken internal measures to improve and accelerate the standards-setting process. In February, we asked the Congress for the authority to streamline the rulemaking process and allow DOE to go to a direct final rule for certain products when a clear consensus for a standard exists among manufacturers, efficiency advocates, the government, and other stakeholders. This process could reduce the time required to reach a completed standard by as much as one-third.

To help accelerate market penetration of advanced appliances, DOE is pursuing the modernization and expansion of ENERGY STAR to accommodate the increasingly rapid flow and evolution of high efficiency technologies like solid state lighting, tankless water heaters, and solar products. ENERGY STAR is a voluntary labeling and recognition program jointly administered by DOE and the Environmental Protection Agency (EPA) that seeks to accelerate the adoption of clean and efficient domestic energy technologies. The ENERGY STAR label helps businesses and consumers easily identify highly-efficient products, homes, and buildings that save energy and money while reducing the pollution from power generation.

For example, earlier this year, DOE announced more stringent criteria for clothes washers and expanded the categories of compact fluorescent lightbulbs (CFL) under the ENERGY STAR® label. Based on first-year projected sales data, approximately 1.9 million ENERGY STAR®-qualified clothes washers will be sold, saving American families up to \$90 million annually on their water and utility bills.⁷ This translates to roughly 0.5 MMT of CO₂ annually. CFL products under the ENERGY STAR® label — which include new categories for CFLs containing less

⁷ DOE/EERE unpublished estimate. The ENERGY STAR program does not claim credit for all of these savings, as many consumers would have purchased energy efficient products in the absence of the ENERGY STAR label. Nevertheless, for ease of calculation, energy and utility cost savings associated with the purchase of any ENERGY STAR-labeled product (compared with a product that has industry-average energy use) is included in this estimate.

mercury, new candelabra products, and more rigorous testing procedures — are expected to save Americans approximately \$30 billion in utility costs over the next five years.⁸

More stringent criteria, combined with a greater diversity of energy-saving product options, will allow Americans to more efficiently use energy in their homes.

In April, the Department announced new ENERGY STAR® criteria for water heaters, the first in the history of the program. Water heating currently represents up to 17 percent of national residential energy consumption, making it the third largest energy user in homes, behind heating and cooling, and kitchen appliances.

Research and Development

We are conducting R&D in energy efficient technologies for advanced solid-state lighting, for net-zero energy buildings and the advanced components needed to achieve net-zero performance, in addition to other building technologies that will be needed to achieve sustained energy reductions. And, we work with industry leaders and stakeholders in coordinated support and investment, not only in R&D, but also in accelerated market deployment of new efficiency technologies.

DOE's Building America program is conducting research through competitively selected industry teams that work directly with leading builders to develop and implement energy-saving construction practices in new residential homes. Current Building America prototype homes are

⁸ *ibid.*

targeting energy savings of 40 percent or more than their predecessors, with an ultimate goal of a 70 percent reduction. When combined with renewable energy technologies now in development, the goal is to achieve net zero energy home performance capability in the five major climate zones in the continental U.S. by 2020. The progress being made in the Building America program is the foundation for the Builder's Challenge already discussed.

In the commercial sector we are focusing our public-private partnership efforts on achieving net-zero energy commercial buildings by 2025. Retail buildings in the United States account for approximately 20% of commercial sector energy consumption and represent the fastest growing subsector, making them an important opportunity for savings. In February 2008 we established the Retailers Energy Alliance with companies such as WalMart, Whole Foods, McDonalds, Home Depot and many more.⁹ To date, 23 companies with over two billion square feet of building space have joined the alliance in order to share best practices, engage equipment manufacturers in discussions of their common needs and to eventually procure the products with the performance they want and need. DOE is working to apply this model to a Commercial Real Estate Alliance and an Institutional Buildings Alliance in the next twelve to eighteen months. We will be reaching out to national accounts to provide research technical assistance to those that want to improve the efficiency of their existing portfolio of buildings by 30 percent while developing new prototypes that save 50 percent or more over current code. Our current and planned activities are consistent with the Energy Independence and Security Act (EISA) Commercial Buildings Initiative provisions – Sections 421 (*Commercial High-Performance*

⁹ As of 7 July 2008, there were 23 members of the Retailer Energy Alliance, as follows: A&P, Applebee's, Arby's, Bealls, Belk, Best Buy, Boston Market, Food Lion, Hardees, The Home Depot, IKEA, JC Penney, John Deere, Kohl's, Lowes, Macy's (Federated), McDonalds, REI, Staples, Supervalu, Target, Wal-Mart and Whole Foods. These companies together represent 2 billion ft² (about 14% of the retail sector floor area), 45,000 stores, and \$786 billion in revenues.

Green Buildings) and Section 422 (*Zero Net Energy Commercial Buildings Initiative*). If the (current) Retailer Alliance Members upgraded one third of their existing buildings by 30% over the standard, then approximately 3 million metric tons of CO₂ would be avoided annually.

As we work with home building and commercial buildings industries we are identifying technology gaps and improvement opportunities at the equipment and component levels. The Department's Solid-State Lighting program earlier this year announced up to \$20.6 million in funding over X years, subject to appropriation, for solid-state lighting research and development. Recent progress includes the cost-shared research DOE conducted with Cree, Inc., a manufacturer of semiconductors that enhance the value of light-emitting diode (LED) solid-state lighting. Cree produced a high powered white light LED that set a new record for brightness and efficacy.¹⁰ This is a great accomplishment as solid state lighting technologies could potentially at least double the efficiency of today's general lighting systems. Based on the rapid progress made in the SSL industry, in part with DOE support, in September 2007 DOE announced ENERGY STAR criteria for 5 niche SSL products which become available on the market on September 30th of this year. DOE has also announced its intention to add more ENERGY STAR SSL products in 2009, sending a signal of expected quality and performance to both consumers and industry.

In addition to lighting efficiency, we are pursuing advancements in heating, ventilation and air conditioning equipment, dynamic and highly insulating window technologies, advanced building shell materials and structures, solar heating and cooling equipment and systems, and energy

¹⁰ <http://buildingsdatabook.eren.doe.gov/docts/5.9.8.pdf>

simulation and analysis software – all aligned to achieving the goal of net-zero energy homes by 2020 and net-zero energy commercial buildings by 2025.

These research and development activities provided the foundation for continuous improvement in our building stock, and the potential to contribute significant energy, cost and carbon savings to the economy.

Public Education and Outreach

The Department is also focusing on broad public education and outreach in order to facilitate widespread market penetration of energy efficient technologies.

Public campaigns, such as the “Change a Light, Change the World” campaign, have been used to drive public awareness. Each fall the Department, in cooperation with the Environmental Protection Agency and the Department of Housing and Urban Development, encourages consumers to change out old incandescent bulbs for new compact fluorescent lamps (CFLs) that have earned the ENERGY STAR® seal of approval. The “Change a Light, Change the World campaign” is now in its seventh year.

In order to further encourage consumer adoption of energy efficient technologies like compact fluorescent lamps, DOE has embarked upon an innovative partnership with the Walt Disney Corporation. DOE announced in 2007 that it has teamed up with Disney in a nationwide campaign to promote energy efficiency through a TV spot based on the Disney Pixar film

"Ratatouille." The 30-second animated spot features the characters from the movie, and urges viewers to make the switch from incandescent bulbs to ENERGY STAR® compact fluorescent lights. The spot, showcased nationwide during primetime viewing hours, reached more than 117 million households between June 15 and August 15, 2007, through networks including HGTV, Food Network, and DIY.

Also, we are working on a campaign to be launched late this summer targeting 8 to 12 years old on they can become learn to become more energy efficient.

Another campaign, launched this past Earth Day, challenges military bases nationwide to replace their incandescent light bulbs with CFLs in on-base housing. The joint DOE and Department of Defense campaign, called "Operation Change Out," will help bases across the country increase energy efficiency, save money on utility bills and reduce carbon dioxide emissions.¹¹ Through these and other campaigns, the Department is committed to motivating policymakers, industry, and consumers to embrace energy efficiency values in their states, cities, and homes.

The Department's Building Technologies Program website is also a helpful educational resource for the public. The site details best practice guidelines for realizing 30 percent energy savings, and is aimed at homeowners, builders, or designers who seek to incorporate energy-efficient building practices into a new or existing home. The guidelines address each step of the home-building process, based on an integrated or whole building, approach. They cover the planning and financing of a home or renovation project, the design and construction phase, and ongoing maintenance. While many best practice guidelines apply regardless of geography, others are

¹¹ <http://www.doe.gov/news/6179.htm>

tailored to the challenges of a specific climate zone, a key consideration in creating an energy-efficient home.

Civic Infrastructure

A fifth area for DOE is our effort to showcase new and retrofitted energy efficient infrastructure throughout our communities. We plan to expand our EnergySmart Schools program, which is focused on reducing K-12 schools' energy consumption, reducing the energy bills for state and local governments, and turning our schools into energy-secure community centers.

Last year, DOE committed up to \$1.5 million in technical assistance to provide 75 comprehensive energy audits in public schools throughout the New Orleans area. In addition to supporting an energy efficient rebuilding in New Orleans and on the Gulf Coast, these comprehensive audits will identify opportunities for New Orleans' public schools to save up to \$1 million annually on utility bills.

High-performance schools also serve as learning incubators on energy efficiency and the associated environmental advantages. Schools are often hubs of local communities – reaching students, parents, teachers, administrators, municipal agents, and service employees – making schools a natural vehicle for transmitting the national priority for energy efficiency and environmental protection. Energy Smart schools can help reduce carbon dioxide emissions contributing to global warming, because energy efficiency helps slow demand for new power generating plants.

As the largest energy consumer in the United States, the federal government also has a tremendous opportunity and a responsibility to lead by example with smart energy management. Executive Order 13423, issued in January 2007, directed all federal agencies to cut their energy consumption by 30% throughout the federal complex. DOE has committed to meet or exceed this mandate through its Transformational Energy Action Management (TEAM) initiative by maximizing the use of Energy Saving Performance Contracts for clean energy technologies, and making the energy efficiency decisions that will make DOE the leading performer and advocate for energy efficiency within the federal sector. Through projects soon to be under contract implemented as a result of recent audits at our largest energy-using sites, we expect to use performance-based contracts to finance over \$400 million in energy improvements that will deliver at least a 20 percent reduction in energy intensity and ensure that new on-site renewable generation accounts for 4 percent of our electricity production. We are meeting major milestones to achieving statutory and Presidential requirements.

Utility Efficiency

The Department is also working with the utility industry to increase opportunities for efficiency investments in homes and commercial buildings. Across the U.S., our current utility ratemaking structure provides incentive for investor-owned utilities to sell more electricity and gas, not less. Encouraging efficiency leads to selling less, which is counter-intuitive to the present business paradigm. So through the policy framework of the National Action Plan for Energy Efficiency, we are working with industry and state and local governments to realign incentives which are fundamentally crucial to making significant progress in the area of energy efficiency.

For example, states play a critical role in providing various types of financial awards for superior performance by their electric and or gas utilities in delivering energy efficiency. Additionally, some states allow a “decoupling” between utility sales and profit or some other form of removing financial disincentives. Still others allow cost recovery of utility efficiency spending.

Utility companies are responding to these state efforts with innovative programs of their own. Many are introducing online calculators, advanced electric meters, in-home displays, remote-control devices that manage or control end-use loads, and innovative pricing plans. Across the country, the combined efforts of state regulators and utility companies are empowering consumers to make their buildings and homes use energy more wisely and efficiently.

The Department has advocated the use of Utility Energy Services Contracts (UESCs), bringing Federal agencies and utilities together to identify, develop, finance, and implement cost-effective energy efficiency, water conservation, and renewable projects at Federal sites. At the Naval Station-Great Lakes north of Chicago more than \$100 million in investments saved more than \$22 million and 1.3 billion Btu annually from electricity, steam, natural gas, fuel oil, and propane.¹²

Conclusion

- Commercial buildings and homes are responsible for more energy-related CO2 emissions than any other end-use sector;

¹² <http://www1.eere.energy.gov/femp/pdfs/annrep05.pdf>

- Most of the nation's projected growth in CO2 emissions through 2030 will be due to increased electric service demands for cooling, lighting, heating and other services;
- Energy efficiency in buildings can be improved by low-cost solutions that avoid CO2 emissions through model codes, appliance standards, and advanced technologies.

In the realm of energy efficiency, DOE is constantly working to enable the private sector to achieve greater savings of energy, electricity consumption, and GHG emissions with each new building constructed and with each step forward in efficient appliances, advanced lighting, and consumer awareness. There are substantial opportunities to increase energy efficiency in our homes and commercial buildings in the United States.

The Department's energy efficiency activities form a comprehensive approach to meeting challenges and taking advantage of the opportunities that the construction and improvement of the built environment affords for reducing energy use and positively affecting the environment.

Thank you again for holding this hearing and for the opportunity to discuss DOE's Research and Development, deployment, and educational efforts to increase energy efficiency and reduce greenhouse gas emissions. This concludes my prepared statement; I would be happy to answer any questions.