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Committee on Commerce, Science and Transportation
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**Hearing on “Improving Energy Efficiency Through Technology and
Communications Innovation”
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Chairman Kerry, Senator Ensign, and Members of the Committee, it is an honor to appear before you today to discuss the role of technology in advancing energy efficiency.

In my capacity as Assistant to the President, Chief Technology Officer, and Associate Director for Technology in the Office of Science and Technology Policy, my mission is to harness the power and potential of technology, data, and innovation to transform the nation's economy and to improve the lives of everyday Americans. The Administration envisions an economy in which jobs are more plentiful, American firms are more competitive, Americans are more safe and secure, and energy use is cleaner and more economical.

In order to achieve our energy and environmental goals, we must fully leverage the commercially attractive energy efficiency opportunities that already exist while accelerating development and deployment of next-generation technologies. While the Nation's energy use per dollar of gross domestic product has been cut in half since 1973 – and about 70 percent of that improvement has come from gains in energy efficiency – much more progress is needed.

Energy supplies are limited, energy demands continue to grow, and global emissions from fossil fuel combustion imperil the planet that we will leave to future generations. That's why the Recovery Act that we passed one year ago commits about \$90 billion to clean energy. A large portion of this funding is being used to modernize the electric grid, to make our homes and businesses more energy efficient, and to double our capacity to

generate renewable electricity. These investments not only contribute to economic recovery; they also lay a new foundation for lasting prosperity.

Broad-based deployment of energy efficiency practices and technologies will yield great benefits to the Nation. According to a recent National Academies report, aggressive efforts in the buildings, transportation, and industrial sectors could enable the United States by 2030 to reduce its energy use by 30 percent – below the level of U.S. energy use in 1990 – while saving money.

To help realize these benefits, the Administration has stepped up its leadership on energy efficiency through high-level policy actions, public-private partnerships, and research initiatives to develop next-generation efficiency technologies. In this context, I am focused on three opportunities to accelerate progress in energy efficiency: smart grid technologies, open data systems that benefit consumers, and research on next-generation buildings.

Smart Grid Technologies

Modernization of the Nation's electric grid is a vital component of the President's comprehensive energy plan. The "smart grid" will help provide consumers with the information, automation, and tools they need to control and optimize energy use. The tools and services enabled by the smart grid will improve the reliability, security, and efficiency of the electric grid. Smart grid technologies can facilitate energy generation from clean energy supplies and enable more effective integration with the electricity delivery system of renewable energy sources, demand response resources, and plug-in electric vehicles.

The Department of Energy (DOE) Smart Grid Investment Grant program, funded by the Recovery Act, is accelerating deployment of smart meters and other components of an advanced electric grid. The National Institute of Standards and Technology (NIST) is leading a public-private effort to develop a core set of smart grid standards. The National Science Foundation supports leading edge research in Smart Grid technology primarily through their Engineering Research Centers Program. An important goal of our efforts

on the smart grid is the widespread availability of energy-saving choices for consumers that will increase reliability, reduce environmental emissions, and foster the growth of renewable energy.

Open Government

In December, OMB Director Peter Orszag published the President's Open Government Directive to hardwire accountability, access, and public participation into government operations, reflecting a set of recommendations that my office culled directly from the American people during the summer of 2009. We are working with the DOE, NIST, and other Federal agencies to apply these principles of openness and incentives for innovation to the arena of the smart grid.

As one step in our efforts to increase the government's participation and collaboration with the public, today we are launching the Smart Grid Forum, a public on-line forum on the future of the smart grid and what it will mean for consumers, including how to encourage innovation in smart grid products and services.

We seek to encourage smart grid solutions that provide all consumers with the information and services they need to efficiently manage their energy consumption, that integrate well with existing or new information and entertainment systems, and that can be widely deployed at low cost. A robust, secure, and flexible architecture based on open standards is needed for information exchange between the home and the smart grid. These systems need to ensure cyber security while enabling broad participation among diverse consumers. Through the Smart Grid Forum, we are inviting the public to provide input on how to achieve these goals most effectively. I encourage everyone to participate.

Buildings Energy Efficiency

In the United States, buildings consume 40 percent of end-use energy and over 70 percent of electricity, while contributing nearly 40 percent of carbon emissions. Energy consumption in the commercial buildings sector alone rose by 70 percent over the 25 year

period ending in 2005 (largely because of the increase in commercial building stock over that time period). U.S. buildings contribute more than 9 percent of world CO2 emissions, more than the total emissions of the United Kingdom, France, and Japan combined. Clearly, buildings are essential to achieving our national energy and environmental goals.

One of our efforts to accelerate technology's role in promoting energy efficiency is to develop net-zero energy buildings, which consume no more energy than they use from renewable sources. We also focus on building designs and technologies that can meet other sustainability objectives, such as using recycled building materials, implementing smart data center designs, reducing water use, or ensuring indoor occupant health and safety.

I currently serve as the co-chair of the National Science and Technology Council (NSTC) Committee on Technology, which includes a Buildings Technology R&D Subcommittee. With sixteen Federal agencies represented, this group promotes the development and deployment of cost-effective net-zero energy building technologies, including sensors, software tools, and advanced heating, ventilation, and air conditioning technologies. The group collaborates with two major DOE initiatives – the Building Systems Innovation Hub and ARPA-E – on these and other research priorities. We are working with public and private stakeholders to integrate these technologies and principles into future building designs, investments, and codes and standards.

We are committed to partnering with local and regional stakeholders to develop and deploy these technologies. On Feb. 12, seven Federal agencies issued a combined Funding Opportunity Announcement of up to \$129.7 million over five years to create a regional research center. This Energy Regional Innovation Cluster (E-RIC), which includes the DOE Building Systems Innovation Hub as an integral component, will develop new building efficiency technologies, work with local partners to implement advanced technologies in area buildings, and promote regional growth. This is our first demonstration of collaboration to pursue economic growth through clusters. By bringing together synergistic Federal programs, we are proactively encouraging collaboration

amongst stakeholders at the regional level to bring the benefits of these technologies to spur new business and job creation, and to align education and workforce training with new business opportunities that may spin out of the E-RIC.

The National Science Foundation (NSF), with support from DOE and EPA, is investing as much as \$20 million in an FY2010 Emerging Frontier and Research Innovation program to understand the fundamental science and engineering needed for next-generation energy and materials technologies for future building systems.

Private-sector innovation, often spurred by public policy and incentives such as the cost-shared R&D grants provided by the DOE's Energy Efficiency and Renewable Energy programs, has led to major strides in energy-efficient and cost-effective technologies for lighting, heating, cooling, refrigeration, computing, and other basic services that drive energy demand in residential buildings and commercial facilities. Hundreds of commercially feasible and demonstrated technologies, some already available and others just beginning to enter the market, could, in total, lead to huge improvements in energy efficiency.

As just one example, public and private collaborations have identified numerous cost-effective opportunities to improve the efficiency of IT data centers, which represent a small but rapidly growing portion of U.S. energy consumption. The Save Energy Now program at the DOE's Office of Energy Efficiency and Renewable Energy is one example of this collaboration, aiming to reduce energy use in U.S. data centers by 10 percent by 2011.

Federal Leadership

The Administration has taken strong action to spur efficiency gains within Federal agencies. The Federal government is the single largest user of energy in the Nation, representing 1.6 percent of U.S. total consumption and costing taxpayers about \$25 billion in FY2007. Of this amount, over \$7 billion was spent on energy to operate the 500,000 buildings that the Federal government currently owns, operates, and leases in the United States.

To ensure that the government leads by example and makes the best use of taxpayer dollars, last October President Obama issued Executive Order 13514 on Federal Sustainability, requiring each agency to establish goals, milestones, and a detailed implementation plan across a range of sustainability metrics. Subsequently, in January, the President announced that the Federal government will reduce its greenhouse gas pollution from non-National security mission critical activities by 28 percent by 2020, yielding a projected \$8 to \$11 billion in cumulative avoided energy costs through 2020. A significant portion of these reductions will be obtained through Federal building efficiency measures and on-site renewable energy. As part of the Executive Order implementation, each agency will be graded on how well it is meeting its performance targets. These annual “scorecards” will be publicly posted online.

Data centers represent an area where there is significant opportunity to achieve energy savings. Over the past decade, we have seen a large increase in the number of Federal data centers. In 1998, there were 432 Federal data centers; today, there are 1,101. This growth has driven increases in the total power requirements and consumption of these facilities. According to DOE, in 2006, data centers accounted for 1.5 percent of all electricity use in the United States, double the corresponding amount in 2000. If current trends continue, future data center energy consumption will grow exponentially, increasing both the costs to the Federal government and challenges to the reliability of electrical supplies.

We have the opportunity to do better with existing technologies. As one example, the U.S Postal Service eliminated over 88 percent of its physical servers – from 895 to 104 – and reduced power consumption by 3.5 million kilowatt hours. When I served as Virginia’s Secretary of Technology, we undertook a similar effort – generating \$12 million annually in savings as the result of a 35-percent reduction in energy use. To ensure that these savings can be achieved across the entire government, the Federal Chief Information Officer, Vivek Kundra, has undertaken a significant data center consolidation effort. Adoption of a cloud computing model – by which I mean, for purposes of today’s discussion, providing useful online services through efficient, shared, and consolidated infrastructure – is a major part of this strategy.

Another area where the Administration is looking to lead by example is in promoting telework. As the recent snow storms in Washington, DC demonstrated, the ability to telework can help keep the government functioning when Federal workers are unable to get to work. Telework is not only important during emergencies but also as a way to reduce energy consumption as employees depend less on modes of transportation powered by fossil fuels. Last year, the White House held an online forum seeking ways for the Federal government to be more energy efficient; telework filled the online suggestion box. Under the leadership of Director John Berry, the Office of Personnel Management will be hosting a forum next month to examine ways for the government to incorporate telework more and to address technology and other challenges to telework.

Innovation Strategy

The Federal government also leads by investing in the building blocks that only the government can provide, setting an open and competitive environment for businesses and individuals to experiment and grow, and by providing extra catalysts to jumpstart innovation in sectors of national importance. In this way, we can harness the inherent ingenuity of the American people and a dynamic private sector to generate innovations.

In September 2009, as part of his Strategy for American Innovation, the President called for a set of “grand challenges” to improve our quality of life and serve as the foundation for the jobs of future. Such challenges could include net-zero energy homes and solar cells as cheap as paint. We intend to fully harness the power and potential of technology and innovation to advance a set of challenges.

Another critical component of innovation in energy efficiency is workforce development. Thus the FY2011 DOE budget includes \$55 million for the RE-ENERGYSE program – or REgaining our ENERGY Science and Engineering Edge – a partnership with the NSF for clean energy education and training. These opportunities include undergraduate and graduate scholarships and fellowships, internships, and post-doctoral opportunities as well as technical training at community colleges, and new K-12 education and outreach efforts.

In conclusion, under President Obama's leadership in calling for a government that works, we are focused on the transformative power of technology and innovation to deliver economic and environmental benefits through improved energy efficiency in buildings and by enabling smarter use of energy by consumers.

I welcome any questions that the Committee may have.