STATEMENT OF

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INTRODUCTION

Mr. Chairman, Ranking Member Kaptur, and Members of the Subcommittee, thank you for the opportunity to testify on our recent accomplishments and on the opportunities and challenges that lie ahead for the Energy Department's Office of Energy Efficiency and Renewable Energy (EERE).

The U.S. Department of Energy (DOE) is pursuing an all-of-the-above approach to developing every source of American energy. EERE leads DOE efforts to help build a strong clean energy economy, a strategy that is aimed at reducing our reliance on foreign oil, saving families and businesses money, creating jobs, and reducing pollution. We support some of America's best innovators and businesses to research, develop, and demonstrate cutting-edge technologies, and work to break down market barriers in our portfolio's three sectors: 1) sustainable transportation (vehicles, biofuels, hydrogen and fuel cells); 2) energy efficiency (energy-saving homes, buildings, and manufacturing); and 3) renewable electricity generation (solar, geothermal, hydrogen and fuel cells, wind and water).

Our nation stands at a critical point in time in terms of the competitive opportunity in clean energy. In 2012, $268 billion was invested globally in clean energy, a 500% increase since 2004; trillions more will be invested in the years ahead. Last year, China pulled ahead of the U.S. in clean energy investment after we gained the investment lead in 2011. We are essentially trading pole position with China as the world begins to accelerate into a decades-long transition to clean energy. In that transition, the United States faces a stark choice: the clean energy technologies of today and tomorrow can be invented and manufactured in America, or we can surrender global leadership and import these technologies from other countries. We can continue wasting hundreds of billions of dollars in unnecessary energy costs – money that we could be reinvesting into our economy – or we can strengthen our productivity and competitiveness by investing in more efficient homes, buildings, and factories and a more flexible and integrated electrical grid that supports greater use of cost-effective clean energy technologies.

The United States has world-class innovation capacity, a unique culture of entrepreneurship, well-developed capital markets, and the finest scientists, engineers, and workers in the world. We have everything it takes to outpace our competitors in clean energy. However, despite this tremendous opportunity, the U.S. energy industry is systematically underinvesting in R&D (0.3% of sales versus 12% in aerospace/defense and 20% in pharmaceuticals, according to one

estimate).[1] The significant underinvestment in energy R&D by the private sector – in spite of the highly strategic importance of energy to American economic growth, energy security, and the environment – makes government support for applied clean energy RD&D critical for our national success.

Today, the technological improvements that EERE, with Congress's support, has helped develop through investments in American innovation over the last four decades, show a clear path to cost competitiveness with conventional forms of energy for a widening array of renewable energy and energy efficiency products both in terms of price and performance, bringing these technologies to the brink of widespread market adoption. Now is the time to stay the course on our recent progress in these areas. Clean energy technologies are real, they are working, and with smart, targeted investments and effective public-private partnerships, they provide us an opportunity to win one of the most important economic races of the 21st century.

EERE'S RETURN ON INVESTMENT

In order to make a significant impact in transforming large existing global energy markets and to maximize the value it delivers to the taxpayer, EERE must invest only in the highest-impact activities in order to achieve our clean energy goals. Evaluations using best-practice, peer-reviewed methods are key to both understanding the returns on past investments and making continuous improvements in EERE's investment strategy. Using well-established methodologies, we have evaluated key elements of our portfolio of EERE activities in energy efficiency, solar, and vehicles investments to date; these activities have clearly produced a significant positive return on investment in the form of economic and environmental benefits. EERE is proud of this record of driving and accelerating innovative clean energy technologies to commercial success. In the near term, EERE is expanding this effort to perform return on investment analyses for all applicable program areas. These studies have, and will, document the value of EERE investments to the taxpayer and provide important feedback to EERE leadership to help identify the most effective investment approaches and allow continual improvement going forward.

Examples of our analyses to date are included below:

- EERE generated $70.2 billion (2008 dollars) in total benefits from vehicles combustion engine R&D due to fuel savings for users of heavy-duty diesel trucks and associated, monetized health benefits, based on $931 million invested from 1986 to 2007.[2]

[1] American Energy Innovation Council, *Business Plan for America's Energy Future,* 2010.

[2] Valued in inflation adjusted 2008 dollars; "Retrospective Benefit-Cost Evaluation of U.S. DOE Vehicle Combustion Engine R&D Investments: Impacts of a Cluster of Energy Technologies," U.S. DOE, May 2010. The investment of $931M includes some funds from the Office of Science.

- EERE generated $18.7 billion (2008 dollars) in total benefits from solar photovoltaic R&D due to module efficiency and reliability improvements, based on $3.7 billion invested from 1975 to 2008.[3]

- A 2001 National Academy of Sciences analysis found that in its first two decades of existence DOE generated approximately $40.4 billion (2008 dollars) in total benefits from energy efficiency R&D, based on $2.1 billion invested from 1978 to 2000.[4]

EERE'S SECTOR-LEVEL PROGRAMS AND ACCOMPLISHMENTS

EERE's strategic investments in clean energy technologies complement those of the private sector. The EERE portfolio consists primarily of competitively selected projects with the largest potential to help achieve national economic, strategic, environmental, and energy goals. It balances investments in higher-risk, early-stage research and development with public-private partnerships that accelerate the transfer of innovations into the marketplace.

Sustainable Transportation

Through our Vehicle, Bioenergy, and Fuel Cell Technologies Offices, EERE advances the development of next-generation technologies to improve plug-in electric and other alternative-fuel vehicles, advanced combustion engine and vehicle efficiency, and the production of low-carbon domestic transportation fuels.

- **Vehicles:** Develops and accelerates deployment of efficient and environmentally friendly highway transportation technologies that will enable America to use less petroleum and lower greenhouse gas emissions from the transportation sector without sacrificing vehicle performance. Activities focus on a mix of near- and long-term technologies for a broad range of vehicle technologies including advanced batteries, power electronics and electric motors, next generation lightweight materials and propulsion materials, advanced combustion engines, advanced fuels and lubricants, and vehicle systems and enabling technologies. The Workplace Charging Challenge – part of DOE's EV Everywhere Grand Challenge – is one of the newest activities in this portfolio, and aims to expand access to charging stations in many U.S. communities.

[3] Valued in inflation adjusted 2008 dollars; "Retrospective Benefit-Cost Evaluation of DOE Investment in Photovoltaic Energy Systems," U.S. DOE, August 2010. Economic benefits were quantified by comparing actual technological progress to counterfactual scenarios under which DOE technical expertise, technology infrastructure, and financial support were not available and PV module companies pursued their technology R&D strategies without DOE support. These counterfactual scenarios were primarily informed by interviews with academic and industry experts.

[4] Valued originally in inflation adjusted 1999 dollars, further inflation-adjusted to 2008 dollars; "Energy Research at DOE: Was It Worth It? Energy Efficiency and Fossil Energy Research 1978 to 2000," National Research Council, 2001

- **Fuel Cells:** Aims to improve the durability of fuel cells, reduce costs, and improve the performance of hydrogen production (from renewable resources), delivery, and storage technologies to enable the widespread commercialization of an alternative energy system to power cars, trucks, and provide for stationary power.
- **Bioenergy:** Enables activities that overcome challenges across the bioenergy supply chain, from the development of sustainable and economically-viable biomass feedstock logistics systems to the conversion of biomass into end uses such as cellulosic ethanol, drop-in hydrocarbon fuels, and bio-products to replace "the whole barrel" of petroleum.

Sustainable Transportation Accomplishments

EERE-supported technological achievements are helping to transform the U.S. transportation sector, saving U.S. families and businesses money by reducing fuel costs and providing them with a range of fuel choices. Our accomplishments in sustainable transportation include the following:

- **Most hybrid electric vehicles sold in the United States today use EERE-developed battery technology**.[5] EERE's efforts to improve nickel-metal hydride (NiMH) batteries resulted in fuel efficiency improvements of up to 50 percent compared to similar non-hybrid vehicles. Additionally, EERE-supported R&D helped discover and optimize new technologies for lithium-ion batteries that reduce battery size and weight compared to NiMH technology by 25-35 percent.
- **Improved cost-competitive battery technologies for electric vehicles.** EERE research efforts contributed to the achievement of a greater than 50 percent cost reduction for automotive lithium-ion batteries between 2008 and 2012.[6] EERE has helped reduce the modeled high volume production cost of high-energy, high-power batteries from $1,200/kWh in 2008 to $500/kWh in 2012, with a goal of reaching $300/kWh by 2014 and $125/kWh by 2022—which if achieved will make a wide range of plug-in hybrid and all-electric vehicles directly cost-competitive with conventional vehicles over the next 5-10 years. Let me provide one example of a recent success that is significantly contributing toward these goals:
    - A battery startup based in Newark, CA, has become a world leader in the race to commercialize new high energy lithium-ion batteries that promise better performing electric vehicles that cost much less. This company's innovative battery cells use a breakthrough mixed-metal cathode material invented at DOE's Argonne National

[5] "Linkages of DOE's Energy Storage R&D to Batteries and Ultracapacitors for Hybrid, Plug-in Hybrid and Electric Vehicles." U.S. DOE, February 2008

[6] Based on projection to high volume manufacturing of battery prototypes that meet or exceed performance requirements using a peer reviewed cost model, and on proprietary data submitted by battery companies participating in the U.S. Advanced Battery Consortium

Laboratory and developed through a decade of sustained EERE support.[7] A major U.S. vehicle manufacturer subsequently has found this battery technology using the cathode so promising that it has invested $7 million in the company. With the help of a 2009 ARPA-e award, the Newark startup is also developing and incorporating a silicon-based anode designed to further boost driving range, lower production costs, and improve safety. Through the U.S. Advanced Battery Consortium—a cooperative agreement between DOE and automakers—and an individual cost-share partnership with EERE, this company continues to optimize this cathode technology. In February 2012, the company announced it had achieved a breakthrough that would enable twice the battery energy density of current lithium-ion batteries and, as a result, has the potential to reduce their cost by more than half.

- **Reduced fuel costs for heavy-duty trucks to help U.S. businesses save money.** EERE's SuperTruck initiative aims to develop technologies to improve the fuel economy (freight hauling efficiency) of heavy-duty, class 8 vehicles by 50 percent by 2015 with respect to a comparable 2009 vehicle. The SuperTruck Initiative has made significant progress in the areas of engine efficiency and emission control, advanced transmissions and hybridization, aerodynamic drag of the tractor and trailer, tire rolling resistance, light-weight materials, and Auxiliary Power Units to reduce engine idling and has already achieved a 20 percent engine efficiency improvement in the laboratory. The SuperTruck Initiative is on track and expects to exceed its 50% freight efficiency improvement goal.

- **Decreased the dependence on oil for transportation in many local communities.** Since 1993, the EERE-supported Clean Cities Program has grown to a national network of nearly one hundred local coalitions, which have collectively displaced more than 4.5 billion gallons of gasoline.[8] These coalitions have helped deploy thousands of alternative fuel vehicles and the fueling stations needed to serve them, aided in the elimination of millions of hours of vehicle idling, and helped accelerate the entry of electric-drive vehicles into the marketplace.

- **Achieved significant reductions in the cost of fuel cells and hydrogen technologies.** EERE has achieved a more than five-fold reduction in the platinum content in fuel cells since 2005,[9] which has led to substantial cost reductions—enabling a more than 35% reduction in modeled high-volume automotive fuel cell cost since 2008, and a more than 80% reduction since 2002.[10] Additional reductions of about 35%, in addition to the achievement of scaled up manufacturing volumes, will be required to achieve cost-parity with internal combustion engines. EERE has

[7] Argonne National Laboratory http://www.anl.gov/articles/argonne-envia-strike-deal-license-advanced-battery-technology
[8] As reported by program partners and based on measured and estimated impacts. http://www1.eere.energy.gov/cleancities/accomplishments.html
[9] DOE Hydrogen and Fuel Cells Program Record # 9018, http://hydrogen.energy.gov/pdfs/9018_platinum_group.pdf
[10] Based on projections to high-volume manufacturing; DOE Hydrogen and Fuel Cells Program Record #12020, http://hydrogen.energy.gov/pdfs/12020_fuel_cell_system_cost_2012.pdf.

also dramatically reduced the costs of technologies for producing and delivering hydrogen—including a >80% reduction in the cost of electrolyzer stacks. Currently, hydrogen production from natural gas is projected at high volume to be cost-competitive with gasoline, and the costs of producing hydrogen from several renewable pathways range from approximately $4 to $10 per gallon gasoline equivalent (gge).[11] EERE will explore pathways to reduce the cost of renewable hydrogen production, delivery, and storage, which will need to come down to $2-4/gge to achieve cost parity with gasoline in other advanced vehicles.

- **Spurred commercialization of fuel cells in key early markets.** EERE-funded R&D in fuel cells and hydrogen has led to the development of more than 360 patents, 35 commercial technologies, and more than 65 technologies that are projected to be commercialized within 3 years. In addition, strategic cost-shared deployments of 700 fuel cell forklifts and about 700 fuel cell backup power units have successfully catalyzed the growth of these early markets, leading to additional purchases of more than 5,000 additional fuel cells, with no additional DOE funding.[12] By accelerating early adoption, we are enabling the growth of a domestic manufacturing base, prompting additional private-sector investment, and helping drive down costs through economies of scale.

- **Supported first-of-a kind integrated biorefineries across the United States**. Through public-private partnerships, EERE has also established, with our industry partners, a network of pioneering biorefineries making cellulosic ethanol, drop in biofuels, and other products at different production demonstration scales. These facilities are validating the costs and significantly reducing the technical and financial risks associated with developing and producing advanced biofuels. After decades of pioneering technological achievements and support from EERE, we expect the first commercial cellulosic ethanol biorefinery in U.S. history to fully come online this year. It will transform municipal solid waste and yard waste into renewable biofuels and clean energy, while commercial cellulosic biorefineries built by two other companies are expected to be online shortly thereafter in 2014. Together, these three facilities will have the capacity to produce more than 50 million gallons of renewable fuels annually.[13]

- **Reached cellulosic ethanol production cost-competitiveness and continuing RD&D portfolio shift to "drop in" hydrocarbon biofuels.** In 2001, our modeling efforts determined that the production cost of a single gallon of cellulosic ethanol would be more than $9.00, if technologies actually existed to do so. After 10 years of dedicated EERE investment, breakthroughs across the biomass supply chain have helped reduce the cost of cellulosic ethanol by more than 75%, and in

[11] DOE Hydrogen and Fuel Cells Program Record # 12002, http://hydrogen.energy.gov/pdfs/12002_h2_prod_status_cost_plots.pdf.
[12] DOE Hydrogen and Fuel Cells Program Records #12013 and #11017, http://hydrogen.energy.gov/program_records.html.
[13] Planned production at each company: 8 million gallons/year, 20 million gallons/year, and 25 million gallons/year

2012, EERE-supported research reached a major milestone – achieving a modeled production cost of $2.15 per gallon of cellulosic ethanol. In addition, improved processing and conversion technologies of biomass resources have reduced the delivered cost in certain biomass feedstock scenarios from $60 per dry ton in 2005 to $35 per dry ton.[14] This year, we continue to further shift our RD&D focus to the next major opportunity in biofuels – non-food cellulosic "drop-in" hydrocarbon biofuels that can directly power our vehicles and aircraft and are compatible with our existing petroleum-based infrastructure.

Renewable Electricity Generation

Through our Solar, Wind and Water Power, and Geothermal Technologies Offices, EERE plays a key role in developing innovative technologies that will make clean, renewable electricity generation cost-competitive with traditional sources of energy, enabling the U.S. to diversify its energy portfolio and better protect our environment and respond to the threat of climate change. In early 2012, through recent U.S. government efforts using EERE-supported technologies, the U.S. met a key national goal when renewable energy generation from wind, solar, and geothermal doubled since late 2008; the cost of these technologies is declining rapidly.

- **Solar:** Drives research and manufacturing innovation, and breaks down market barriers, through DOE's SunShot Initiative to help make solar energy cost-competitive with other forms of electricity by the end of the decade.
- **Wind and Water Power:** Leads and partners on the development of technologies that improve the reliability and affordability of land-based and offshore wind energy systems; and accelerates technology development for cost-effective and environmentally responsible renewable power generation from water.
- **Geothermal:** Supports research, development, and demonstration projects to improve the discovery of new geothermal resources and develop innovative methods of accessing those resources for cost-effective base-load (24-hour) renewable electricity production.

Renewable Electricity Accomplishments

By investing in renewable electricity technologies, EERE is driving lower costs and introducing better performing technologies to provide clean, renewable electricity for homes and businesses across the country. Our accomplishments in the renewable electricity generation sector include the following:

[14] "Feedstock Supply R&D". 2011. Biomass Multi-Year Program Plan. Available at: http://www1.eere.energy.gov/biomass/pdfs/mypp_april_2011.pdf

- **Accelerated the solar industry's technological progress by an estimated 12 years.** EERE's research and development efforts are helping to drive down the costs of solar power. Without EERE involvement, the average solar photovoltaic (PV) module production cost per watt would have been $5.27 in 2008, rather than $1.92, based on a retrospective benefit-cost evaluation that included a counterfactual assessment.[15] Today, PV modules are sold for less than $1/W.

- **Enabled a multitude of innovative solar start-ups.** In addition, since 2007, our SunShot Initiative's Incubator program has successfully leveraged $92 million in EERE funding to enable innovative start-up companies to subsequently secure more than $1.7 billion in follow-on private capital.

- **Enables US leadership in solar R&D innovations**. EERE-supported solar PV research has resulted in more than half of the solar cell world records over the past 35 years. A recent study found that 30% of the solar patents around the world are linked to foundational DOE-attributed patents.[16]

- **Accelerated the wind industry's technological progress by an estimated 6 years.** Without EERE involvement, the overall the reliability, commercial risk, and cost of wind energy would be 6 years behind where it is now, at a loss of over two-thirds of cumulative wind power deployed through 2008, based on a retrospective benefit-cost evaluation that included a counterfactual assessment.[17] In 2012, wind energy added nearly half of all new power capacity in America – even more than new natural gas power capacity.[18]
- **Drove improvements in wind components, and continues to showcase technology innovation to increase viability and reliability of wind.** Through research, development, and demonstration, EERE and its partners have achieved significant improvements in key wind turbine components, particularly composite-related structures. Through innovation, supporting policies, and a robust U.S. wind market, U.S. manufacturing captured more than 70 percent of the domestic wind energy market in 2012, up from around 35 percent in 2005. The U.S. is home to over 400 manufacturing companies, across more than 40 states, in the wind energy supply chain.

[15] "Retrospective Benefit -Cost Evaluation of DOE Investment in Photovoltaic Energy Systems," U.S. DOE, August 2010
[16] "Linkages from DOE's Solar PV R&D to Commercial Power from Solar Energy," U.S. DOE, April 2011.
[17] "Retrospective Benefit-Cost Evaluation of U.S. DOE Wind Energy R&D Program," U.S. DOE, June 2010
[18] Federal Energy Regulatory Commission's December 2012 report. Available at: http://www.ferc.gov/legal/staff-reports/dec-2012-energy-infrastructure.pdf

- **Demonstrated successful co-production of strategic minerals from geothermal brines.** To improve the cost-effectiveness of geothermal development, EERE is advancing mineral extraction technologies to remove valuable minerals from geothermal brines during the power production process – an additional revenue source that lowers the cost of development. Based on extraction technology originally developed at Lawrence Livermore National Laboratory, EERE funded the first demonstration facility to co-produce lithium, manganese, and zinc from geothermal brines, in the Salton Sea area of California. The estimated lithium production alone from their plants could be enough for batteries to power 300,000 to 600,000 electric vehicles per year and make the U.S. a major lithium producer.
- **Demonstrated recent progress in Enhanced Geothermal Systems (EGS).** Enhanced Geothermal Systems are manmade geothermal systems, created where there is hot rock but little to no natural permeability or fluid saturation; hydrothermal systems, by contrast, are naturally occurring geothermal systems. EGS signifies a significant long-term opportunity for widespread geothermal power production beyond just hydrothermal-rich regions of the United States, and successful development and deployment could facilitate access to a resource estimated to be on the order of 100-500+ GWe (USGS, 2008)[19]. Recent successes in three EGS projects include a project in Northern CA – demonstrating potential to produce 5 MW; a project in Bend, OR, demonstrating reservoir stimulation and preliminary results of further reservoir creation from a single well where none existed before – a first-of-its-kind achievement; and a project in Western NV, demonstrating fluid injection and stimulation to within the magnitude of a commercial well, as well as dramatically increased flow rate. These achievements represent steady progress in our efforts to optimize and validate EGS development in the United States, and ultimately establish the parameters under which EGS can be commercially successful.
- **Supported the development and deployment of the first U.S. commercial tidal energy system.** Tidal energy is a resource that can be harnessed wherever changing tides move a significant volume of water – including off the coasts of many U.S. cities where there is high electricity demand. To illustrate one recent success that garnered national media coverage:
    - The first ever grid-connected tidal power project in the United States is now delivering electricity to the utility grid from an underwater power system in Cobscook Bay, Maine. The device is designed to operate in shallow tidal or deep river sites at depths of 50 to 100 feet, and has a peak output of 180 kilowatts – enough electricity to power 25 to 30 homes annually. Two additional devices will be installed at the Cobscook Bay Project site in the fall of 2013, and together, the three-device power system will generate enough energy to power

[19] A Technology Roadmap for Strategic Development of Enhanced Geothermal Systems , February 2013 Available at: https://pangea.stanford.edu/ERE/db/GeoConf/papers/SGW/2013/Ziagos.pdf

75 to 100 homes. The devices connect directly to an onshore substation through a single underwater transmission line.

- **Upgraded and expanded U.S. clean hydropower capacity**. Through American Recovery and Reinvestment Act investments, EERE has supported capacity and efficiency upgrades of 7 U.S. hydropower facilities by funding low-cost, high-impact upgrades to existing clean energy infrastructure and by applying modern energy generating technologies to sustainably harness water for clean, renewable power generation. As of 2012, three of these projects have been completed and the remaining four will be placed in service by 2014. In total, these retrofits are expected to add more than 131,000 MWh of sustainable annual generation of electricity – enough to power about 11,400 homes.

Energy-Saving Homes, Buildings, and Manufacturing

Through its Building Technologies, Advanced Manufacturing, Weatherization and Intergovernmental Programs, and Federal Energy Management Program Offices, EERE is continually developing innovative, cost-effective energy-saving solutions to improve the energy efficiency of U.S. plants, manufacturing processes, products, homes, and buildings in which we reside, work, and shop.

- **Advanced Manufacturing:** EERE invests in high-impact cross-cutting manufacturing innovation and efficient energy-intensive process technologies to reduce energy costs for U.S. manufacturing and improve U.S. competitiveness.
- **Buildings:** EERE supports research, development, and demonstration of advanced building efficiency technologies and practices to make U.S. homes and buildings more efficient, affordable, and comfortable.
- **Weatherization and Intergovernmental:** EERE works with State, local, U.S. territory, and tribal governments to advance energy-efficient home retrofits through State-managed networks of local weatherization providers; provides States technical and financial resources to help them achieve their own energy efficiency and renewable energy goals; and supports feasibility assessments and the development of implementation plans for clean energy projects on Tribal lands.
- **Federal Energy Management:** EERE assists the Federal government in leading by example through its Federal Energy Management Program, which provides interagency coordination, technical expertise, training, financing resources, and performance contracting support for Federal agencies to help the Federal Government meet its own goals for cutting energy use.

Energy Efficiency Accomplishments

By investing in technology innovation that increases energy productivity, EERE helps U.S. consumers and businesses save money and improve their global competitiveness. Accomplishments in the energy efficiency sector include the following:

- **EERE-enacted new standards to improve the energy efficiency of household appliances.** EERE appliance standards save households money on their utility bills, as these households replace their existing appliances with newer models that use less energy. As a result of the standards implemented from 1987 through 2011, energy users were estimated to have saved approximately $40 billion dollars on their utility bills in 2010.[20] Since 2009, 16 new or updated standards covering more than 30 products have been issued, which will help increase annual savings even further over the coming years. Cumulative consumer utility bill savings associated with these recently enacted standards are projected to be $180 billion (undiscounted) through 2030.[21] Federal energy efficiency standards reduce the regulatory burden on appliance and equipment manufacturers by pre-empting a potential patchwork of state standards with a single Federal standard; this regulatory streamlining enhances industry competitiveness. EERE actively encourages manufacturer and other stakeholder participation and interaction at all stages energy conservation standards development and implementation.
- **Reduced costs for high performance windows.** EERE investment in low emission (low-e) coatings for windows has played an important role in developing cost-effective windows that are three times more efficient than those from the 1970s. First introduced to the market in 1983, windows with low-e coatings now account for nearly 75 percent of home windows sold.
- **Cut costs for U.S. homes and businesses to power, heat, and cool their buildings.** EERE investments have resulted in energy savings in both residential and commercial buildings. In collaboration with EPA through the Home Performance with ENERGY STAR Program EERE has partnered with state governments, local governments, utilities, and non-profit organizations since 2002 to encourage homeowners to perform building science-based energy upgrades to their homes resulting in average energy savings of 20-30%. To date, more than 300,000 retrofits have been completed – saving owners 15% to 30% annually on their energy bills.
- **Increased U.S. manufacturing competitiveness.** Since 1979 EERE and its partners have successfully developed 220 new, energy-efficient manufacturing technologies, received 78

[20] Savings generated from the analysis for each rule promulgated through 2011. For further information see: http://ees.ead.lbl.gov/bibliography/energy_and_economic_impacts_of_u_s_federal_energy_and_water_conservation_standards_adopted_from_1987_through_2011.

[21] Savings generated from the analysis for each rule promulgated since January 20, 2009. For a complete list of products with standards, please see: http://www1.eere.energy.gov/buildings/appliance_standards/standards_test_procedures.html.

R&D 100 Awards, and delivered technical assistance to more than 33,000 industrial plants. Collectively, these activities have saved billions of dollars and cut carbon emissions by millions of tons, which will continue to grow. Regarding energy-efficient manufacturing technology development, recent EERE successes include the following:

- A steelmaker partnered with EERE to reduce four energy-intensive iron plant process steps— coke making, sintering, power plants, and blast furnaces—into a one-step breakthrough iron manufacturing process that saves time, eliminates the need for carbon-intensive coke, and consumes 30% less energy than a conventional blast furnace.
- A company used EERE support to take previously fragile and expensive super-insulation based upon extremely porous materials called aerogels and pioneered the commercial-scale production of flexible industrial insulation for piping, tanks, and other equipment that is twice as thin as and up to five times more thermally efficient than the current standard. The company has sold millions of square feet of this insulation, saving U.S. manufacturers money on energy costs while improving competitiveness.

- **Scaling up combined heat and power** by supporting manufacturers' R&D investments in reciprocating engines in combined heat and power (CHP) facilities. Since 1970, as CHP use has increased by nearly a factor of six, EERE has also helped manufacturing facilities owners to nearly double the collective combined efficiency of their heat production and electricity generation through the installation of CHP. For example, EERE's network of Clean Energy Application Centers has supported more than 225 energy assessments, and provided over 700 technical support activities on CHP projects, supporting over 1.5 GW of CHP capacity installed or under development in the United States.
- **Provided funds to states to weatherize more than 1,000,000 homes.** Since 2009, the Weatherization Assistance Program has improved the energy performance and comfort in the homes of over 1,000,000 American low-income families across the nation, saving these families hundreds of dollars on their heating and cooling bills each year.
- **Saved taxpayers money by cutting the Federal Government's energy use**. From FY 2005 to FY 2011 EERE has facilitated $3.1 billion of efficiency investments in federal government facilities from performance-based contracts, which will result in energy cost savings of approximately $8.5 billion over the life of the energy-saving measures. The savings on utility bills and operation and maintenance created through the facility upgrades will be used to pay the private contractor for the project over the term of the contract, and in most cases, the agencies continue to save money and energy after the contract term ends.

MANUFACTURING COMPETITIVENESS

I'm constrained by time and the focus of this hearing from discussing in detail with you today some of the key cross cutting thrusts that EERE is pursuing which leverage and align the efforts of our individual technology offices.

But I do want to note one such thrust – an EERE-wide effort we are undertaking to increase American competitiveness in clean energy manufacturing.

Through this effort, we are beginning an in-depth analysis of the international supply chain for all of the clean energy technologies EERE invests in to inform the development of more comprehensive competitiveness strategies and technology development roadmaps. This analysis will ensure that EERE's innovation investment strategy aligns well with U.S. competitive advantages to increase the probability that EERE technology investments will result in U.S. manufacturing activity.

Furthermore, the President has proposed to create a network of up to 15 Manufacturing Innovation Institutes across the country through the National Network for Manufacturing Innovation (NNMI). This network would serve to create an effective manufacturing research infrastructure for U.S. industry and academia to solve industry-relevant problems. As sustainable, manufacturing innovation hubs, Institutes will create, showcase, and deploy new capabilities, new products, and new processes that can impact large-scale commercial production. To make progress right away, the President announced in his State of the Union address a plan to launch three new Institutes using existing resources. Under this plan, EERE expects to launch a Clean Energy Manufacturing Innovation Institute as part of a multi-agency effort that includes the Departments of Defense and Commerce, the National Science Foundation, and the National Aeronautics and Space Administration. This Institute will focus on manufacturing technologies that address critical energy needs and will be selected through an open and competitive process.

These, and all other manufacturing related activities, are being coordinated across EERE to ensure operational efficiency, and to leverage and replicate best practices and successful models. We recognize, as does this Committee, the many benefits of U.S. based manufacturing, including job creation and other economic multiplier effects, high-tech intellectual property generation, and private sector support of research and development. We want to ensure that our efforts at EERE are laser-focused on supporting and scaling up this critical sector.

EFFECTS OF SEQUESTRATION

I have been asked to address the impacts of the sequestration on EERE program activities. The negative impacts of the sequestration, if combined with another Continuing Resolution based on FY 2012 levels, will be acutely felt by EERE's Weatherization Assistance Program (WAP) in the Weatherization and Intergovernmental Programs Office. States, the District of Columbia, U.S. territories, and Native American tribes will suffer from receiving less Weatherization assistance funds that enable low-income families in need to reduce their energy bills by making their homes more energy efficient. We estimate this reduction in funding, when compared to the Administration's FY 2013 Budget Request, will mean the following:

- Thousands fewer homes will be weatherized, with eligible low-income families losing potential energy savings.
- A potential loss of full-time employment for a large number of skilled weatherization retrofit professionals, which could also lead to the deterioration of States' abilities to deliver these upgrades.
- The potentially complete elimination by grantees of some of their sub-grantee network members.
- The potential closing of a number of training programs with concurrent loss of professional retrofit certification capability.

This Program was appropriated a low FY 2012 funding level, as we had residual American Recovery and Reinvestment Act (ARRA) funding still available to supplement new appropriations. Now, however, the remaining ARRA funds that were previously available in many states in FY 2012 have been expended – leaving limited ability to absorb reductions without cutting into core programmatic goals.

Furthermore, sequestration will not allow us to ramp up funding for important clean energy manufacturing activities as planned. Our advanced manufacturing activities with industry partners aim to accelerate technologies and practices that best enable U.S. manufacturers to succeed in global markets; a reduction in funding will delay DOE's efforts to bring together industry, small businesses, and universities to invest in emerging technologies that will create manufacturing jobs and boost our global competitiveness at a juncture when other countries, such as China, are investing at an greatly increased pace.

ORGANIZATIONAL REFORMS

Winning the clean energy race requires smart investments and smart policies. It also requires smart organizations.

In order to be the most effective, transparent organization we can be, and one that maximizes impact on the energy landscape and provides the highest possible return on investment to the American taxpayer, EERE is implementing some small, but important, organizational reforms. Fundamentally, these reforms are intended to ensure that EERE consistently practices good government by being flat, organizationally uniform, transparent, and effective in order to serve our mission of creating American leadership in the transition to a global clean energy economy. These reforms take what we consider to be the best of organizational innovations made by other organizations that are widely respected and considered best practices. The essence of what we are doing can be summarized as two thrusts:

- First, we are better organizing ourselves around energy sectors, while maintaining our focus on individual technologies, to improve our coordination and impact. We will do this by adding a new Deputy Assistant Secretary for Transportation, in addition to the existing Deputy Assistant Secretaries for Energy Efficiency and for Renewable Power Technologies. This approach elevates and responds directly to the urgency of reducing our oil dependence in the transportation sector, while building on our current executive expertise and maintaining our current budget structure.

- Second, in order to perform best practice active project management, including creation and enforcement of rigorous "Go-No Go" milestones in our agreements, performance of regular in-depth project site visits/reviews, and termination of under-performing projects, we are simplifying our organizational structure to better achieve program success by creating more uniform roles and responsibilities with clear accountability for active project management within our programs.

I want to be clear about this. I believe we have a fundamental commitment to you and to American taxpayers – particularly in these tough fiscal times – to invest the funds you appropriate to us in the most efficient and impactful way possible. Our organizational changes will allow us to better fulfill that commitment.

I should also emphasize that, based on this Committee's request, EERE has been shifting to forward funding of multi-year commitments wherever possible so that we are minimizing the exposure of taxpayers to future mortgages in situations where the funding has yet to be appropriated and

allowing EERE to be highly responsive to any changing conditions or opportunities that emerge in the clean energy landscape.

CLOSING

In conclusion, let me reiterate the key points that I want to leave you with today. At EERE, we recognize the enormous opportunity that clean energy represents for the United States. Working in partnership with the private sector, we are optimistic that we can create and sustain American leadership in the global transition to clean energy, and in so doing grow high paying jobs and strong market share for our workers and businesses. We stand behind EERE's track record of accomplishments and our efforts to make our organization even more effective and accountable to you and to the American taxpayer as we pursue our mission. We are privileged to play this role and to work with this Committee to help ensure that the United States wins the global clean energy race.