

**Statement of Steven Chu
Secretary, U.S. Department of Energy
Before the
Senate Committee on Appropriations
Subcommittee on Energy and Water Development, and Related Agencies

FY 2010 Appropriations Hearing
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Chairman Dorgan, Ranking Member Bennett, members of the Committee, I am pleased to be before you today to present President Obama's fiscal year 2010 budget request for the Department of Energy.

The President's 2010 Budget seeks to usher in a new era of responsibility – an era in which we invest to create new jobs and lift our economy out of recession, while laying a new foundation for our long-term growth and prosperity.

The FY 2010 budget request of \$26.4 billion provides the next critical investment in a multi-year effort to address the interconnected challenges of economic uncertainty, U.S. dependence on oil, and the threat of a changing climate by transforming the way our nation produces and consumes energy. Meeting these challenges will require both swift action in the near-term and a sustained commitment for the long term to build a new economy powered by clean, reliable, affordable and secure energy. We will also train the next generation of a technical workforce and the scientific researchers needed to maintain the United States' preeminent position in science and technology. At its core, this budget request emphasizes science, discovery, and innovation to support the key missions of the Department.

I want to note at the outset that in developing the FY 2010 request the Department considered that the \$38.7 billion of American Recovery and Reinvestment Act of 2009 (Recovery Act) funding received by the Department allows for the acceleration of a number of important commitments. The Recovery Act makes investments in energy conservation and renewable energy sources (\$16.8 billion), environmental management (\$6 billion), loan guarantees for renewable energy and electric power transmission projects (\$6 billion), grid modernization (\$4.5 billion), carbon capture and sequestration (\$3.4 billion), basic scientific research (\$1.6 billion), and the establishment of the Advanced Research Projects Agency - Energy (ARPA-E) (\$400 million). These investments will help jumpstart the economy, save and create jobs, and serve as a down payment on addressing fundamental energy challenges, while reducing carbon emissions and U.S. dependence on oil.

INVESTING IN SCIENCE TO ACHIEVE TRANSFORMATIONAL DISCOVERIES

The FY 2010 budget request supports our strategic framework by:

- Investing in science to achieve transformational discoveries;
- Fostering the revolution in energy supply and demand while positioning the United States to lead on global climate change policy;
- Increasing American economic competitiveness;
- Maintaining the nuclear deterrent, reducing the risk of nuclear proliferation, and advancing nuclear legacy cleanup; and
- Improving the management of the Department.

The President has committed to doubling federal investment in basic research over ten years. The Department will support this commitment by investing in basic and applied research, creating new incentives for private innovation, and promoting breakthroughs in energy. Our nation's ability to sustain a growing economy and a rising standard of living for all Americans depends on continued advances in science and technology. Scientific and technological discovery and innovation are the major engines of increasing productivity and are indispensable to ensuring economic growth, job creation, and rising incomes for American families in the technologically-driven 21st century.

As Secretary, one of my top priorities is to amplify the fundamental research undertaken by the Office of Science with novel approaches to solving the nation's energy problems. While the Department has made important contributions over the years, despite almost three decades of effort, we are still confronted by the fundamental problems of energy security and environmental degradation from our energy use. That is why I am proposing new approaches to solving the energy question. Specifically, this budget request includes three initiatives designed to cover the spectrum of basic to applied science to maximize our chances of energy breakthroughs. The FY 2010 budget will launch eight Energy Innovation Hubs, while the Energy Frontier Research Centers (EFRCs) and ARPA-E were launched last month.

Let me briefly explain the differences and why I believe launching these Hubs is so important.

EFRCs are small-scale collaborations (predominantly at universities) that focus on overcoming known hurdles in basic science that block energy breakthroughs – not on developing energy technologies themselves.

ARPA-E is a highly entrepreneurial funding model that explores potentially revolutionary technologies that are too risky for industry to fund.

The proposed Energy Innovation Hubs will take a very different approach – they will be multi-disciplinary, highly collaborative teams ideally working under one roof to

solve priority technology challenges, such as artificial photosynthesis (creating fuels from sunlight).

A few years ago, I changed the course of my scientific work to focus on solving our energy and climate challenges. I did so because of the great national and global urgency of this issue – but also because, as a scientist, I remain optimistic that science can offer us better solutions than we can imagine today. But those solutions won't come easily; they will only come if we harness the creativity and ingenuity and intellectual horsepower of our best scientists in the right way.

Having dedicated the last several years of my work to solving the energy challenge, I'm convinced that launching Energy Innovation Hubs is a critical next step in this effort. Bringing together the best scientists from different disciplines in collaborative efforts is our best hope of achieving priority goals such as making solar energy cost competitive with fossil fuels, or developing new building designs that use dramatically less energy, or developing an economical battery that will take your car 300 miles without recharging.

These are the breakthroughs we need – and the Energy Innovation Hubs will help us achieve them. I saw the power of truly collaborative science like this firsthand during my time at Bell Laboratories. I believe that to solve the energy problem, the Department of Energy must strive to be the modern version of Bell Labs in energy research, and that is what these Hubs will do. They will essentially be little “Bell Labses.”

The scientific collaboration the Hubs will foster will be unique and indispensable, and must be backed by a meaningful and sustained investment. These investments will pay for themselves many times over, ensuring American leadership and American competitiveness when it comes to the green energy jobs of tomorrow.

The following is additional information about the three initiatives:

- **Energy Innovation Hubs**

In FY 2010 the Department proposes to fund eight multi-disciplinary Energy Innovation Hubs, at a total of \$280 million. Modeled after the Department's Bioenergy Research Centers, the work of the Hubs will span from basic research to engineering development to commercialization and a hand-off to industry. Each Hub will be funded at \$25 million per year, with one-time additional start-up funding of \$10 million in the first year for renovation, equipment and instrumentation.

The Hubs will support cross-disciplinary research and development focused on the barriers to transforming energy technologies into commercially deployable materials, devices, and systems. They will advance highly promising areas of energy science and technology from their early stages of research to the point that the risk level will be low enough for industry to deploy them into the marketplace. While the intent is to provide a funding stream that is more dependable than the standard funding mechanisms, renewal after 5 years will not be automatic. To

receive renewed funding, Hubs will be expected to be delivering exceptional scientific progress.

The research Hubs will explore the following topics: Solar Electricity; Fuels from Sunlight; Batteries and Energy Storage; Carbon Capture and Storage; Grid Materials, Devices, and Systems; Energy Efficient Building Systems Design; Extreme Materials; and Modeling and Simulation.

- **Energy Frontier Research Centers**

In FY 2010 the Department of Energy will continue to support Energy Frontier Research Centers (EFRC). Currently there are 46 EFRCs, funded at \$2 to \$5 million per year. These centers enlist the talents and skills of the very best scientists and engineers to address current fundamental scientific roadblocks to clean energy and energy security. Roughly one-third of the centers are supported by Recovery Act funding. These centers, involving almost 1,800 researchers and students from universities, national labs, industry, and non-profit organizations from 36 states and the District of Columbia, address the full range of energy research challenges in renewable and low-carbon energy, energy efficiency, energy storage, and cross-cutting science. EFRC researchers take advantage of new capabilities in nanotechnology, light sources that are a million times brighter than the sun, supercomputers, and other advanced instrumentation, much of it developed in collaboration with the Department of Energy's Office of Science.

- **Advanced Research Projects Agency- Energy (ARPA-E)**

ARPA-E is a new Department of Energy organization modeled after the Defense Advanced Research Projects Agency, created during the Eisenhower administration in response to Sputnik. The Recovery Act provided \$400 million and the FY 2010 budget requests \$10 million for ARPA-E. The purpose of ARPA-E is to advance high-risk, high-reward energy research projects that can yield revolutionary changes in how we produce, distribute, and use energy. It will ensure that the United States maintains a technological lead in developing and deploying advanced energy technologies.

ARPA-E seeks out the best ideas and assembles teams that can move quickly to help bring the idea to market, and funds this work through grants that range between \$500,000 and \$10 million. Most projects will be funded with seed money that sunsets after three years. Research teams are expected to either make exceptionally rapid progress or bring their technology to the point the private sector can pick it up within that time.

These initiatives will be augmented with a broad educational effort that cuts across DOE program offices to inspire students and workers to pursue careers in science, engineering, and entrepreneurship specifically related to clean energy. This education effort will help to develop the scientific and technical expertise to sustain the new energy economy and increase American competitiveness.

- **RE-ENERGYSE (REgaining our ENERGY Science and Engineering Edge)**
As part of President Obama’s recent address before the National Academy of Sciences on reinvigorating scientific research and innovation in the United States, the President announced a joint education initiative between the National Science Foundation and the Department of Energy to “inspire tens of thousands American students to pursue careers in science, engineering and entrepreneurship related to clean energy.”

As part of this initiative, the Department will launch a comprehensive K-20+ science and engineering initiative, funded at \$115 million in FY 2010, to educate thousands of students at all levels in the fields contributing to the fundamental understanding of energy science and engineering systems. This initiative, which complements the Department’s other education efforts, will provide graduate research fellowships in scientific and technical fields that advance the Department’s energy mission; provide training grants to universities that establish multidisciplinary research and education programs related to clean energy; support universities that dramatically expand energy-related research opportunities for undergraduates; build partnerships between community colleges and different segments of the clean tech industry to develop customized curriculum for “green collar” jobs; and increase public awareness, particularly among young people, about the role that science and technology can play in responsible environmental stewardship.

Office of Science

The FY 2010 budget requests \$4.9 billion for the **Office of Science**, a \$184 million increase over FY 2009. In general, the 2010 request will focus on breakthrough science while developing and nurturing science and engineering talent. It will also increase funding for climate science and continue America’s role in international science and energy experiments. The budget also invests in the next generation of America’s scientists by expanding graduate fellowship programs in critical energy-related fields. This funding builds upon the \$1.6 billion provided in the Recovery Act for basic science programs at the Department of Energy.

The Office of Science supports investigators from more than 300 academic institutions and from all of the DOE laboratories. The FY 2010 budget request will support about 25,000 Ph.D.s, graduate students, undergraduates, engineers, and technicians. Approximately 24,000 researchers from universities, national laboratories, industry, and international partners are expected to use the Office of Science’s scientific user facilities. The FY 2010 request supports the President’s plan to increase federal investment in the sciences and train students and researchers in critical fields, to invest in areas critical to our clean energy future, and to make the U.S. a leader on climate change.

Two of the Department’s eight Energy Innovation Hubs are requested in the Office of Science in FY 2010 (\$70 million). These Hubs will bring together teams of

experts from multiple disciplines to focus on two grand challenges in energy: the creation of fuels directly from sunlight without the use of plants or microbes and advanced methods of electrical energy storage.

The Office of Science supports a diverse number of research programs including:

- High-Energy Physics (\$819 million)
- Nuclear Physics (\$552 million)
- Biological and Environmental Research (\$604 million)
- Basic Energy Sciences (\$1.7 billion)
- Advanced Scientific Computing Research (\$409 million)
- Fusion Energy Sciences (\$421 million)

FOSTERING THE REVOLUTION IN ENERGY SUPPLY AND DEMAND WHILE POSITIONING THE UNITED STATES TO LEAD ON GLOBAL CLIMATE CHANGE POLICY

U.S. dependence on oil is a national security challenge. Furthermore, the United States has a responsibility to curb carbon emissions to mitigate the effects of global climate change. The FY 2010 budget request will expand the use of low-carbon and renewable energy sources and efficiency, and support the Smart Grid. Deploying these technologies will position the United States to lead on global climate change policy.

Energy Efficiency and Renewables

Achieving these goals requires changes to both the demand and supply of energy. DOE is addressing both by improving the nation's energy efficiency to reduce energy demand and by investing in technologies and approaches to transform energy supply and transmission. The FY 2010 budget request of \$2.3 billion for the **Office of Energy Efficiency and Renewable Energy** (EERE) will transform the nation's energy infrastructure by investing in a variety of renewable sources of electricity generation and deploying technologies to reduce our dependence on oil and decrease energy use in homes, transportation, and industry. These sources of energy will reduce the production of GHG emissions and usher in a revitalized economy built on the next generation of domestic production. Investments in efficiency R&D, grants to States and weatherization assistance will have immediately tangible benefits by reducing energy use, lowering energy bills, and reducing GHG emissions and helping to create jobs across the country.

This budget request for EERE provides a diverse portfolio of solutions to our energy and environmental challenges. This starts with improving energy efficiency, which can be one of the cheapest, cleanest means of reducing greenhouse gas emissions. The budget includes significant increases in several programs in support of the President's efforts to promote energy efficiency, including these increases:

- Building Technology program— \$238 million (+\$98 million or 69 percent)
- Vehicle Technology program— \$333 million (+\$60 million or 22 percent); and

The budget continues the shift to clean and renewable energy, including these increases:

- Solar Energy program— \$320 million (+\$145 million, or 82 percent);
- Wind Energy program— \$75 million (+\$20 million, or 36 percent); and
- Geothermal program— \$50 million (+\$6 million or 14 percent.)

The budget also has funding for:

- Fuel Cells Technology (\$68.2 million)
- Biomass and Biorefinery Systems R&D (\$235 million)
- Water Power (\$30 million)
- Industrial Technologies (\$100 million)
- FEMP (\$32.3 million)
- Weatherization (\$220 million)
- State Energy Program Grants (\$75 million)

Electricity Transmission and Reliability

The nation's ability to meet the growing demand for reliable electricity is challenged by an aging electricity transmission and distribution system and by vulnerabilities in the U.S. energy supply chain. Despite increasing demand, the U.S. has experienced a long period of underinvestment in power transmission and infrastructure maintenance. The majority of the power delivery system was built on technology developed in the 1960s, 70s and 80s and is limited by the speed with which it can respond to disturbances. This limitation increases the vulnerability of the power system to outages that can spread quickly and have regional effects. Deploying the next generation of clean energy sources will require modernization of U.S. energy infrastructure which will rely on digital network controls and transmission, distribution and storage breakthroughs.

The proposed FY 2010 **Office of Electricity Delivery and Energy Reliability** budget provides \$208 million, an increase of 52 percent over FY 2009, and builds on the "smart grid" investments and other activities to modernize and secure the electric grid provided by \$4.5 billion of Recovery Act funds, supporting the following areas:

- Clean energy transmission and reliability (\$42 million)
- Smart grid research and development (\$67 million)
- Energy storage (\$15 million)
- Cyber security for energy delivery systems (\$50 million)
- Permitting, siting and analysis (\$6.4 million)
- Infrastructure security and energy restoration (\$6.2 million)

Fossil Energy

The FY 2010 budget request of \$882 million for the **Office of Fossil Energy (FE)** will help ensure that the United States can utilize traditional domestic energy resources in

a clean and affordable manner. The United States has 25 percent of the world's coal reserves, and fossil fuels currently supply 86 percent of the nation's energy. Low-carbon emissions coal plants and production of methane (natural gas) from gas hydrates will help allow fossil fuels to be used as abundant and low-carbon emitting energy resources. In direct support of the Department of Energy's Energy Security mission, \$229 million of the \$882 million has been requested to provide operations, maintenance and repair funding for a Strategic Petroleum Reserve program that is environmentally responsible and fully responsive to the needs of the nation and the public, protecting against potential disruptions in foreign and domestic petroleum supplies.

The Department is committed to advancing Carbon Capture and Storage (CCS) technologies in order to promote cleaner and efficient use of fossil fuels. The \$3.4 billion in Recovery Act funds, combined with \$222 million requested in FY 2010 for CCS research and development, is the keystone of the Department's clean coal research program which seeks to establish the capability of producing electricity from coal with dramatically reduced atmospheric emissions of carbon dioxide.

In FY 2010, the Energy Innovation Hub for CCS will focus on enabling fundamental advances and discovery of novel and revolutionary capture/separation approaches to dramatically reduce the energy penalty and cost associated with CO₂ capture.

The FY 2010 budget request for FE funds the following areas:

- Coal (\$403.9 million) including \$179.9 million for carbon sequestration
- Fossil energy research and development (\$617.6 million)
- Naval Petroleum and Oil Shale Reserves (\$23.6 million)
- Strategic Petroleum Reserve (\$229.1 million)
- Northeast Home Heating Oil Reserve (\$11.3 million)

Nuclear Energy

The \$845 million budget request for the **Office of Nuclear Energy (NE)** recognizes that nuclear energy is a fundamental component of the energy mix which currently supplies approximately 20 percent of the nation's electricity and over 70 percent of low carbon emitting electricity.

In order to research and develop nuclear energy technologies that could help meet non-proliferation and climate goals, and to maintain the national nuclear technology infrastructure, the FY 2010 budget request for NE funds the following areas:

- Nuclear Power 2010 (\$20 million)
- Generation IV (\$191 million)
- Fuel Cycle Research and Development Program (\$192 million)
- Radiological Facilities Management (\$77 million)
- Idaho Facilities Management (\$203 million)

Loan Guarantee Program

In FY 2010, the DOE will continue to accelerate the availability of loans for innovative technologies through the Loan Guarantee Program, while ensuring taxpayer interests are protected. The Department requests \$43.0 million in funding in FY 2010 to operate the Office and support personnel and associated costs. This request will be offset by collections authorized under Title XVII of the Energy Policy Act of 2005 (EPACT 2005). Additionally, the FY 2010 budget provides \$20 million for administrative costs to help enable the **Advanced Technology Vehicle Manufacturing Loan Program** to support up to \$25 billion in loans to automobile and automobile part manufacturers for re-equipping, expanding, or establishing manufacturing facilities to produce advanced technology vehicles or qualified components.

MAINTAINING THE NUCLEAR DETERRENT, REDUCING THE RISK OF NUCLEAR PROLIFERATION, AND ADVANCING NUCLEAR LEGACY CLEAN-UP

Nuclear Security

The National Nuclear Security Administration (NNSA) continues significant efforts to meet administration and secretarial priorities, leveraging science to promote national security. The FY 2010 President's budget request is \$9.9 billion, which is \$815 million more than the FY 2009 request, to meet defense and homeland security-related objectives.

The United States continues a fundamental shift in national security strategy to address the realities of the 21st century. The FY 2004-directed reductions to the U.S. nuclear weapons stockpile were completed in 2007, five years early. Today's nuclear weapons stockpile is now the size envisioned for 2012, and by 2012 it will be almost 15 percent less than that -- a total that is just 25 percent of what it was at the end of the Cold War. Consistent with the Administration's Nuclear Posture Review, the Department of Energy has created a vision for a revitalized nuclear weapons complex that is significantly more agile and responsive, and will allow further reductions in the nuclear stockpile by providing an industrial hedge against geopolitical or technical problems.

The FY 2010 budget request for NNSA funds the following areas:

- Weapons Activities (\$6.4 billion)
- Defense Nuclear Nonproliferation (\$2.14 billion)
- Naval Reactors (\$1.0 billion): \$175 million increase from FY 2009
- Office of the Administrator (\$420.8 million)

Environmental Management

The federal government has the dual responsibilities of addressing the nuclear weapons production legacy of our past and providing the necessary environmental infrastructure for today that will ensure a clean, safe and healthy environment for future generations. To deliver on the Department's obligations stemming from 50 years of nuclear research and weapons production during the Cold War, the **Office of Environmental Management (EM)** continues to focus its resources on those activities that will yield the greatest risk reductions, with safety as the utmost priority. To achieve a balance of risk reduction and environmental cleanup, the FY 2010 request of \$5.8 billion, a decrease of 3 percent from FY 2009, builds upon the \$6 billion in Recovery Act funding. These investments are already having an impact. Fifty skilled new workers recently reported to work at the Savannah River Site.

This request supports the following activities, in priority order:

- Essential activities to maintain a safe and secure posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal
- Spent nuclear fuel storage, receipt and disposition
- Special nuclear material consolidation, processing, and disposition
- High priority groundwater remediation
- Transuranic and mixed/low level waste disposition
- Soil and groundwater remediation
- Excess facilities deactivation & decommissioning

In developing the FY 2010 budget for its environmental cleanup efforts, the Department focused on achieving the greatest risk reduction, while also incorporating regulatory compliance commitments and best business practices, to maximize cleanup progress. In FY 2010, EM is aggressively pursuing the consolidation and disposition of surplus plutonium and other special nuclear materials to enhance national security and to minimize the storage risks and costs associated with these materials. In addition, EM continues to make significant progress on the construction and operation of waste treatment and immobilization facilities across the complex. The budget continues shipments of remote-handled transuranic waste to the Waste Isolation Pilot Plant.

The FY 2010 budget request for EM funds the following activities:

- Non-Defense Environmental Management (\$238 million)
- Defense Environmental Management (\$5.5 billion)
- UED&D Fund (\$559 million)

Yucca Mountain

The FY 2010 budget request of \$197 million for OCRWM implements the Administration's decision to terminate the Yucca Mountain program while developing nuclear waste disposal alternatives. All funding for development of the Yucca Mountain facility would be eliminated, such as further land acquisition, transportation access, and additional engineering. The budget request includes the minimal funding needed to

explore alternatives for nuclear waste disposal through OCRWM and to continue participation in the Nuclear Regulatory Commission (NRC) license application process, consistent with the provisions of the Nuclear Waste Policy Act. The Administration intends to convene a “blue-ribbon” panel of experts to evaluate alternative approaches for meeting the federal responsibility to manage and ultimately dispose of spent nuclear fuel and high-level radioactive waste from both commercial and defense activities. The panel will provide the opportunity for a meaningful dialogue on how best to address this challenging issue and will provide recommendations for managing and disposing of spent nuclear fuel and high-level radioactive waste.

IMPROVING THE MANAGEMENT OF THE DEPARTMENT

As Secretary, I am making a concerted effort to improve management throughout the Department. The Department is committed to strengthening its management to implement the \$26.4 billion FY 2010 request and \$38.7 billion of Recovery Act funds. The Department has developed strong oversight strategies for Recovery Act implementation, including upfront risk assessments and building specific risk management plans, upgrading process controls, establishing personal risk assurance accountabilities, and expanding outreach, training, and coordination between Headquarters and field offices. The Recovery Act, however, is only one aspect of a much larger effort to improve the Department’s management.

As part of President Obama’s commitment to fiscal discipline, DOE will focus on using its resources responsibly, transparently, and effectively by identifying potential savings throughout the agency. The FY 2010 budget request of \$182.3 million for Departmental Administration, along with resources in individual program offices, will continue the improvement in key functional areas such as human, financial, project, and information technology management. These efforts will instill management excellence and encourage the most efficient use of the Department’s resources.

The Office of the Chief Information Officer (CIO) will receive \$104.5 million, \$33.4 million of which will go to cybersecurity and secure communications, \$9.4 million to the corporate management information program, and \$23.6 million for energy information technology services.

The Office of the Chief Financial Officer will continue its effort in FY 2010 to build and improve its integrated business management system, iMANAGE, with the deployment of budget execution and formulation modules such as iBUDGET. To accomplish this and other goals, the CFO’s office will receive \$66 million in the FY 2010 budget. A significant portion of the increase is to assume costs previously carried by the CIO for accounting systems operations.

The Office of Management (\$88.4 million) and the Office of Human Capital Management (\$29.5 million) will help ensure effective and efficient management principles permeate from top to bottom at the Department of Energy. The Department has been making steady progress in improving project management and developed an

action plan with concrete steps and scheduled milestones to successfully address the root causes of the major challenges to planning and managing Department projects. The action plan identifies eight measures that, when fulfilled, will result in significant, measurable, and sustainable improvements in the Department's contract and project management performance and culture. Primary actions include: strengthened front-end planning, optimized staffing, improved risk management, better alignment of funding profiles and cost baselines, strengthened cost estimating capability, improved acquisition strategies and plans, improved oversight, and stricter adherence to project management requirements.

The Department's human capital management efforts are focused on an integrated approach that ensures human capital programs and policies are linked to the Department's missions, strategies, and strategic goals, while providing for continuous improvement in efficiency and effectiveness. The Department is revising its human capital management strategic plan to address future organizational needs, workforce size, skill gaps, performance management systems and diversity. To accomplish this goal, the Department will continue to implement strategies to attract, motivate and retain a highly skilled and diverse workforce to meet the future needs of the nation in such vital areas as scientific discovery and innovation.

CONCLUSION

It is my firm belief that the short-term impact of the Recovery Act combined with the new approaches and long-term vision in President Obama's FY 2010 budget, will lay the groundwork necessary for creating the new green economy. Both President Obama and I look forward to working with the 111th Congress to make this vision a reality.

I appreciate the opportunity to appear before you to present the FY 2010 budget proposal for the Department of Energy. I will be happy to take any questions that the Chairman and members of the Committee may have at this time.