

**STATEMENT OF SAMUEL W. BODMAN
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Before the

**COMMITTEE ON SCIENCE
U.S. HOUSE OF REPRESENTATIVES**

Concerning the

DEPARTMENT OF ENERGY'S FY 2007 BUDGET

February 15, 2006

Good morning, Chairman Boehlert, Ranking Member Gordon and members of the Committee. I am pleased to appear before you today along with my Administration colleagues to discuss the President's FY 2007 budget request for the Department of Energy (DOE) and the role that DOE plays in the President's science and energy initiatives.

In his State of the Union address on January 31 President Bush laid out an ambitious and exciting path for the Administration when he unveiled his **American Competitiveness Initiative** and the **Advanced Energy Initiative**. The American Competitiveness Initiative will invest in and reverse a trend of static funding for research and development in the physical sciences; as a result we in the Energy Department believe this initiative is a real landmark. The proposal will double the Federal commitment to the most critical basic research programs in the physical sciences over the next ten years; a total of \$50 billion of new funding through DOE's Office of Science, the National Science Foundation, and the Department of Commerce's National Institute of Standards and Technology. This historic commitment will significantly change the future of science in this country and will be a bold statement to our science colleagues around the world. An important element of the Advanced Energy Initiative is the **Global Nuclear Energy Partnership**, a comprehensive strategy to enable the safe and secure expansion of nuclear energy around the world. We in the Energy Department are excited about this vision and mission and the role we will play in it. I am pleased to have the opportunity to testify before you today to urge the Science Committee to join us in this initiative.

The Department of Energy's budget for Fiscal Year (FY) 2007 follows the blueprint laid out by the President's new initiatives. The \$23.5 billion budget request seeks to address America's short-term energy needs while positioning our country for the future. The budget request makes bold investments to improve America's energy security while protecting our environment, puts policies in place that foster continued economic growth, spurs scientific innovation and discovery, and addresses and reduces the threat of nuclear proliferation.

Most notably, this budget request contains:

- **A Landmark Investment in Scientific Research**
The FY 2007 budget includes a \$505 million increase in DOE's Science programs, which is part of a commitment to double funding for certain high-leverage science agencies over the next ten years. The **American Competitiveness Initiative** recognizes that scientific discovery and understanding help drive economic strength and security. Developing revolutionary, science-driven technology is at the heart of the Department of Energy's mission. The increase proposed for the Department's Science programs reflects the significant contribution DOE and its world-class research facilities make to the Nation.
- **Strategic Investments to Reduce America's Dependence on Foreign Oil and Develop Clean Energy Technologies**
The President's **Advanced Energy Initiative** provides a 22 percent increase for research that can help reduce America's dependence on foreign oil and advance clean energy technologies. The FY 2007 Budget proposes \$149.7 million for Biomass and Biorefinery Systems Research and Development (R&D) program to support the new **Biofuels Initiative** to develop cost competitive ethanol from cellulosic materials (agricultural wastes, forest residues, and bioenergy crops) by 2012.

In addition, the budget request continues to pursue the vision of reducing greenhouse gas emissions through the development of a hydrogen economy. The FY 2007 Budget requests a total of \$289.5 million (including \$1.4 million requested by the Department of Transportation) to support implementation of the President's **Hydrogen Fuel Initiative**. The FY 2007 Budget also provides a 27 percent increase for advanced battery technologies that can improve the efficiency of conventional hybrid electric vehicles (HEV) and help make "plug-in" HEV's commercially viable.

To help develop clean electricity, the FY 2007 Budget funds diverse technology R&D programs. The FY 2007 Budget includes \$148.4 million for a new **Solar America Initiative** to develop cost competitive solar photovoltaic technology by 2015. The FY 2007 Budget also provides \$60.0 million for U.S. participation in **International Thermonuclear Experimental Reactor (ITER)**, an international experimental reactor program that has the potential for putting us on a pathway to tap nuclear fusion as an enormous source of plentiful and environmentally safe energy. The FY 2007 Budget advances the Administration's commitment to the **FutureGen** project, which will establish the capability and feasibility of co-producing electricity and hydrogen from coal with near-zero atmospheric emissions of pollutants and greenhouse gasses.

- **Strategic Investments to Enable Nuclear Energy Expansion in a Cleaner, Safer Manner**
The Department's FY 2007 budget features \$250 million to begin investments in the **Global Nuclear Energy Partnership (GNEP)**. GNEP is a comprehensive strategy to enable an expansion of nuclear power in the U.S. and around the

world, to promote non-proliferation goals, and to help resolve nuclear waste disposal issues.

The Energy Information Administration projects that over the next 25 years, demand for electricity in the United States alone will grow by over 40 percent. Nuclear power is an abundant, safe, reliable and emissions-free way to help meet this growing demand for energy throughout the world. As part of the GNEP strategy, the United States will work with key international partners to develop and demonstrate new proliferation resistant technologies to recycle spent nuclear fuel to reduce waste. To help bring safe, clean nuclear power to countries around the world, the international GNEP partners will also develop a fuel services program to supply developing nations with reliable access to nuclear fuel in exchange for their commitment to forgo developing enrichment and recycling technologies.

As a complement to the GNEP strategy, the Department will continue to pursue a permanent geologic disposal site for nuclear waste at **Yucca Mountain**, and the FY 2007 budget includes \$544.5 million to support this goal. Based on technological advancements that would be made through GNEP, the volume and radio-toxicity of waste requiring permanent disposal at Yucca Mountain could be greatly reduced, delaying the need for an additional repository indefinitely. It is important to emphasize, however, that GNEP does not diminish in any way the need for, or the urgency of, the nuclear waste disposal program at Yucca Mountain. Yucca Mountain is still required under any fuel cycle scenario. Even with the successful development of a recycling program, there will remain a significant amount of “once-through” spent nuclear fuel that will require final disposal in a repository. In addition, the residual material from the recycling program also will require final disposition in a repository. The GNEP will affect the longer-term scope of the repository program, but not the near term need for the Department to put in place a program to begin accepting spent nuclear fuel for disposal as quickly as feasible.

GNEP builds upon the successes of programs initiated under President Bush’s leadership to encourage the construction of new nuclear power plants here in the United States. The FY 2007 budget includes \$632.7 million for nuclear energy programs, a \$97.0 million increase above the FY 2006 appropriation. In addition to the \$250 million for GNEP, **Generation IV** (Gen IV) research and development (\$31.4 million) will improve the efficiency, sustainability, and proliferation resistance of advanced nuclear systems and Nuclear Power 2010 (\$54.0 million), will lead the way, in a cost-sharing manner, for industry to order new, advanced light-water reactors by the end of this decade. In addition, ongoing implementation of the Energy Policy Act of 2005 (EPACT) will establish federal insurance to protect sponsors of the first new nuclear power plants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors’ control.

PROMOTING SCIENCE AND TECHNOLOGICAL INNOVATION

As the millennium unfolds, we stand on the threshold of scientific revolutions in biotechnology and nanotechnology, in materials science, in fusion energy and high-intensity light sources, and in high-performance computing, to touch on only a few important fields. The nations that lead these scientific revolutions will likely dominate the global high-tech economy for the foreseeable future. We are on the verge of major new discoveries about the nature of our universe, solutions to some of the deepest mysteries of the cosmos and the fundamental understanding of matter—insights that will transform the way we think about ourselves and our world.

The President's **American Competitiveness Initiative** will encourage American innovation and bolster our ability to compete in the global economy through increased federal investment in critical areas of research, especially in the physical sciences and engineering. This initiative will generate scientific and technological advances for decades to come and will help ensure that future generations have an even brighter future.

Twenty-first century science requires sophisticated scientific facilities. In many fields, private industry has neither the resources nor the near-term incentive to make significant investments on the scale required for basic scientific research to yield important discoveries. Indeed, in recent years, corporate basic research has declined. That is why the Department's Office of Science, which is responsible for ten world-class U.S. national laboratories and is the primary builder and operator of scientific facilities in the United States, plays such a critical role. Investment in these facilities is much more than bricks and mortar: it is an investment in discovery and in the future of our Nation. The Office of Science is also educating and training our next generation of scientists and engineers. Roughly half of the researchers at Office of Science-run facilities are university faculty or graduate or postdoctoral students (who work side by side with scientists and researchers employed directly by the labs), and about a third of Office of Science research funds go to institutions of higher learning. In addition, the National Nuclear Security Administration (NNSA) operates three world-class national laboratories which greatly advanced the frontiers of science in connection with their national security mission and which have many interactions with universities.

I am pleased to inform the Committee that the Department is already achieving meaningful scientific results with our latest high end supercomputing systems, including Blue Gene L and Purple at Lawrence Livermore National Laboratory and our Red Storm supercomputer at Sandia National Laboratory. Within a month of coming online, weapons designers at Lawrence Livermore and Los Alamos, working jointly, have discovered key physics that are important to weapons design that could not have been identified using less capable computers. This discovery is critically important to predicting the behavior of weapons, and, as a result, our ability to be responsive to national needs. Because of the interrelationships among the Department's science-based programs, these new, remarkably powerful computers are already having a major, positive effect on science in several of our laboratories.

The President's FY 2007 budget request of \$4.1 billion for the Office of Science will move us forward on several scientific fronts designed to produce discoveries that will strengthen our national competitiveness. Final international negotiations are close to

being completed with our international partners in **ITER**, the fusion experimental reactor designed to demonstrate the scientific and technological feasibility of fusion as a plentiful, environmentally benign source of energy. A request of \$60.0 million in FY 2007 provides funding for the second year of the ITER project. The return on investment will expand across international borders and has the promise of tremendous economic opportunity and development.

The FY 2007 budget also includes \$105.9 million to enable us to continue construction of the **Linac Coherent Light Source (LCLS)**, the world's first x-ray free electron laser. The LCLS will allow us to watch matter in action, one molecule at a time, and witness chemical reactions at the microscopic level in real time. The structural knowledge obtained with x-rays holds the key to understanding the properties of matter such as mechanical strength, magnetism, transport of electrical currents and light, energy storage, and catalysis. Likewise, in biology much of what we know about structure and function on a molecular level comes from x-ray studies. Such knowledge forms the basis for the development of new materials and molecules and the enhancement of their properties, which in turn will advance technology, fuel our economy, and improve our quality of life. In addition, the FY 2007 Budget seeks \$19.2 million in FY 2007 for the first full year of operations of each of four facilities for nanoscience research and \$19.4 million to continue with construction of a fifth.

The FY 2007 budget provides \$171.4 million for the **Spallation Neutron Source (SNS)**, which enters its first full year of operation as the world's foremost facility for neutron scattering.

The FY 2007 budget request also includes \$135.3 million for the **Genomes: GTL** research, which will help us understand how nature's own microbial communities can be harnessed to remove carbon from the atmosphere, generate hydrogen for fuel, and turn cellulose into ethanol.

Within the \$4.1 billion FY 2007 budget request for Science, \$143.3 million is provided to support near full operation of the **Relativistic Heavy Ion Collider (RHIC)**, which gives us a lens into the early universe, and \$80.0 million is allocated to allow near full operation of the **Continuous Electron Beam Accelerator Facility (CEBAF)**, which will give new insight on the quark-structure of matter. Early studies of nuclear and particle physics provided the foundation for technologies that have changed our daily lives, giving us televisions, transistors, medical imaging devices, and computers, and has enormous potential to lead to unexpected discoveries. The **Large Hadron Collider (LHC)** at CERN, in Switzerland, is scheduled to be completed in 2007, will open a new chapter in illuminating the structure of matter, space and time. At this new energy frontier, qualitatively new phenomena of nature should emerge. There are many possibilities - supersymmetry, extra space dimensions, or unexpected new symmetries of nature - but finding out which, if any, are true can only be settled by experiment. In FY 2007, \$56.8 million is requested to support U.S. participation in the LHC research program. The new results anticipated at the LHC can be significantly advanced by discoveries at a potential next generation International Linear Collider (ILC) which would break new ground in our understanding of nature. In FY 2007, funds for ILC research and development are doubled with a funding request of \$60.0 million.

The budget also includes \$318.7 million to solidify America's leadership in the economically vital field of **high-performance computing**, a tool increasingly integral not only to advanced scientific research, but also to industry. The budget will provide the pathway toward the development of computational systems that enable researchers to attack a wide range of currently intractable scientific problems through modeling and simulation, enabling the U.S to extend our leadership in this strategic area. Additionally, from development of the suite of scientific software and applications for the petascale computers, U.S. industry will be able to accelerate innovation, potentially saving billions in development costs and giving our economy untold competitive advantages.

We are on the verge of a revolution across multiple sciences as profound as any humanity has witnessed - one that will transform our vision of nature and, ultimately, our industry and economy.

ADVANCING AMERICA'S ECONOMIC AND ENERGY SECURITY

The Energy Policy Act of 2005, signed by President Bush on August 8, 2005, advances the United States towards a secure energy future. The FY 2007 budget request of \$2.6 billion to support energy programs fulfills President Bush's pledge to promote a strong, secure economy and expand our Nation's energy supply by developing a diverse, dependable energy portfolio for the future.

The President has proposed the **Advanced Energy Initiative** to help reduce America's dependence on foreign sources of oil and accelerate development of clean energy technologies through targeted increases in federal investment. This initiative has served as the blueprint for DOE's FY 2007 budget proposal.

The FY 2007 budget request of \$1.2 billion for energy efficiency and renewable energy includes two initiatives to emphasize technologies with the potential for reducing our growing reliance on oil imports and for producing clean electricity with reduced emissions. The FY 2007 budget proposes \$149.7 million for the **Biofuels Initiative** to develop by 2012 affordable, domestically-produced bio-based transportation fuels, such as ethanol, from cellulosic feedstocks (such as agricultural wastes, forest residues, and bioenergy crops), and accelerate the development of biorefineries. Biomass has the promise to deliver a plentiful domestic energy resource with economic benefits to the agricultural sector, and to directly displace oil use. The President's **Solar America Initiative** is proposed to be funded at \$148.4 million, a substantial increase of \$65.3 million above FY 2006 funding. The increase accelerates the development of solar photovoltaics, a technology that converts energy from the sun directly into electricity. The goal of this R&D initiative is to make this emissions-free technology cost-competitive with other electricity generation sources by 2015.

The President's **Hydrogen Fuel Initiative** is funded at \$289.5 million and includes \$195.8 million for DOE's Energy Efficiency and Renewable Energy program, \$23.6 million for DOE's Fossil Energy program, \$18.7 million for DOE's Nuclear Energy program, \$50.0 million for DOE's Science program, and \$1.4 million for the Department

of Transportation. Hydrogen and fuel cell technology holds the promise of an ultra-clean and secure energy option for America's energy future. The increase of \$40.2 million above the FY 2006 appropriation accelerates activities geared to further improve the development of hydrogen production and storage technologies, and evaluate the use of hydrogen as an emissions-free transportation fuel source.

While the budget proposes increases for Biomass, Solar and Hydrogen research, the Geothermal Program will be closed out in FY 2007 using prior year funds. The 2005 Energy Policy Act amended the Geothermal Steam Act of 1970 in ways that should spur development of geothermal resources without the need for subsidized Federal research to further reduce costs.

Nuclear power, which generates 20 percent of the electricity in the United States, contributes to a cleaner, more diverse energy portfolio. In FY 2007 a total of \$632.7 million is requested for nuclear energy activities. Within the total, \$250 million will support the **Global Nuclear Energy Partnership (GNEP)**. GNEP is a comprehensive strategy to enable an expansion of nuclear power in the U.S. and around the world, to promote nuclear nonproliferation goals; and to help resolve nuclear waste disposal issues.

GNEP will build upon the Administration's commitment to develop nuclear energy technology and systems, and enhance the work of the United States and our international partners to strengthen nonproliferation efforts. GNEP will accelerate efforts to:

- Enable the expansion of emissions-free nuclear power domestically and abroad;
- Reduce the risk of proliferation; and
- Utilize new technologies to recover more energy from nuclear fuel and dramatically reduce the volume of nuclear waste.

Through GNEP, the United States will work with key international partners to develop new recycling technologies that do not result in separated plutonium, a traditional proliferation risk. Recycled fuel would then be processed through advanced burner reactors to extract more energy, reduce waste and actually consume plutonium, dramatically reducing proliferation risks. As part of GNEP, the U.S. and other nations with advanced nuclear technologies would ensure developing nations a reliable supply of nuclear fuel in exchange for their commitment to forgo enrichment and reprocessing facilities of their own, also alleviating a traditional proliferation concern.

GNEP will also help resolve America's nuclear waste disposal challenges. By recycling spent nuclear fuel, the heat load and volume of waste requiring permanent geologic disposal would be significantly reduced, delaying the need for an additional repository indefinitely.

The Administration continues its commitment to open and license Yucca Mountain as the nation's permanent geologic repository for spent nuclear fuel, a key complement to the GNEP strategy. Managing and disposing of commercial spent nuclear fuel in a safe and environmentally sound manner is the mission of DOE's Office of Civilian Radioactive Waste Management (RW).

To support the near-term domestic expansion of nuclear energy, the FY 2007 budget seeks \$54.0 million for the **Nuclear Power 2010** program to support continued industry cost-shared efforts to reduce the barriers to the deployment of new nuclear power plants. The technology focus of the Nuclear Power 2010 program is on Generation III+ advanced light water reactor designs, which offer advancements in safety and economics over the Generation III designs. If successful, this seven-year, \$1.1 billion project (50% to be cost-shared by industry) could result in a new nuclear power plant order by 2009 and a new nuclear power plant constructed by the private sector and in operation by 2014.

Funding of \$1.8 million is provided in FY 2007 to implement a new program authorized in the recently enacted Energy Policy Act of 2005. The program will allow DOE to offer **risk insurance** to protect sponsors of the first new nuclear power plants against the financial impact of certain delays during construction or in gaining approval for operation that are beyond the sponsors' control. This program would cover 100 percent of the covered cost of delay, up to \$500 million for the first two new reactors and 50 percent of the covered cost of delay, up to \$250 million each, for up to four additional reactors. This risk insurance offers project sponsors additional certainty and incentive to provide for the construction of a new nuclear power plant by 2014.

The FY 2007 budget request includes \$31.4 million to continue to develop next-generation nuclear energy systems known as **Generation IV (GenIV)**. These technologies will offer the promise of a safe, economical, and proliferation resistant source of clean, reliable, sustainable nuclear power with the potential to generate hydrogen for use as a fuel. Resources in FY 2007 for GenIV will be primarily focused on long-term research and development of the Very-High Temperature Reactor.

The **University Reactor Infrastructure and Educational Assistance** program was designed to address declining enrollment levels among U.S. nuclear engineering programs. Since the late 1990s, enrollment levels in nuclear education programs have tripled. In fact, enrollment levels for 2005 have reached upwards of 1,500 students, the program's target level for the year 2015. In addition, the number of universities offering nuclear-related programs also has increased. These trends reflect renewed interest in nuclear power. Students will continue to be drawn into this course of study, and universities, along with nuclear industry societies and utilities, will continue to invest in university research reactors, students, and faculty members. Consequently, Federal assistance is no longer necessary, and the 2007 Budget proposes termination of this program. The termination is also supported by the fact that the program was unable to demonstrate results from its activities when reviewed using the Program Assessment Rating Tool (PART), supporting the decision to spend taxpayer dollars on other priorities. Funding for providing fresh reactor fuel to universities is included in the Research Reactor Infrastructure program, housed within Radiological Facilities Management.

Recognizing the abundance of coal as a domestic energy resource, the Department remains committed to research and development to promote its clean and efficient use. U.S. coal accounts for twenty five percent of the world's coal reserves. For the last three years, the Department has been working to launch a public-private partnership, **FutureGen**, to develop a coal-based facility that will produce electricity and hydrogen

with essentially zero atmospheric emissions. This budget includes \$54 million in FY 2007 and proposes an advance appropriation of \$203 million for the program in FY 2008. Funding for FutureGen will be derived from rescinding \$203 million in balances no longer needed to complete active projects in the Clean Coal Technology program. Better utilization of these fund balances to support FutureGen will generate real benefits for America's energy security and environmental quality.

The budget request for FY 2007 includes \$4.6 million to support **Alaska Natural Gas Pipeline** activities authorized by Congress in late 2004. Within the total amount of \$4.6 million, \$2.3 million will be used to support an Office of the Federal Coordinator and the remaining \$2.3 million will support the loan guarantee portion of the program. Once constructed, this pipeline will be capable of delivering enough gas to meet about 10 percent of the U.S. daily natural gas needs.

The budget request proposes to terminate the oil and gas research and development programs, which have sufficient market incentives for private industry support, to other energy priorities.

The Energy Policy Act of 2005 established a new mandatory oil and gas research and development (R&D) program, called the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research program, which would be funded from Federal revenues from oil and gas leases beginning in FY 2007. These R&D activities are more appropriate for the private-sector oil and gas industry to perform. Therefore this budget proposes to repeal the program through a future legislative proposal.

The FY 2007 budget includes \$124.9 million for a refocused portfolio of energy reliability and assurance activities in the **Office of Electricity Delivery and Energy Reliability**. This will support research and development in areas such as high temperature superconductivity, and simulation work needed to enhance the reliability and effectiveness of the Nation's power supply. This office also operates the Department's energy emergency response capability and led DOE's support effort during and after the Gulf Coast hurricanes.

ENSURING A CLEAN ENVIRONMENT

The Bush Administration is laying a strong technological foundation to develop cost-effective options to meet clean development and climate objectives. While maintaining core programs in renewable energy, energy efficiency, nuclear power, fusion, and other areas, the Administration has launched important new initiatives and programs, including President Bush's Hydrogen Fuel Initiative, the FutureGen advanced clean coal project, and advanced nuclear power. Internationally, the U.S. has initiated a number of technology collaborations, including the Asia-Pacific Partnership for Clean Development and Climate, the Carbon Sequestration Leadership Forum, the International Partnership for a Hydrogen Economy, the Generation IV International Forum, and the Methane to Markets Partnership, and it joined the ITER fusion project.

The United States leads the world in the development of climate-friendly technologies and spends more on climate change science and technology development—\$2 billion and \$3 billion in FY 2006, respectively—than any other country. As a result of technological progress, we are on track to meet the President’s goal of reducing GHG intensity by 18 percent by 2012. For FY 2007, the President is proposing, through the Advanced Energy Initiative announced during the State of the Union Address, large increases in funding for solar, bioenergy, hydrogen, nuclear, and advanced clean coal R&D to change the way we produce power for our homes and automobiles and to reduce oil imports. The Department’s FY 2007 budget also reflects our continuing strategy to reduce the greenhouse gas intensity of the American economy. A vital part of this strategy is the Climate Change Technology Program (CCTP). CCTP was established within the Department of Energy in the fall of 2002 and was authorized by Congress as part of the Energy Policy Act of 2005. The goal of CCTP is to accelerate the development of advanced, cost-effective technologies that reduce, avoid, or capture and sequester GHG emissions. Through leadership in research, development, demonstration and deployment, the U.S. approach aims to build on America’s strengths in innovation and technology and inspire others, at home and abroad, to participate in an ambitious technological undertaking to address climate change concerns.

CONCLUSION

The Administration recognizes that science and energy are central to our economic and national security. Indeed, energy helps drive the global economy and has a significant impact on our quality of life and the health of our people and our environment. The FY 2007 Budget Request balances the need to address short-term challenges while planning for long-term actions as the President outlined in his new initiatives, the **American Competitiveness Initiative** and the **Advanced Energy Initiative**. The request reflects our belief that basic science research must remain strong if we are to remain competitive with our global partners. The request contains bold new initiatives in nuclear, biomass, and solar energy. It continues the President’s strong commitment to clean coal, hydrogen, and fusion. The request honors our commitment to deal with civilian nuclear waste, as well as legacy waste from the Cold War, and to further our already successful nonproliferation programs in order to help ensure a safer world for generations to come.