

The Department of Energy in the FY 2008 Budget

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HIGHLIGHTS

- Among all science agencies and R&D programs in the President's proposed FY 2008 budget, the Department of Energy's (DOE) Office of Science would be the undisputed winner. Under the Administration's plan, funding for the Office of Science would rise by 7.2 percent above last year's request and 15.4 percent above the FY 2007 appropriations Congress adopted in the joint funding resolution passed and signed into law in February.

- DOE considers FY 2008 a watershed year for the Office of Science. If the requested increase materializes, it would be a major step toward righting a fiscal boat that has been sinking slowly for more than two decades. During that time the Office's level of effort has slipped by almost a third, according to many analysts. If Congress fails to act on the Department's request, the Office of Science would face the task of making choices among its mandates, all highly detrimental to the conduct of American science. It could reduce operations at national user facilities into which the federal government has poured tens of billions of dollars of construction money and which serve tens of thousands of users from universities, industry and other government agencies. It could curtail construction on new user facilities, severely jeopardizing the nation's global competitive standing and its ability to innovate. Or it could consider jettisoning its commitment to university-based individual-investigator science that currently comprises about one third of its research portfolio. To many policy makers, these are "Hobson's Choices," or with Democrats now in control of the House, more appropriately Peter Visclosky's (D-IN) choices. Any one of them would cause irreparable damage.

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- As part of the President's \$2.7 billion continuation of the Advanced Energy Initiative, a commitment to wean the nation off imported oil, the Administration budget would place increasing emphasis on Biofuels R&D and the FutureGen project that has as its goal emission-free (carbon included) electricity and hydrogen production from coal. The budget would also focus R&D spending on the Building and Vehicles Technologies with the aim of greatly improving "end-use" energy efficiencies. The Administration's FY 2008 requests for these accounts are substantially higher than its comparable requests last year (up 20.0 percent for Bio, up 100.0 percent for FutureGen, up 11.8 percent for Building Technologies and up 6.1 percent for Vehicle Technologies), but, except for FutureGen, the proposed spending for these accounts would fall well below the FY 2007 appropriations (Table II-11) that Democrats incorporated in the joint funding resolution.

- The Department's proposed R&D budget for Energy Supply and Conservation would also boost spending for Hydrogen Technology (up 10.0 percent) and Nuclear Energy (up 13.6 percent). And in line with long-term energy research, the Science account would include a 34.1 percent increase for Fusion Energy Sciences, driven almost entirely by a \$160 million request for the FY 2008 U.S. contribution to the International Thermonuclear Experimental Reactor (ITER) that is under construction in France.

INTRODUCTION

The DOE traces its origin to 1946, when Congress established the Atomic Energy Commission (AEC) to oversee the nation's embryonic nuclear weapons and civilian nuclear reactor programs. In 1974, responding to the national energy crisis, Congress consolidated energy R&D programs housed throughout the federal government and combined them with the non-regulatory activities of the AEC to create the Energy Research and Development Administration (ERDA). In 1977, when ERDA achieved Cabinet status, it was renamed the Department of Energy.

Today, the Department of Energy is one of the principal investors in federal R&D. Among the government agencies, it ranks first in supporting physical sciences research and first in supporting national facilities. It ranks second in mathematics and computer science. Its research programs play an extraordinarily important role in training the

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next generation of scientists and engineers. University researchers, for example, receive slightly more than 15 percent of the Office of Science budget directly, and in many fields, including the life sciences, they rely heavily on the facilities DOE operates at its national laboratories.

Traditionally, about half of DOE's R&D budget is allocated to developing, building and operating federally funded research and development centers (FFRDCs), including multipurpose, specialized civilian and national weapons laboratories. These centers, long regarded as jewels in the nation's R&D enterprise, contain many large facilities, such as synchrotron light sources, neutron reactors, specialized accelerators and super computers, which are used by scientists and engineers in universities, industry and other federal research agencies.

The FFRDCs also provide excellent opportunities for interdisciplinary activities. Today, for example, biomedical researchers constitute more than 40 percent of the users of the synchrotron-radiation facilities, developed and maintained by accelerator physicists, optical scientists, vacuum engineers and computer scientists. And teams of scientists at FFRDCs, drawn from different fields, tackle complex problems ranging from the environment to nuclear safeguards.

The missions of the FFRDCs also evolve over time to meet changing needs and to take advantage of technological advances. The Stanford Linear Accelerator Center (SLAC), for example, developed for high-energy physics in the 1960's, today devotes an increasing fraction of its resources to the material sciences, biological sciences and cosmology.

Some research fields could not survive in the United States without the FFRDCs. The particle accelerator at Fermi National Laboratory, for example, is the center of American experiments in high-energy physics, while the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory and the Continuous Electron Beam Accelerator at Thomas Jefferson National Laboratory represent a major focus of the nuclear physics community.

POLITICAL ENVIRONMENT

When Congress takes up the FY 2008 presidential budget request for the Department of Energy, it will encounter a rocky landscape, one that was unanticipated half a year ago. It will face major proposed increases for

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R&D spending, especially for the Office of Science, where the Administration is asking for double-digit percentage growth above the FY 2007 appropriation. And it will face new “pay-go” rules that require all increases in spending in one budgetary line to be offset by reductions in other budgetary lines or by revenue increases. The large percentage increase requested for the Office of Science, although critically justifiable, will nonetheless provoke close congressional scrutiny.

Science at DOE was not supposed to have been caught in such a tight fiscal spot for FY 2008. Had Congress acted in a timely fashion and passed the required FY 2007 appropriations bills, the pending request for the Office of Science would have been just over 7 percent; large, certainly, but politically far more palatable. To understand how DOE Science finds itself in this unenviable place requires a short review of recent history.

A year ago, the President had made DOE’s Office of Science one of the cornerstones of the American Competitive Initiative (ACI), which proposes a ten-year doubling of federal research support for the physical sciences, math and engineering. With strong backing from Energy Secretary Samuel Bodman, the White House had requested a 14.1 percent increase for the Office of Science for FY 2007 to begin to address the 30-percent decline in level of effort the DOE’s program had suffered over the previous two decades. The full House and Senate Appropriations Committees had endorsed the increase, and the Department had every expectation that it would see its first significant rise in science funding in many years. But the DOE’s expectations remained unfulfilled at the October 1 start of the new fiscal year.

During the first six years of the Bush Administration Congress never once had completed the critical task of funding all activities of the federal government on time. But FY 2007 took congressional dithering to a new level. As September rolled to a close, only the Departments of Defense and Homeland Security had received their budgetary blessings. Lack of Senate action had put the rest of the federal government on temporary life support with a Continuing Resolution (CR) in place until the November congressional elections returns were in.

The CR kept funding at FY 2006 levels, and for DOE’s R&D programs the situation could not have been much worse. But prospects did get worse in the aftermath of the November elections. Republicans, who lost

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control of both the House and Senate for the first time in twelve years, elected to adjourn *sine die* and leave the Continuing Resolution in effect until February, challenging Democrats to resolve federal spending priorities in less than two months. The Administration, too, was faced with an unwelcome consequence: developing an FY 2008 budget without knowing what the DOE's FY 2007 spending might ultimately be.

In mid-December, the White House and DOE got a sense of the worst-case scenario when the new Appropriations Committee Chair Designates, Sen. Robert C. Byrd (D-WV) and Rep. David Obey (D-WI), announced that time constraints would prevent them from developing new appropriations bills and would require a CR for the balance of the fiscal year. Such a scenario, with spending frozen at last year's level, would have been catastrophic especially for the DOE Office of Science, which had lost more than 7 percent in purchasing power in FY 2006.

Eventually, intense lobbying by science advocates and pointed political direction by the Democratic leadership opened the way for budgetary adjustments for several science accounts, including DOE's research programs. But even though House Speaker Nancy Pelosi (D-CA) strongly supported the increases approved by the House in the 109th Congress, Rep. Peter J. Visclosky (D-IN), the new chairman of the Energy and Water Appropriations Subcommittee, was less enthusiastic. In what may presage the agenda his Subcommittee could follow in developing spending plans for FY 2008, he argued for re-directing the FY 2007 Science R&D increases into the Energy Efficiency and Energy Renewables (EERE) account, much of which falls outside the R&D classification. By the time the House and Senate came to agreement on what became known as the joint funding resolution for FY 2007, only \$200 million of the original \$500 million promised to the Office of Science survived. EERE received the remaining \$300 million.

Given Chairman Visclosky's inclinations, the DOE will have to do a far better job of articulating the importance of its Science portfolio to developing the future high-tech work-force, bolstering U.S. competitiveness on the global stage and, most importantly, to paving the way for the next generation of renewable energy technologies and energy efficiency. Chairman Visclosky's emphasis on near-term technological applications, rather than on long-term research, is consistent with the historical bent of many members of his party. It is the Democrats' Innovation Agenda with its emphasis on basic research, touted by House

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Speaker Pelosi, Democratic Policy Committee Chairman Rep. George Miller (D-CA) and Energy and Commerce Committee member Anna Eshoo (D-CA), among others, that represents a true break with tradition. If the House is to make DOE's wished-for R&D spending plan a reality, the new Democratic vision must trump the old one.

The political landscape in the Senate is substantially different. There, the DOE's R&D programs enjoy strong bipartisan support, with both the chairs and ranking members of the Energy and Water Appropriations Subcommittee [Byron Dorgan (D-ND) and Pete V. Domenici (R-NM)] and the Energy and Natural Resources Committee [Jeff Bingaman (D-NM) and Domenici] still reliable proponents. If there is any R&D cloud on the Senate side, it is the possibility that several senators may challenge the DOE's decision to use some of the roll-off of Environmental Management funds to support the Office of Science. But the endorsement of the DOE's science programs by more than three fifths of the Senate again this year in a "Dear Colleague Letter" addressed to appropriators suggests that the Department's science programming may well receive the favored budget treatment the Administration has requested.

FUNDING REQUEST AND PRIORITIES

Energy Supply and Conservation: Promoting America's energy security through reliable, clean and affordable energy is a DOE mantra for FY 2008. To that end, the Department would establish four goals: (1) increasing energy options and reducing dependence on oil through greater diversity in the energy portfolio; (2) improving the quality of the environment by reducing greenhouse gas emissions and mitigating adverse impacts due to energy production and energy use on land, water and air; (3) creating a more flexible and reliable energy infrastructure; and (4) improving energy efficiency in a cost-effective manner.

Although many environmentalists might consider the Department's FY 2008 R&D requests too low to achieve these lofty goals anytime soon, the proposed Energy Supply and Conservation budget does represent a break with past Administration spending proposals and priorities. Still, compared to the recently enacted FY 2007 joint funding resolution, the budget request looks remarkably modest. Except for Hydrogen Technology, which would climb 10.0 percent, and Nuclear Energy, which would jump by 15 percent, all other accounts would decline,

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mostly by double-digit percentages (see Table II-1). This apparent paradox is directly attributable to the 16.9 percent increase the Democratic-controlled Congress adopted for the Energy Efficiency and Renewable Energy account in the joint funding resolution, after it rejected the relatively flat funding the 109th Congress had favored.

Science: “Transformational Science for Energy, Environment and America’s Competitiveness” is how DOE’s Under Secretary for Science, Raymond Orbach, describes the Department’s proposed budget for the Office of Science. The White House spending plan, according to Orbach, would emphasize these three themes: (1) “Basic research for advanced scientific breakthroughs that will revolutionize our approach to the Nation’s energy, environment and national security challenges;” (2) “World-leading research capabilities that maintain U.S. leadership in science and technological innovation;” and (3) “Supporting, training and educating the Nation’s current and future scientific & technical workforce: Ph.D.’s, post docs, graduate students and science educators.”

As the prime federal agency charged with enabling innovation for future energy technologies and as the steward of the extensive scientific user facilities and national laboratories—also known as federally funded research and development centers (FFRDC’s)—widely regarded as gems in the government’s R&D portfolio, the first two missions will probably be relatively secure if Congress provides even modest increases for the Department’s activities. But as Patricia Dehmer, Associate Director for Basic Energy Sciences (BES), has noted, FY 2008 could be a make-or-break year for much of the third mission, the university research programs. The last two decades of budgetary neglect, according to Dehmer, have left the Department’s ability to fund individual investigator research grants very much in doubt. Although the Office of Science currently supports the research of 25,500 Ph.D.’s, postdoctoral research associates and graduate students, it lost 2,200 researchers last year due to limited financial resources. The FY 2008 increase the Administration has requested for the Office of Science, Dehmer says, would enable the DOE to recommit itself fully to this historic mission.

High-Energy Physics (HEP), DOE’s second largest Science program, would increase 4.1 percent from its FY 2007 level to \$782 million in FY 2008. The program would also be relieved of \$21.5 million of its total SLAC (Stanford Linear Accelerator Center) operation, with the portion associated with the Linac Coherent Light Source (LCLS) being assumed

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by Basic Energy Sciences. The Department's HEP FY 2008 budget would focus on facilities operations and improvements at Fermilab (\$216.2 million), operations at the SLAC B-Factory (\$55.8 million) and support for international programs at the Large Hadron Collider (LHC), located in Geneva, Switzerland. Non-Accelerator Physics using underground or space-based facilities, often relegated to second-class status, would see its budget rise by 21.0 percent. Finally, driven in part by R&D for the International Linear Collider (ILC) project (\$60 million), currently under consideration in a number of countries, and the general need for future superconducting radio frequency technologies (\$23.5 million), the budget would allocate a total of \$183 million to Advanced Technology R&D, a gain of 17.1 percent.

Nuclear Physics, which ran into serious funding shortfalls two years ago, would see its budget climb by 11.5 percent to \$471 million. In FY 2006, the program was so strapped for money that it planned to mothball the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory. Without a \$13 million gift from financier and philanthropist James Simons, the premier U.S. nuclear physics facility would have been shuttered, at least temporarily. For FY 2008, the DOE would provide the needed resources (\$162.2 million) for RHIC to continue studies of quark-gluon plasmas and the properties of hot, dense nuclear matter. The Nuclear Physics budget would also provide \$14.5 million in project engineering and design (PED) money for the 12-GeV upgrade of the Continuous Electron Beam Facility at Jefferson Laboratory and \$4.0 million for R&D to develop advanced rare isotope beams capabilities.

Fusion Energy Sciences would receive \$160 million for the U.S. procurement, fabrication and delivery of components to the International Thermonuclear Experiment Reactor (ITER), as well as the agreed-on share of common costs at the site in Cadarache, France. The remaining parts of the Fusion program would receive cost-of-living increases, bringing total funding to \$428 million.

Basic Energy Sciences (BES), the largest program in the Office of Science, would receive \$1.5 billion, more than one third of that devoted to facilities operations at four synchrotron light sources and three neutron sources, including the recently completed Spallation Neutron Source (SNS) at Oak Ridge National Laboratory (ORNL). The BES account would also allocate \$128.3 million to the Stanford Linear Accelerator Center for partial support of the SLAC linac and for continued

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construction of the Linac Coherent Light Source (LCLS). And it would spend \$100.5 million on the five Nanoscale Science Research Centers that are now fully operational. Finally, BES would boost its spending on core research programs in support of individual investigators to \$582.7 million. The core research programs, which have seen virtually no increases for many years, even in current dollars, received \$428.0 million in FY 2006.

Advanced Scientific Computing Research (ASCR) would benefit from a proposed \$57 million increase, bringing its total funding to \$340 million for FY 2008. American capabilities in high-speed computing, which had been outstripped by Japan only half a dozen years ago, have improved dramatically with new capabilities at ORNL, Argonne National Laboratory (ANL) and Lawrence Berkeley National Laboratory. The Department proposes to upgrade the ORNL and ANL facilities further, aiming for one Petaflop at Oak Ridge and 250-500 Teraflops at ANL. To achieve these gains, the ASCR account would include \$201.1 million for high-performance computing and network facilities and testbeds. The ASCR budget would also include \$82.8 million for applied mathematics and computer science, about a third more than in FY 2006.

Biological and Environmental Research, the home of all of the scientific earmarks in most prior years, was a “clean” account in the FY 2007 joint funding resolution, receiving \$483 million for peer-reviewed and laboratory activities. For FY 2008, the Administration would push funding to \$531.9 million, with much of the increase (\$45 million) devoted to the Life Sciences activity. In addition to continuing support of Genomics, Life Sciences would provide new monies for three Bioenergy Research Centers to accelerate investigations of cost-effective methods for producing cellulosic ethanol and other biofuels. Finally, in spite of the Administration’s stated commitment to Climate Change Research, that account would remain almost unchanged at \$138 million.

Fossil Energy: The Department would allocate almost all of the \$359 million in R&D funding in this account to Coal Research, and most of that to programs associated with producing electricity from coal with zero emissions, including the elimination of CO₂ loading of the atmosphere. The money would be split between FutureGen (\$108 million, a 100 percent increase above FY 2007) and Fuels and Power Systems (\$246 million, a decline of 21.1 percent from FY 2007).

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Atomic Energy Defense Activities – National Nuclear Security Administration (NNSA): Defense would no longer represent the largest portion of the DOE R&D portfolio, ceding that spot to Science in FY 2008. The NNSA R&D budget would grow by a scant 2.6 percent, as indicated in Table II-11, although the internal distribution of funds would shift, principally due to the planned reductions in the construction baseline for the National Ignition Facility (NIF) at Lawrence Livermore National Laboratory. The Department would reallocate some of the NIF funding to support other weapons programs, most prominently the Reliable Replacement Warhead (RRW), a controversial activity that is likely to meet some congressional resistance. Although many policy makers regard Nonproliferation and Verification to be high priorities for the United States, the Administration's budget would continue to chip away at R&D associated with this activity, reducing support by 1.6 percent to \$266 million.

Radioactive Waste Management: The Department has responsibility for managing and disposing of the nation's spent nuclear fuel and high-level radioactive waste, both civilian and military. Although the Environmental Management activity represents almost a third of all DOE spending the R&D associated with the program is very modest. For FY 2008 it would account for only \$53 million, about \$7 million below the FY 2007 funding contained in the joint funding resolution.