

## Department of Energy R&D in the FY 2010 Budget

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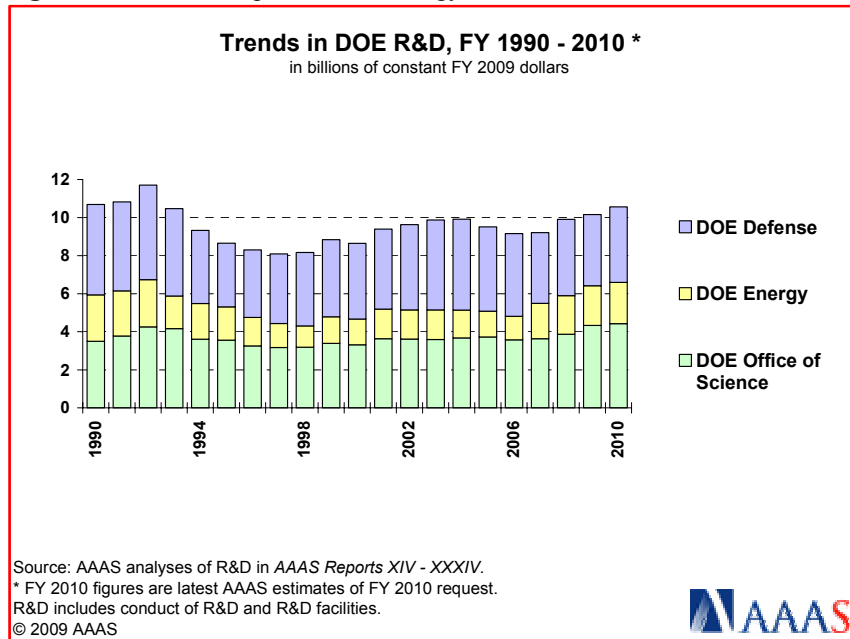
### HIGHLIGHTS

- **The Department of Energy's (DOE) Electricity Delivery and Reliability program in the Energy Portfolio would be a clear winner in the 2010 budget. R&D would more than double, climbing 104.7 percent to \$174 million.**
- The Office of Science would see a 3.3 percent rise in R&D spending, growing \$142 million for a total of \$4.5 billion, a large drop from the 13.6 percent increase last fiscal year. However, R&D in DOE Science did receive a significant boost in funding in the order of \$1.6 billion in the America Recovery and Reinvestment Act (ARRA) of 2009. The final 2009 appropriations, ARRA funding, and the FY 2010 budget request put the DOE Office of Science on track to double over ten years as detailed in the American COMPETES Act of 2007 (see Table II-11).
- The total DOE R&D portfolio would increase above the rate of inflation, growing 5.0 percent or \$508 million to \$10.7 billion because of the large increases to Electricity Delivery in the energy portfolio, and smaller increases for DOE's science and defense R&D portfolios.
- DOE's energy-related R&D would total \$2.2 billion, an increase of 5.4 percent. Investments in renewables such as solar and wind energy would show strong gains, increasing 82.9 percent and 36.4 percent, respectively. Compared to last year's request, fossil fuels would plummet in the Administration's request. Coal R&D would sink 41.7 percent for a total request of \$404 million, including the cancellation of the clean coal power initiative. In addition, DOE once again proposes to eliminate funding for gas and oil technology R&D, and to cancel \$50 million in mandatory funding for a deepwater oil and gas exploration R&D program.

## DOE R&D IN THE FY 2010 BUDGET

The Department of Energy's (DOE) R&D programs remain a high priority despite an increasingly tight domestic budget. DOE's Office of Science is the largest federal sponsor of physical sciences research and is thus one of three federal agencies (besides the National Science Foundation and the National Institute of Standards and Technology laboratories) that were selected to receive substantial increases to fulfill the goal of increasing federal investments in basic physical sciences research as laid out in the America COMPETES Act. DOE's energy R&D portfolio was also a key priority during the Bush Administration and thus received enormous increases in 2007 and 2008.

**Figure 1.** Trends in Department of Energy R&D



The total DOE budget would decrease substantially by \$7.4 billion or 21.8 percent to \$26.4 billion (see Table II-11). However, that decrease is due to the one-time appropriation of \$7.5 billion in FY 2009 for an Advanced Technology Vehicle Loan program. The DOE R&D portfolio would climb \$508 million or 5.0 percent to \$10.7 billion in the 2010 budget (see Table II-11). The energy R&D portfolio would grow by a modest 5.4 percent to \$2.2 billion after receiving enormous increases in

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2007 and 2008, while DOE's defense R&D portfolio would gain 6.8 percent to \$4.0 billion.

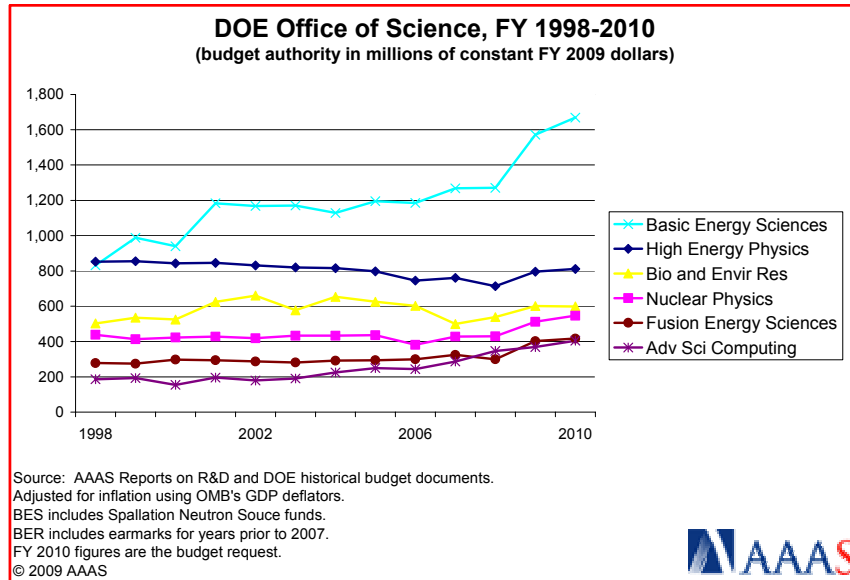
### **R&D IN THE DOE OFFICE OF SCIENCE**

DOE's Office of Science has long been the dominant federal sponsor of physical sciences research, especially in physics and related fields. It is also an important supporter of computer sciences, mathematics, environmental sciences, materials research, nanotechnology, and engineering. It was one of the programs targeted by the America COMPETES Act to double between 2006 and 2016. But until fiscal year 2009 Science appropriations had fallen short of that trajectory, despite requests for large increases. In 2007, DOE requested a 14 percent increase for Science funding, and ended up with 5 percent; in 2008, the request was for a 16 percent increase, but again the final increase was 5 percent. In 2009 the agency requested an 18.6 percent increase and the final appropriations provided 17.3 percent. Although the FY 2010 budget request does not follow this trajectory and calls for only a 3.3 percent increase (\$142 million) for a total budget of \$4.5 billion (see Table II-11), it does not take into account the \$1.6 billion that the Office of Science received in 2009 as part of the stimulus package (see Figure 1).

**Funding for individual Science programs would vary with some receiving substantial boosts such as climate and environmental sciences at 61 percent, and others facing steep declines such as the 25 percent drop in biological systems science (see Figure 2).**

The Office of Science supports cutting-edge research through a mix of laboratory research at DOE's national laboratories, university-based research, and the construction and operation of large scientific user facilities that can be used by external researchers for their experiments. Roughly half of Science R&D funding goes to operate and construct facilities, while the other half supports research, mostly at DOE laboratories, but also a large portion at universities. The laboratory research and large facilities are housed primarily at ten Science laboratories that are federally owned and contractor operated, such as the Oak Ridge National Laboratory in Tennessee, Brookhaven National Laboratory in New York, and Argonne National Laboratory in Illinois.

**Figure 2.** Department of Energy Science Programs



After a significant hit in 2008 that deleted the U.S. contribution to the International Thermonuclear Experimental Reactor (ITER) project, fusion research would total \$421 million, up \$18 million or 4.6 percent. The request includes \$135 million to continue support for R&D, procurement and personnel contributions to the ITER project now underway in France, after appropriators zeroed out U.S. participation in ITER in 2008 to preserve funding for domestic fusion programs. Domestic fusion projects in New Jersey, California, and Massachusetts would mostly stay even in 2009 after an increase in 2008.

The High-Energy Physics (HEP) program also took a significant hit in 2008 appropriations, but rebounded in the final 2009 budget receiving \$796 million, up \$93 million or 13.2 percent. The Administration would request only a 2.9 percent increase in FY 2010, leaving the programs with a total of \$819 million. The program does most of its work at three facilities located at two DOE labs (Fermilab in Illinois and the Stanford Linear Accelerator Center (SLAC) in California) and also cooperates in the international Large Hadron Collider (LHC) in Switzerland, which experienced a massive electrical malfunction shortly after it was officially turned on last year. The European Organization for Nuclear Research, which manages and operates the facility, has targeted late 2009 to relaunch the facility. The International Linear Collider (ILC), the next

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big international high-energy physics project after the LHC, resulted in layoffs and furloughs at the Fermilab in Illinois after appropriators slashed funding in 2008. Although the project is not included in the 2010 request, funding in the order of \$60.2 million went to Fermilab as part of the ARRA package allowing the lab to remain open and to potentially bring the ILC back on track.

Basic Energy Sciences (BES) fared better than High-Energy Physics. The program would receive a 7.2 percent increase to \$1.7 billion in 2010 (see Figure 2). BES would continue to support the new Energy Frontier Research Centers initiated last year at approximately \$100 million for basic research in material, chemical, and geosciences. The request also includes funding to develop two new Energy Innovation Hubs in fuels from sunlight and battery storage. Construction funding for the National Synchrotron Light Source II and Linac Coherent Light Source will continue, while funding for the Spallation Neutron Source (SNS) and five nanoscale research centers would keep current operations at a high level.

High-performance computing research in the Advanced Scientific Computing Research (ASCR) program would be boosted 10.9 percent to \$409 million to expand the availability of high-performance computing capacity that researchers can use for their experiments, primarily at Oak Ridge and Argonne laboratories. Biological and Environmental Research (BER) would essentially remain flat with a 0.4 percent increase in 2010 to \$604 million. The slight growth is due mostly to a 25 percent drop in the Biological Systems Science program. In contrast, Climate and Environmental Sciences would see a 60.6 percent increase, mostly to support a new effort to be started in 2010 on climate modeling visualization. The BER funding request also will continue to fund three bioenergy research centers in Tennessee, Wisconsin, and California to work on cellulosic ethanol and other biofuels.

### **DOE ENERGY R&D**

In the last few years, DOE's applied investments in energy R&D have expanded dramatically from roughly \$1.5 billion a year to well over \$2 billion (see Figure 1). In 2010, DOE would continue on that trajectory with a \$2.2 billion request, up \$112 million or 5.4 percent.

**There would be some reshuffling of renewable energy R&D priorities to reflect the new Administration's priorities, and funding**

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**for a number of areas would grow extremely high compared to earlier years.** The Hydrogen Technology program (\$169 million in FY 2009) was dropped and reconfigured into a new Fuel Cell technology R&D program with a request of \$68 million. Biomass R&D would increase 8.3 percent for a total of \$235 million, a stark contrast to last year's request for a 14 percent increase. Solar energy R&D spending, on the other hand, would ramp up significantly growing 82.9 percent to \$320 million. In another change of priorities, the Wind Energy R&D program would get a boost in 2010 to \$75 million, up 36.4 percent. But hydropower funding would fall from \$40 million to \$30 million. In past years, this program would see an annual tug-of-war between DOE and Congress over its relative importance with Congress reversing previous attempts to eliminate the program. Another new priority for the Administration is the launch of a new education program entitled the Regaining our Energy Science and Engineering Edge (RE-ENERGYSE) program. DOE proposes \$115 million in FY 2010 for this new initiative to encourage students from K-12 to undergraduate studies and beyond to pursue education and careers in energy-related sectors.

Proposed for big decreases is nuclear energy R&D, a renewable energy technology funded in a separate account, down 13.7 percent in FY 2010 dropping from \$651 million to \$562 million. Much of the FY 2010 funding for nuclear R&D would continue to support nuclear reactor, fuel cycle, and waste management technologies, in addition to safety and nonproliferation activities.

Funding for other energy programs would also increase well above the rate of inflation; Geothermal Technology would grow 13.6 percent to \$50 million, Building Technology would grow significantly by 69.8 percent to \$238 million, while Industrial Technology would increase 11.1 percent to \$100 million and Vehicle Technology would increase 21.9 percent to \$333 million.

Fossil energy R&D would decline in 2010 to \$469 million, down 4.5 percent, but that is due in part to congressional earmarks that are not renewed in the 2010 request and to the fact that \$3.5 billion was appropriated for fossil energy programs (e.g., carbon capture and sequestration) in the ARRA stimulus package. Hence, funding for the Clean Coal Power Initiative, Carbon Sequestration, and other fuel and power system programs appear to be zeroed out in the FY 2010 budget, when in fact funding exists to support these efforts within DOE. That said the FutureGen program, which was set to double in the FY 2009

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request and was zeroed out by the 111<sup>th</sup> Congress in the 2009 omnibus bill, would not be renewed in the new Administration's request. Elsewhere within fossil energy, funding for Natural Gas Technology would grow 25 percent to \$25 million. Finally, as the former Bush Administration had done in past years, the Obama Administration budget request would try to block \$50 million in mandatory funding for an ultra-deepwater natural gas and other petroleum research fund that was created by the Energy Policy Act of 2005 and scheduled for a 2007 start. DOE would block 2010 funding to shift money to other programs.

### **DOE DEFENSE R&D**

DOE and its predecessors have long had responsibility for managing the nation's nuclear weapons stockpile, supplying nuclear reactors to the Navy, and dealing with the environmental consequences of nuclear weapons work. DOE's defense R&D to address these responsibilities would gain 6.8 percent or \$254 million to \$4.0 billion in 2010 (see Table II-11). The core Weapons Activities programs, which funds science-based alternatives to nuclear testing in order to maintain the U.S. nuclear weapons stockpile, would be essentially flat funded at \$6.4 billion in 2010. A little less than half of this spending goes to R&D activities, for a total of \$2.7 billion (up 0.6 percent). The most significant change between 2009 and 2010 is the Administration's support for Fissile Materials Disposition, a program to dispose of surplus weapons-grade fissile material in the United States. That program would ramp up an astounding 1,612 percent, from a mere \$41 million in FY 2009 to \$702 million in the FY 2010 request. While the majority of the funds would go towards the disposal of surplus fissile materials in the United States, approximately \$1 million would go to support U.S. activities in Russia. The Environmental Management program would also see significant growth, increasing 228 percent to \$105 in FY 2010 to continue to support efforts to clean up and speed up the closure of former nuclear weapon production facilities.

The Advanced Simulation and Computing program, which funds high-end computing simulation of nuclear explosions, would stay flat at \$556 million. The program, the defense counterpart to the nondefense ASCR program, mostly takes place in DOE's three weapons laboratories (Los Alamos and Sandia in New Mexico, Lawrence Livermore in California). The Inertial Confinement Fusion program, aimed at simulating nuclear weapons fusion under controlled laboratory conditions, would also remain flat at \$437 million.

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The DOE proposal does not renew the proposal to initiate research on the Reliable Replacement Warhead (RRW) project to explore new warhead designs for use with existing nuclear weapons. The project faced consistent skepticism in Congress over whether the U.S. needs new warheads, even for existing weapons and zeroed out funding for RRW development 2008 and 2009.

#### **OUTLOOK FOR THE DOE BUDGET**

Because energy R&D continues to be a high priority both for the new Obama Administration and the Democratic Congress, DOE R&D programs could be well positioned to receive increases in the 2010 appropriations process, but any increases to domestic discretionary spending programs could be vulnerable because they represent a large potential source of funds if Congress seeks to shift priorities to other domestic programs. As always, congressional appropriators will revise the DOE request and may rearrange the mix of priorities. For example, the new RE-ENERGYSE program did not receive significant support in the House appropriations bill so far. The overall outcome will hinge on whether Congress will be any more successful than in the past two years in securing more money overall for domestic appropriations. Given the current economic crisis and the level of government spending laid out in the ARRA stimulus package, the 111<sup>th</sup> Congress is less likely to have the appetite to further expand discretionary levels.