



AAAS R&D Funding Update November 19, 2003 (updated Nov. 26 in [])-

Energy Bill Authorizes Increased DOE Science Funding, But Appropriations Fall Short

Highlights

- **Congress has finalized a comprehensive energy policy bill that establishes U.S. energy policy for the next decade.** The bill includes authorizations for science and energy R&D programs in the Department of Energy (DOE).

- **The energy bill authorizes \$23.7 billion in funding for DOE's Office of Science over the next five years, but funding is unlikely to match the authorization (see Table). The FY 2004 appropriation for the Office of Science falls \$333 million short of the FY 2004 authorized level.**

After two years of debate, Congress has finalized a comprehensive energy authorization bill (HR 6) that sets U.S. energy policy for the next decade. [Congress was set to give final approval to the conference report (final version) of the bill last week, but the Senate failed to close debate on the bill, postponing final action until 2004 and possibly dooming the chances for the bill to be signed into law.] The 1000-plus page bill provides tax incentives for U.S. energy production, sets federal standards for energy use and energy efficiency, changes federal regulations on extracting energy from public lands, partially restructures the U.S. electric power industry in response to the August Northeast blackout, and authorizes programs in the Department of Energy (DOE). The bill includes authorizations for DOE's energy and science R&D programs which provide both policy guidance as well as suggested funding levels for the next five years.

The energy bill authorizes \$23.7 billion in funding for DOE's Office of Science over the next five years (FYs 2004-2008) on a funding path that would see the Office's budget grow by 76 percent from last year's level to a high of \$5.8 billion in FY 2008 (see Table). After adjusting for expected inflation, the gain would be 62 percent over FY 2003. The bill authorizes similar increases in funding for DOE's energy R&D programs in the areas of energy conservation, fossil energy, solar and renewable energy, and nuclear energy. In all, the bill authorizes \$37.2 billion over the next five years for DOE's primarily R&D programs in energy and science, including \$6.0 billion for FY 2004.

Authorization bills, however, only contain suggested funding levels and do not actually provide funding. Unlike the tax cuts totaling \$26 billion over the next decade that are included in the bill and would take effect without further action, funding for these DOE programs and others will continue to be provided year by year in the annual appropriations bills and could fall well short of the authorized funding levels. Authorizations are intended as guides for future Congresses as they make budget decisions one year at a time, and are intended to set policy guidelines for how programs operate.

This week, Congress approved FY 2004 appropriations for DOE that fall well short of the authorized levels in the energy bill. On the same day that the House authorized \$3.8 billion for the Office of Science in FY 2004 in the energy bill, the House approved an Energy/Water appropriations bill (HR 2754) that provided \$3.5 billion in actual funding for FY 2004, falling \$333 million short of the authorization. For all the R&D programs covered in the energy bill, final FY 2004 appropriations fall short of the authorized funding levels (see Table), dimming prospects for actual funding to meet the authorized targets in future years. For primarily R&D programs authorized in the energy bill, final FY 2004 funding levels fall \$582 million short of the \$6.0 billion authorized. (The November 10 AAAS R&D Funding Update on the AAAS R&D web site provides details of final FY 2004 appropriations for DOE).

Office of Science programs in the Energy bill

The energy bill legally authorizes the activities of DOE's **Office of Science (OS) for the next five years, and authorizes \$23.7 billion on a budget path that would see its budget grow from \$3.3 billion last year to \$5.8 billion by FY 2008 through a series of budget increases between 10 and 15 percent a year**, including an authorized 15 percent boost in FY 2004. The final FY 2004 appropriation of \$3.5 billion, however, is only a 4.7 percent increase and falls well short of the authorization. 93 percent of the OS budget goes to R&D activities, with the remainder for overhead costs and infrastructure support.

Only a few OS programs receive specific authorized funding levels, leaving DOE with greater flexibility to determine the shape of future budgets. **The Fusion Energy Sciences program** is the only OS major program to receive a specific authorization of \$335 million in FY 2004, increasing to \$393 million in FY 2008 for a nearly 60 percent increase over last year. The \$264 million appropriation for FY 2004 falls \$71 million short of the authorization. The Fusion authorization does not include future construction costs of the **International Thermonuclear Experimental Reactor (ITER)** program, a multi-national multi-billion dollar fusion research facility that will begin construction shortly in either Europe or Japan, but the energy bill authorizes DOE to negotiate U.S. participation in ITER. It also calls on DOE to create a written plan to fully document the U.S. role in ITER. If U.S. participation in ITER should end, the energy bill provides an alternative for a domestic burning plasma experiment instead. For the wider fusion program, the energy bill declares that it will be U.S. policy to conduct R&D and other activities leading to the utilization of fusion for domestic energy as soon as possible and calls on DOE to submit a plan within six months on how the U.S. can achieve that policy.

The energy bill also authorizes the completion of another major science facility, the **Spallation Neutron Source (SNS)** under construction in Tennessee. The bill caps total SNS project costs (including past costs) at \$1.4 billion and authorizes \$349 million for construction and development costs through the expected completion of the facility in FY 2006. The project is funded by the OS Basic Energy Sciences program.

The energy bill authorizes several R&D efforts within the OS portfolio. The bill authorizes continuing efforts in catalysis research and development. Catalysis R&D in the OS Basic Energy Sciences program funds R&D on catalyst design, catalyst synthesis, and basic molecular research to better synthesize catalyst compounds. There is an authorization of \$183 million over five years within OS for these efforts. The bill also authorizes the rapid expansion of the existing **nanoscale science and engineering program** in DOE, part of the multi-agency National Nanotechnology Initiative. The bill envisions the DOE effort nearly tripling between FY 2003 and FY 2008, from \$133 million to \$390 million, although the FY 2004 appropriation would fall approximately \$65 million short of the FY 2004 authorization. The nanotechnology authorization is similar to the authorized levels in the pending House bill to authorize the multi-agency initiative. The bill also authorizes the Genomes to Life program within OS Biological and Environmental Research, although it authorizes \$100 million only in FY 2004 as an explicit authorization of funding. Looking to the future, the bill authorizes a new fission and fusion energy materials research program beginning in FY 2006 that would perform materials science research related to fission and fusion.

Left out of the final Energy bill is the creation of a post of Under Secretary for Science in the DOE to provide a high-visibility figure in the Department with direct responsibility to the Energy Secretary. Many advocates for DOE's science activities have called for this step, and had hoped that the final energy bill would create this position. Currently, the Director of DOE OS is several steps lower than an Under Secretary in the DOE hierarchy.

Energy R&D Programs in the Energy Bill

In addition to the Office of Science, **DOE funds energy-related R&D programs through programs in Energy Conservation, Fossil Energy, Renewable Energy, and Nuclear Energy**, all of which are authorized in the final energy bill. The bill envisions steadily increasing budgets for all of these programs (see Table), including a doubling of the Nuclear Energy budget from \$260 million in FY 2003 to \$690

million in FY 2008. The Energy Conservation program funds R&D on energy efficiency technologies in energy-using industries, buildings, transportation, and the energy distribution network, in addition to non-R&D activities to encourage greater use of energy-efficient technologies in housing. The Fossil Energy program funds R&D on new technologies to reduce the use of coal, oil, and natural gas or to reduce their environmental impacts. Included in the Fossil Energy program is the Clean Coal Power Initiative, an R&D effort to develop cleaner-burning coal technologies and to encourage their implementation in power generation and other industries. The energy bill authorizes \$200 million a year separately for the next five years for this program. The Renewable Energy program funds R&D on solar, geothermal, wind, hydrogen, biomass, and other renewable energy technologies, and also funds efforts to deploy these technologies on a wider scale. Elsewhere in the energy bill is a comprehensive authorization for a hydrogen program to develop, deploy, and encourage the use of hydrogen in vehicles, energy production, and fuel cells, authorized at \$274 million in FY 2004 in an overlap with the Renewable Energy and Energy Conservation programs. The Nuclear Energy program funds a variety of programs related to nuclear power, including a Nuclear Energy R&D Initiative to develop next-generation nuclear power technologies and university programs to encourage nuclear R&D.

All told, these energy R&D programs are authorized to receive \$13.5 billion over the next five years, of which roughly two-thirds would go to R&D activities. But the FY 2004 appropriations for these programs fall \$249 million short of the FY 2004 authorization, casting doubt on whether these funding levels will actually materialize in future budgets.

Other Provisions in the Energy Bill

There are several miscellaneous provisions in the energy bill that could affect the management of DOE's R&D portfolio. The bill calls on DOE to contract with the National Academy of Sciences to do a study on DOE's R&D evaluation methodologies to determine the scientific and technical merit of these methodologies and to recommend improvements. The bill also calls on DOE to use merit review to award R&D funds as much as possible, and to rely on external advisory boards for scientific advice for both the DOE Office of Science and the energy R&D programs. In a nod to the future workforce needs of DOE, the bill also authorizes the creation of a DOE scholarship program that will prepare students for careers at DOE, starting at \$800,000 in FY 2004 and growing to \$2 million in FY 2008. Finally, there are also earmarks (congressionally designated performer specific R&D projects) in the bill. The bill instructs DOE to build an Arctic Engineering Research Center at the University of Alaska Fairbanks and provides \$3 million a year for six years out of DOE funds for that purpose. Another facility, the Barrow Geophysical Research Facility, is authorized as a multi-agency \$61 million facility, but funds are only authorized and not appropriated.

Next Steps

[The Senate failed to limit debate on the energy bill, and Senate leaders have pulled the bill from the Senate calendar until 2004. It is unclear whether the Senate will be able to approve the bill next year, or whether the bill will die in the Senate. The final Energy/Water appropriations bill is expected to be signed into law shortly. The Fossil Energy and Energy Conservation programs already have their final FY 2004 budgets in the Interior appropriations bill.]

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AAAS Analysis of the FY 2004 Energy Authorization Bill

Table. AAAS Analysis of DOE Authorized Funding Levels in the FY 2004 Energy Bill
(budget authority in millions of dollars)

	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008	% Change FY 03-08	
	Estimate	Auth.	Auth.	Auth.	Auth.	Auth.	current \$	constant \$
Authorized Funding Levels								
Office of Science	3,295	3,785	4,153	4,618	5,310	5,800	76.0%	62.4%
- Fusion Research	248	335	349	362	377	393	58.5%	46.2%
- Nanoscale Science	133	270	292	322	355	390	193.2%	170.6%
Energy Conservation	600	616	695	772	865	920	53.3%	41.5%
Fossil Energy	459	530	556	583	611	626	36.3%	25.8%
Clean Coal Power	149	200	200	200	200	200	34.2%	23.8%
Renewable Energy	398	480	550	610	659	710	78.4%	64.6%
Nuclear Energy	260	398	485	565	595	690	165.4%	144.9%

FY 2004 Authorized vs Appropriated

	FY 2004	FY 2004	Change in '04
	Auth.	FINAL	Final vs. Authorized
Office of Science	3,785	3,452	-333
- Fusion Research	335	264	-71
- Nanoscale Science	270	205	-65
Energy Conservation	616	589	-27
Fossil Energy	530	493	-37
Clean Coal Power	200	172	-28
Renewable Energy	480	421	-59
Nuclear Energy	398	301	-97

Source: AAAS analyses of funding levels in the conference report of the FY 2004 energy authorization bill (HR 6).

Programs in the table include both R&D and non-R&D components.

FY 2003 figures represent latest estimates of FY 2003 funding levels from the FY 2003 omnibus appropriations bill.

FY 2004 Final figures based on final FY 2004 Energy / Water and Interior appropriations bills

Constant dollar conversions based on GDP deflators from OMB.

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