Congress Approves Increase for DOE R&D

(This analysis is part of a series of AAAS R&D Funding Updates on the FY 2002 congressional appropriations process. This analysis includes information on R&D in final FY 2002 appropriations for the Department of Energy. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D by agency in FY 2002 appropriations, is available on the AAAS R&D Web Site (http://www.aaas.org/spp/R&D) in the "FY 2002 R&D" or the "What's New" sections.)

(This update is substantially similar to the October 31 update on DOE appropriations, but the figures and text have been updated to include emergency appropriations for DOE approved in December.)

Recently, President Bush signed into law the final versions of two appropriations bills providing funding for the Department of Energy (DOE). On November 13, he signed into law the FY 2002 Energy-Water appropriations bill (HR 2311; Public Law 107-66), which funds most of DOE. Earlier on November 5, he signed the FY 2002 Interior appropriations bill (HR 2217; Public Law 107-63), which funds the remainder of DOE. DOE also received emergency counter-terrorism and domestic security appropriations in a Defense bill that cleared Congress on December 20. Together, the bills provide **$8.1 billion for DOE's R&D programs, $378 million or 4.9 percent more than FY 2001, and a substantial $723 million above the request** (see Table). R&D in DOE's three mission areas of energy, science, and defense all increase over FY 2001.

Both the Energy-Water and Interior bills provide far more for nondefense discretionary programs than the budget request, in a strong dissent from the Bush Administration's proposals to cut dramatically federal investments in energy and natural resources-related programs. The two bills together provide $21.2 billion for DOE's total budget in FY 2002 (including emergency funds from the Defense bill), nearly $1.3 billion more than FY 2001 (see Table). The appropriations are $2.1 billion more than the sharply reduced DOE budget the Administration requested. About two-thirds of the DOE budget goes to defense-related activities involving the U.S. nuclear weapons stockpile and related environmental clean-up costs. The final appropriation provides $14.9 billion for DOE's defense activities (up 8.0 percent; see Table), including a substantial boost from emergency funds for counter-terrorism activities. DOE's nondefense programs also increase slightly compared to FY 2001, but increase dramatically compared to the request.

Within this mix, DOE's R&D programs fare slightly worse than the overall DOE budget but still see an increase. **Total DOE R&D is $8.1 billion, a 4.9 percent increase over FY 2001, with small increases for energy R&D (up 1.6 percent) and science R&D (up 2.1 percent) and a larger increase for defense R&D (up 8.4 percent). The slight increase for energy R&D compares favorably to the DOE budget request, which called for a 28.3 percent cut in DOE's energy-related R&D.**

Although energy policy was much in the news before the September 11 terrorist attacks because of gasoline price hikes, brownouts in California, the release of a controversial Bush Administration National Energy Policy, and proposals to open the Alaska National Wildlife Refuge (ANWR) for oil drilling, in recent months those concerns took a back seat to simply moving the DOE appropriations forward, and the final bills avoid controversies over DOE and energy in order to provide DOE with basically a status-quo budget, except for emergency appropriations from the post-September 11 response fund. Falling oil prices even in a time of U.S. military action in the Middle East have taken much of the urgency away from formulating new energy policies. While the Bush Administration proposed drastic cuts in many of DOE's energy R&D programs, the final bills generally keep funding at FY 2001 levels or provide slight increases. While the Administration requested a 30.8 percent cut in **Renewable Energy Resources** R&D, the final appropriation allows for a 3.3 percent increase over FY 2001 to $339 million. In the final Interior bill, **Fossil Energy** R&D increases 3.0 percent to $408 million, a far cry from the requested cut of more than 25 percent. The

request would have reduced funding for several fossil energy areas such as oil and gas by as much as 50 percent, offset somewhat by an increased emphasis on coal research. The final bill keeps funding for most fossil fuels at close to FY 2001 levels, while also providing additional funds for coal technologies. The Interior bill also boosts **Energy Conservation** R&D by 3.1 percent to $454 million, a sharp contrast to a proposed 28 percent cut. The overall Energy Conservation account climbs by 11.9 percent to $913 million because of significant boosts to two non-R&D grants programs, the weatherization assistance program and the state energy grants program. The only energy R&D program to decline is Nuclear Energy R&D, down 3.5 percent to $78 million, though is well above the $57 million request.

In the **Science** account, the final Energy-Water bill provides $3.0 billion for R&D, a $63 million or 2.1 percent increase. Most Science programs receive funding close to FY 2001 funding levels. Both **Fusion Energy Sciences** and Nuclear Physics receive the same amounts as last year ($245 million and $355 million, respectively). The **High Energy Physics** (up 0.6 percent to $706 million) program edges up slightly. The **Advanced Scientific Computing Research** (ASCR) declines by 4.6 percent to $158 million. Within the **Basic Energy Sciences** (BES) program, Congress provides $291 million in funding for **the Spallation Neutron Source (SNS)**, the same as the request and 4.8 percent more than FY 2001. The largest increase in the Science account is in the **Biological and Environmental Research** (BER) program, which funds DOE's contribution to the Human Genome Project. BER funding jumps $46 million or 9.6 percent to $527 million because the conference report contains $73 million for more than 50 congressional earmarks, some of them renewed from FY 2001.

On the defense side, most of DOE's R&D is funded by the **National Nuclear Security Administration (NNSA),** which was created two years ago by Congress in response to national security concerns and allegations of espionage at DOE weapons laboratories. NNSA began operations on March 1 of 2000, and is designed to be a semi-autonomous agency within DOE with its own command structure separate from the rest of DOE. NNSA is responsible for $7.6 billion, or more than a third, of the total DOE budget in FY 2002 (up 12.2 percent from FY 2001).

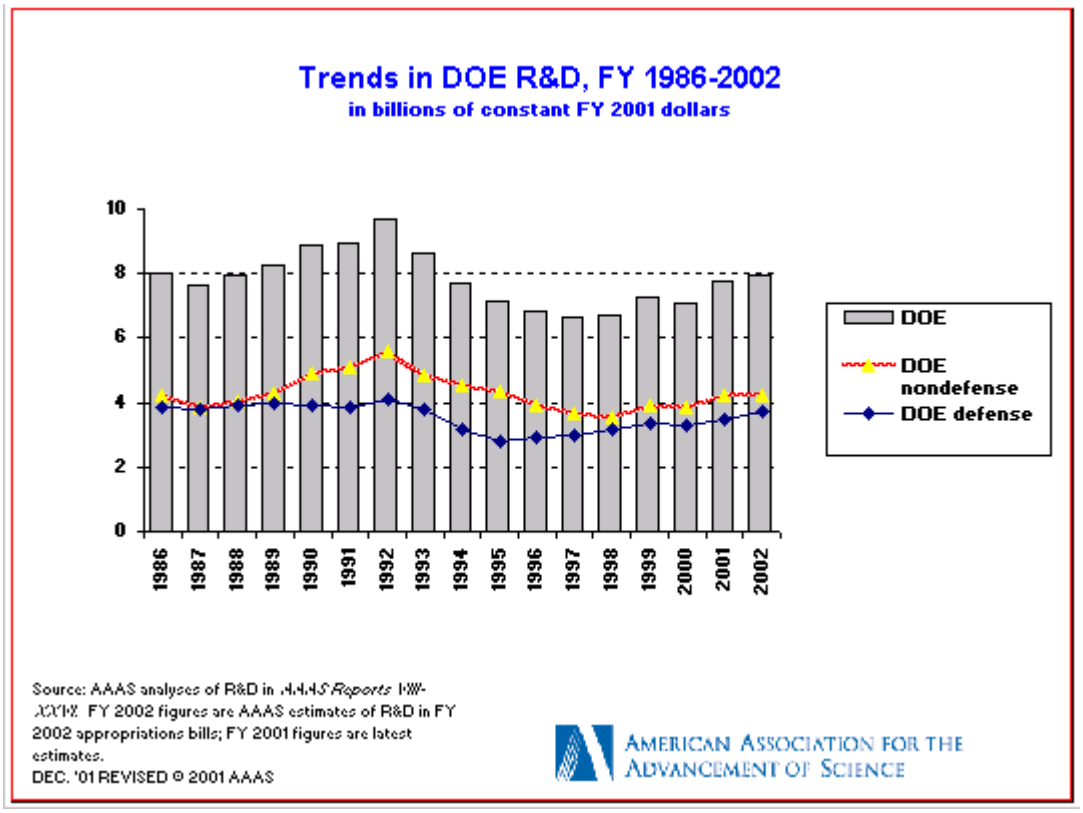

Figure 1. (click on the image to view or download a color, full-page PDF version of the chart)

NNSA funds almost half of DOE's total R&D, $3.6 billion out of a $8.1 billion portfolio in FY 2002. Maintaining the U.S. nuclear weapons stockpile is one of DOE's major defense responsibilities, and since the U.S. banned nuclear testing DOE has relied on science to ensure the continuing reliability and safety of U.S. nuclear weapons. DOE's major R&D program in that effort is in Weapons Activities. **The final Energy-Water bill provide $2.6 billion for Weapons Activities R&D in FY 2002, a 9.0 percent increase**. The total includes a supplemental emergency appropriation of $60 million for R&D out of the post-September 11 emergency fund. This program funds most of the R&D at the three weapons labs (Los Alamos and Sandia in New Mexico, Lawrence Livermore in California) which are responsible for the nation's nuclear weapons stockpile. Within the account, the final bill cuts funding for **Advanced Simulation and Computing** (formerly the **Accelerated Strategic Computing Initiative** (ASCI)), an effort to develop the next generation of computer processing technologies to better model nuclear explosions. The program receives $730 million, down 2.3 percent from this year. Inertial Confinement Fusion (ICF) receives $261 million, an increase of 11.9 percent. DOE hopes to use ICF technologies to simulate nuclear explosions. The **National Ignition Facility**, the major facility for the ICF effort, receives the requested $245 million for construction in the final bill, despite continuing concerns that the project may fall further behind schedule and over budget. The emergency funds mostly go to improving physical and cyber security at the weapons laboratories.

Included in the Defense bill's emergency appropriations for DOE is $78 million for nonproliferation R&D to develop improved detection technologies for bioterrorism and nuclear terrorism agents and an expanded research effort on potential nuclear terrorism. Because of the emergency funds, total nonproliferation and verification R&D increases 51.2 percent to $309 million.

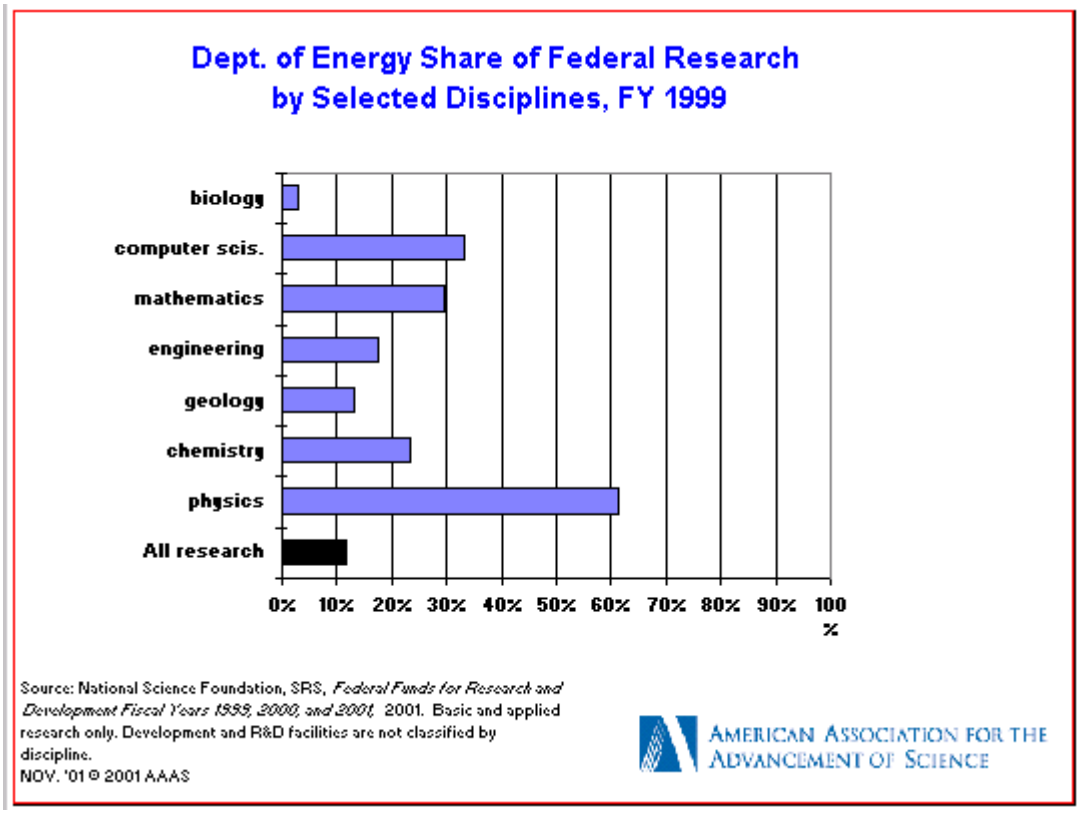

Figure 2. (click on the image to view or download a color, full-page PDF version of the chart)

DOE's R&D budget has had an up-and-down history over the past several years, as shown in Figure 1. After the end of the Cold War, DOE's defense R&D declined sharply from FY 1992 to FY 1995, but has increased since then as the Stockpile Stewardship (now Weapons Activities) program's budget has grown.

The FY 2002 increase brings DOE defense R&D nearly back to its late Cold War funding levels. DOE's nondefense R&D also peaked in FY 1992 but then suffered a steeper and more prolonged decline that lasted until FY 1998. Initially, the cuts were driven by the cancellation of the Superconducting Super Collider in 1993. But after the Republican takeover of Congress in 1994, DOE nondefense R&D declined further because of tight restrictions on domestic discretionary spending aimed at achieving a balanced budget and because of Republican animosity toward DOE itself. In the last few years, DOE nondefense R&D has begun to inch back toward previous funding levels but falls behind inflation in FY 2002. Total DOE R&D has been increasing for the past five years but remains well below the funding levels of the early 1990s.

DOE is a key funding source for research in many disciplines, as shown in Figure 2. Although DOE funds only about 11 percent of total federal support for research, it is by far the largest supporter of physics research, accounting for nearly two-thirds of total federal support. DOE is also an important supporter of research in mathematics (the largest federal supporter) and computer sciences (second behind only DOD), with 30 percent of total federal support in these fields funded both through the nondefense ASCR program and Weapons Activities on the defense side. DOE is also the largest agency supporter of chemistry research with nearly a quarter of all federal support. DOE is the third-largest supporter of engineering research behind DOD and NASA, with 17 percent of the total, but in the sub-disciplines of chemical engineering and metallurgy / materials engineering DOE provides half and a third of total federal support, respectively.

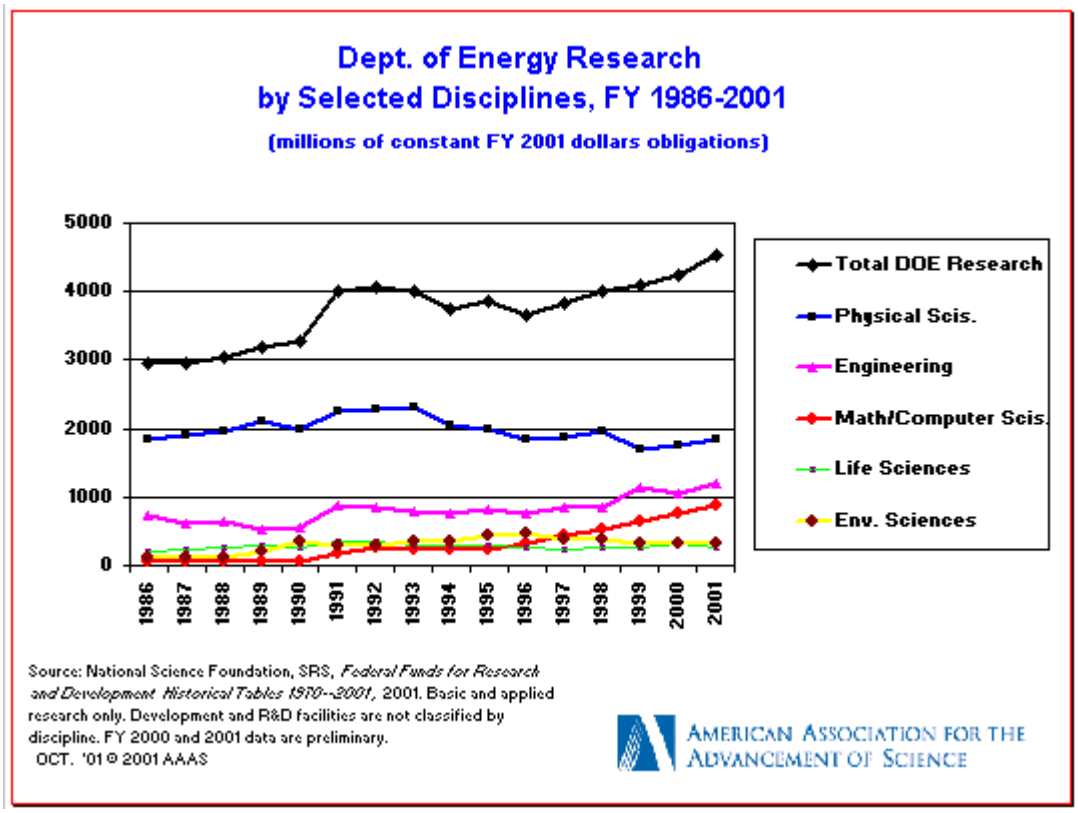

Figure 3. (click on the image to view or download a color, full-page PDF version of the chart)

As shown in Figure 3, DOE support for these fields has had its ups and downs over the past decade. While overall DOE research funding has increased in recent years as DOE has shifted its portfolio away from development toward basic and applied research, funding for the physical sciences (which includes physics and chemistry) has declined dramatically from Cold War peak funding levels. This has especially affected physics, for which DOE is the majority federal sponsor. Other disciplines have fared better: engineering funding has mostly remained steady, while DOE support of mathematics/computer sciences (mostly computer sciences) has increased dramatically because of the increasing importance on high-performance

computing in DOE's nuclear weapons work and the increasing importance of IT research in the overall federal portfolio.

In addition to its important funding role in federal research, DOE is the second largest federal funding source for R&D facilities construction, including large capital equipment for research, and is the largest if NASA's enormous Space Station investment is excluded. In FY 2002, DOE will spend $1.1 billion of its R&D budget on R&D facilities and capital equipment. In addition to construction, DOE is also responsible for the operation of dozens of scientific user facilities at its national laboratories, which allow scientists and engineers across a broad range of disciplines to use unique laboratory facilities and research equipment unavailable in their own laboratories. In addition to existing facilities at DOE labs, in the next few years the Spallation Neutron Source and the National Ignition Facility will be completed.

President Bush signed the Energy-Water bill into law on November 13 (Public Law 107-66), and the Interior bill into law on November 5 (Public Law 107-63). Congress gave final approval to the Defense bill on December 20, which includes $158 million in emergency R&D funds for DOE's defense activities out of the $40 billion post-September 11 emergency response fund.

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Table. Department of Energy
Congressional Action on R&D in the FY 2002 Budget
(budget authority in millions of dollars)

			Action by Congress				
	FY 2001	FY 2002	**FY 2002**	Chg. from Request		Chg. from FY 2001	
	Estimate	Request	**Approved**	Amount	Percent	Amount	Percent
DOE Appropriations Containing R&D:							
1. Energy Supply R&D	409	284	**417**	133	46.8%	8	2.0%
2. Fossil Energy R&D	396	296	**408**	112	37.8%	12	3.0%
3. Energy Conservation	441	316	**454**	138	43.8%	14	3.1%
4. Science	2,955	2,930	**3,018**	88	3.0%	63	2.1%
5. Atomic Energy Defense Activities	3,499	3,542	**3,794**	252	7.1%	295	8.4%
6. Clean Coal Technology [1]	0	0	**0**	0	- -	0	- -
7. Radioactive Waste Management	45	31	**31**	0	0.0%	-13	-29.9%
Total DOE R&D	7,744	7,399	**8,122**	723	9.8%	378	4.9%
Detail of selected appropriations:							
1. Energy Supply R&D							
Solar and Renewables	328	227	**339**	112	49.3%	11	3.3%
Nuclear Energy	81	57	**78**	21	36.7%	-3	-3.5%
TOTAL Energy Supply	409	284	**417**	133	46.8%	8	2.0%
4. Science [2]							
High Energy Physics	702	706	**706**	0	0.0%	4	0.6%
Nuclear Physics	355	355	**355**	0	0.0%	0	0.0%
Fusion Energy Sciences	245	245	**245**	0	0.0%	0	0.1%
Basic Energy Sciences	984	997	**1,004**	7	0.7%	20	2.0%
(Spallation Neutron Source)	*278*	*291*	***291***	*0*	*0.0%*	*13*	*4.8%*
Adv. Scientific Computing Res.	166	163	**158**	-5	-3.1%	-8	-4.6%
Biological and Environmental Res.	481	442	**527**	86	19.4%	46	9.6%
Energy Research Analyses	1	1	**1**	0	0.0%	0	2.5%
Multiprogram Lab Support	22	22	**22**	0	0.0%	0	0.0%
TOTAL Science [2]	2,955	2,930	**3,018**	88	3.0%	63	2.1%
5. Atomic Energy Defense Activities							
National Nuclear Security Administration (NNSA)							
Naval Reactors	669	667	**665**	-2	-0.3%	-3	-0.5%
Weapons Activities	2,357	2,449	**2,569**	120	4.9%	212	9.0%
Stockpile R&D	*246*	*306*	***349***	*44*	*14.2%*	*104*	*42.2%*
Adv. Simulation and Computing	*747*	*738*	***730***	*-8*	*-1.1%*	*-17*	*-2.3%*
ICF Ignition and High Yield [3]	*234*	*223*	***261***	*39*	*17.3%*	*28*	*11.9%*
Nat'l Ignition Facility Construction	*197*	*245*	***245***	*0*	*0.0%*	*48*	*24.2%*
All Other Weapons Acts. R&D	*934*	*938*	***984***	*46*	*4.9%*	*50*	*5.4%*
Nonproliferation & Verification R&D	204	195	**309**	114	58.5%	105	51.2%
Fissile Materials Disposition	62	67	**67**	0	0.0%	6	9.6%
Total NNSA R&D	3,292	3,379	**3,611**	232	6.9%	319	9.7%
Environmental Management	176	131	**151**	20	15.2%	-25	-14.0%
Nuclear Safeguards & Security	26	26	**26**	0	0.0%	0	0.0%
Intelligence	5	5	**5**	0	0.0%	0	0.0%
TOTAL Atomic Defense R&D	3,499	3,542	**3,794**	252	7.1%	295	8.4%

(continued)

DOE R&D by Budget Function:							
Defense	3,499	3,542	**3,794**	252	7.1%	295	8.4%
General Science	2,955	2,930	**3,018**	88	3.0%	63	2.1%
Energy	1,290	927	**1,310**	383	41.3%	20	1.6%

AAAS estimates based on FY 2002 appropriations bills. Includes conduct of R&D and R&D facilities.
FY 2001 and FY 2002 request figures based on OMB R&D data and supplemental agency budget data.
Figures are rounded to the nearest million. Changes calculated from unrounded figures.
FY 2002 Approved includes emergency funds transferred to DOE from funds appropriated in Public Law 107-38.
[1] Does not reflect previously appropriated funds in this program, nor rescissions and deferrals. True budget authority in this account is as follows: $9 million FY 2001 (after $95 mil. Transfer to Fossil Energy), and $82 million FY 2002.
[2] Does not include program direction, waste management, and other non-R&D costs.
[3] Inertial Confinement Fusion.

December 26, 2001 - Based on enacted FY 2002 appropriations bills.
Includes emergency appropriations for counterterrorism and national security.

Department of Energy Budget (budget authority in millions of dollars)

			Action by Congress				
	FY 2001	FY 2002	**FY 2002**	Chg. from Request		Chg. from FY 2001	
	Estimate	Request	**Approved**	Amount	Percent	Amount	Percent
Weapons Activities (NNSA)	5,201	5,300	**5,565**	265	5.0%	364	7.0%
Other NNSA Activities	1,571	1,477	**2,030**	553	37.5%	459	29.2%
Total NNSA	6,772	6,777	**7,595**	819	12.1%	823	12.2%
Defense Environmental Restoration	5,061	4,549	**5,243**	694	15.3%	182	3.6%
Nuclear Waste and Other Defense	1,970	2,030	**2,074**	44	2.2%	104	5.3%
Total DOE defense	13,803	13,355	**14,912**	1,557	11.7%	1,109	8.0%
Science	3,155	3,160	**3,233**	73	2.3%	78	2.5%
Energy Supply	661	505	**667**	162	32.0%	5	0.8%
Fossil Energy	539	449	**583**	134	29.8%	43	8.0%
Energy Conservation	815	756	**913**	157	20.8%	97	11.9%
Other Energy Programs	344	324	**352**	28	8.6%	9	2.5%
Nondefense Environmental Mngmt.	291	229	**236**	8	3.4%	-55	-18.8%
Power Marketing Administrations	202	205	**208**	2	1.2%	6	2.9%
Departmental Administration	106	115	**105**	-10	-8.5%	-1	-0.8%
Total DOE Budget	19,917	19,098	**21,209**	2,111	11.1%	1,292	6.5%

Source: Department of Energy budget justification and FY 2002 appropriations bills.
DOE appropriations only (does not include offsets and other mandatory).
Excludes deferrals of funds in Clean Coal Technology and other deferrals.
FY 2001 figures adjusted to reflect rescissions and supplementals in FY 2001 emergency and supplemental bills.
FY 2002 Approved includes emergency funds transferred to DOE from funds appropriated in Public Law 107-38.
December 26, 2001 - Based on enacted FY 2002 appropriations bills.
Includes emergency appropriations for counterterrorism and national security.