



House Boosts DOE Science and Energy R&D

AAAS R&D Funding Update on DOE R&D in FY 2008 House Appropriations

Highlights

- **The Department of Energy's (DOE) Office of Science would be the clear winner among R&D agencies in the 2008 budget and now in House appropriations. R&D in DOE Science would climb 16.8 percent to \$4.1 billion in the 2008 House appropriation (see Table).**

- The House would give DOE \$9.8 billion for its total R&D portfolio, a substantial 11.7 percent or \$1.0 billion increase that exceeds the request by \$519 million. R&D in all three of DOE's missions of science, energy, and defense would increase.

- DOE's energy-related R&D would total \$1.8 billion, a large 18.5 percent increase after a similar increase last year, in contrast to a requested cut. The House would go along with proposed increases for R&D investments in renewable energy technologies such as hydrogen, biomass, and solar energy, but would also revive geothermal and hydropower R&D programs proposed for elimination. In fossil fuels, the House would add to a large request for coal R&D, including a one-third boost for carbon sequestration R&D, but would also save gas and oil technology R&D programs from elimination.

- The House would eliminate funding for DOE's proposal to develop a Reliable Replacement Warhead (RRW) as a new type of nuclear warhead. While funding for nuclear weapons R&D would fall, the House would provide enormous increases for nonproliferation R&D and environmental cleanup technology development, resulting in a total DOE defense R&D investment of \$3.8 billion, up 4.0 percent.

DOE R&D in FY 2008 House Appropriations

On June 6, the House Appropriations Committee approved its version of the FY 2008 Energy-Water appropriations bill (HR 2641) providing funding for Department of Energy (DOE) programs. The full House is expected to debate and approve the bill the week of June 11. The House bill contains nearly \$32 billion in 2008 discretionary spending for DOE, the Corps of Engineers, and other programs, \$1.3 billion more than the current year and \$1.1 billion more than the President's request. DOE would receive a total budget of \$25.2 billion, \$1.0 billion or 4.2 percent more than the current year and half a billion above the President's request (see Table).

DOE was already in line for a large R&D funding increase in DOE's request, but the House would add even more money to its science programs and would also add money for renewable energy R&D programs. **The House would give DOE \$9.8 billion for its R&D programs in 2008, a substantial \$1.0 billion or 11.7 percent increase, and \$519 million more than DOE's request.** There would be increases to all three of DOE's mission areas of science, energy, and defense.

President Bush's American Competitiveness Initiative (ACI) and Advanced Energy Initiative (AEI), both set for their second years in 2008, have made the Department of Energy's (DOE) R&D programs a high priority within an increasingly tight domestic budget. (For details of DOE R&D in the FY 2008 budget request, see Chapter 8 of *AAAS Report XXXII: R&D FY 2008* or the March 21 AAAS R&D Funding Update on DOE.) DOE's Office of Science is the largest federal sponsor of physical sciences research and is thus one of three federal agencies (the other two are the National Science Foundation and the National Institute of Standards and Technology laboratories) that would receive substantial increases to fulfill the ACI's goal of increasing federal investments in basic physical sciences research. DOE's energy R&D

portfolio funds R&D on a variety of topics, including renewable energy R&D on the Administration priorities of hydrogen, solar power, and biomass, all of which received substantial increases in 2007. The Democratic majority in the 110th Congress has already signaled its support for these two Administration priorities, both rhetorically (under different labels) and financially in wrapping up 2007 appropriations earlier this year with increases for these programs.

Congress again steps up to the plate for these programs in the just-started 2008 appropriations process. The House would not only fully fund a requested 15 percent increase for the Office of Science but would add even more money for biological and environmental programs for a 16.8 percent increase. In energy, the House would chisel the DOE request for hydrogen R&D slightly, but would add significantly to the requests for every other energy R&D program including several that had been proposed for elimination.

R&D in the DOE Office of Science

DOE's Office of Science, in its various incarnations over the decades, 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; the Bush Administration's and now Congress' push to boost physical sciences through large increases in the Science budget would pay off for all Science research areas. Last year, DOE requested a 14 percent increase for Science funding, and ended up with 5 percent in this February's final 2007 appropriations bill. To catch up with the ACI's ten-year funding trajectory, the 2008 request for the total Office of Science budget would be a 16 percent boost to \$4.4 billion, consistent with a plan to double the budget between 2006 and 2016. More than 90 percent of the Science budget goes to R&D activities; Science R&D would gain 15.4 percent in the FY 2008 request to \$4.1 billion; the House would add \$50 million in R&D funding on top of that amount for a 16.8 percent increase (see Table). The total Science budget would climb 19 percent to \$4.5 billion, including additions to the request for non-R&D facilities maintenance costs. The large 2008 increase following 2007's increase would mark a departure from the flat or declining funding trends of earlier years (see Figure 1), and in real terms would bring Science funding very close to its all-time high of 1992, before the Superconducting Super Collider was canceled.

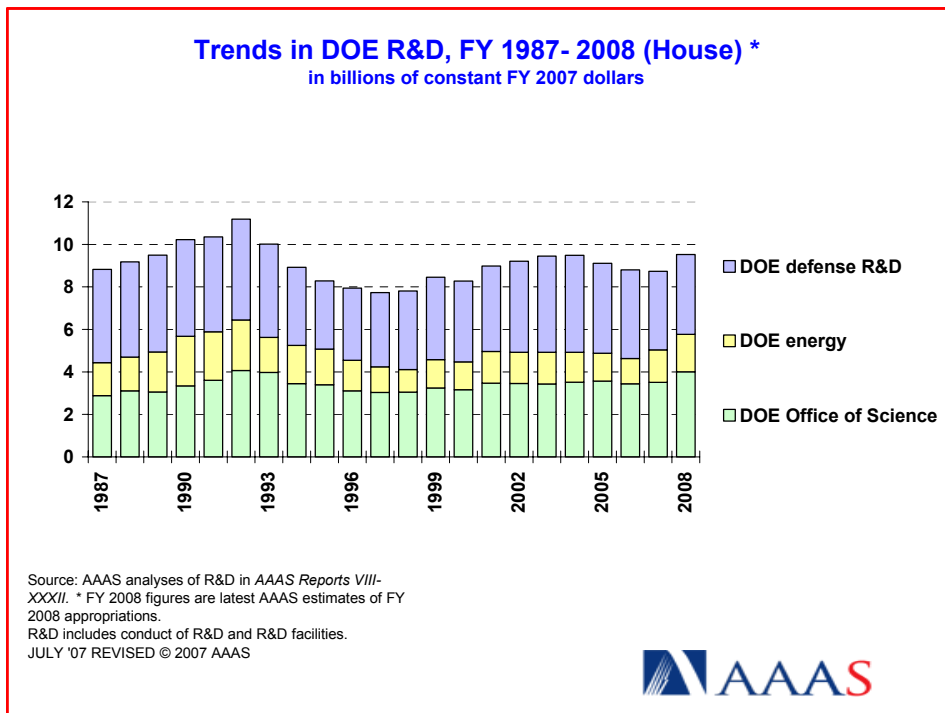


Figure 1. (click on the image for PDF)

Funding for every Science program would increase substantially for the second year in a row, including a 34 percent increase for fusion research, and 20 percent boosts for basic energy sciences, computing research, and biological and environmental research (see Figure 2). Most Science programs would reach new highs in the 2008 House appropriation.

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 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. After several years in which tight budgets have forced the cancellation of planned facilities, dramatic reductions in facility operating times, and reductions in external research support, the 2007 increase and the even larger 2008 increase would allow the Office to open new facilities and begin planning for newer ones, expand user times at existing facilities, and boost support of external research.

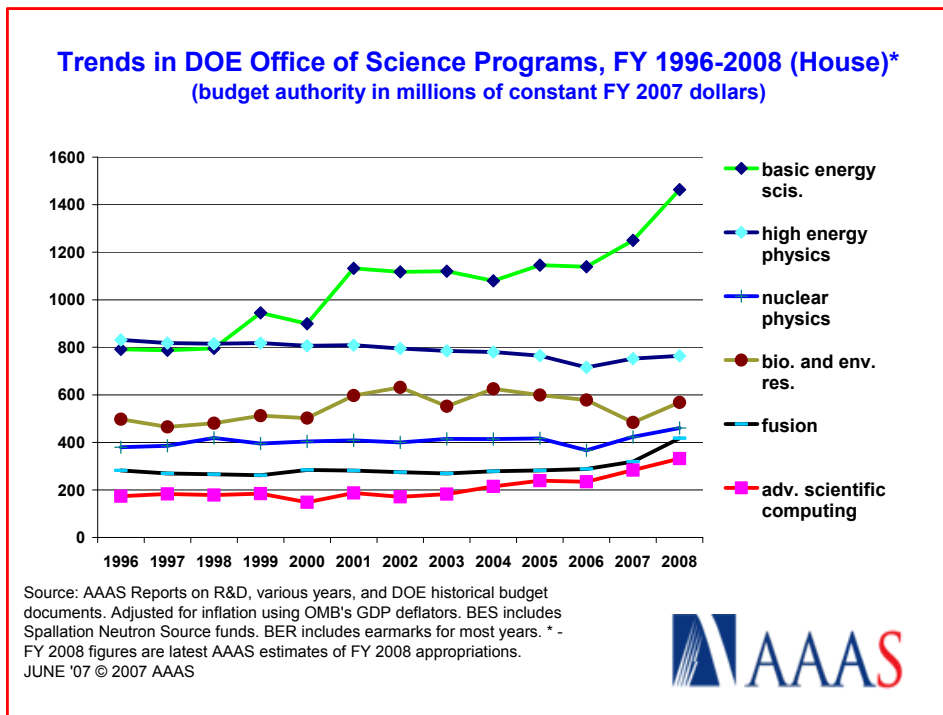


Figure 2. (click on the image for PDF)

The House would agree to the requests for most Science programs but would add \$50 million on top of a requested increase for Biological and Environmental Research (BER) for \$98 million or 20 percent boost to \$582 million. \$30 million of the House add-on would go to biological research to expand research on biofuels and carbon sequestration, with the new money to be awarded competitively. The remaining \$20 million add-on would go to climate change research, especially climate modeling research to take advantage of the high-performance computing capabilities of the Office of Science.

Basic Energy Sciences (BES) has fared the best among Science program areas in recent years, and would continue to do well with a 19.9 percent increase to \$1.5 billion in both DOE's request and now the House appropriation (see Figure 2). Construction funding for the Linac Coherent Light Source, the Advanced Light Source, and planning for the National Synchrotron Light Source II would keep the program busy with a full plate of future facilities, even as the Spallation Neutron Source (SNS; due to open this year),

four light sources, five nanoscale research centers would keep current operations at a high level. BES would also fund more basic research on hydrogen, solar, and biomass topics as a complement to the more applied energy research programs elsewhere in DOE.

High-performance computing research in the Advanced Scientific Computing Research (ASCR) program would be in for a 20 percent boost to \$340 million to expand the availability of high-performance computing capacity that researchers can use for their experiments, primarily at Oak Ridge and Argonne laboratories. By 2008, ASCR could be operating two centers with greater than 250 teraflop computing capability, working toward petaflop capability.

The multinational International Thermonuclear Experimental Reactor (ITER) would continue to expand with full U.S. participation through the Fusion Energy Sciences program, up 34 percent or \$109 million to \$428 million in 2008. ITER funding climbed from \$19 million last year to \$60 million in 2007, and would soar to \$160 million next year. The large Fusion increase would enable ITER funding to climb and still leave enough for a slight increase for domestic fusion activities in New Jersey, California, and Massachusetts.

The High Energy Physics (HEP) program, which funds basic research on the nature of matter and energy, would get a 4.1 percent increase to \$782 million (see Table). The program does most of its work at three facilities located at two DOE labs (Fermilab in Illinois and the Stanford Linear Accelerator Center in California) and also cooperates in the international Large Hadron Collider (LHC) in Switzerland, which transitions from fabrication toward operation later this year. Some funding pressure would be relieved by a planned shift in operating funds for the B-factory in California from HEP to the BES program. The increase along with the money freed up from the transfer should allow the program to sustain facility operating times, to boost research funding, and to sustain a \$60 million research investment in the International Linear Collider, the next big international high-energy physics project after the LHC. The Nuclear Physics (NP) program would get an 11.5 percent increase to \$471 million. NP seeks to understand the structure and interactions of subatomic particles, and supports four user facilities.

DOE Energy R&D Programs

Last year, President Bush proposed dramatic funding boosts for selected alternative energy R&D programs as part of his Advanced Energy Initiative (ACI) to reduce U.S. dependence on Middle East oil; Congress unexpectedly added even more money to bring DOE energy R&D to \$1.5 billion in 2007, a surprising 32 percent boost over the year before. The 2008 request retreats from the 2007 highs in most areas down to \$1.4 billion, but the House would barrel ahead with a \$1.8 billion total for energy R&D in 2008, 30 percent more than the request and 18.5 percent more than the current year. The House Energy-Water bill makes a point of decrying a decades-long decline in federal energy R&D investments down to one-fifth to one-third of peak 1980 funding levels, and points to the 2007 and 2008 pending increases as the first steps toward restoring federal investments in energy R&D. If the House appropriation is enacted, then DOE energy R&D would climb 56 percent in just two years, although funding levels would still remain well below peak investments in the late 1970s.

While the Administration's energy R&D increases in some areas would be offset by steep cuts or program eliminations in other energy areas, the House would provide increases across the board for renewables, energy conservation, and fossil fuels R&D programs.

In renewable energy, the House would reduce the request for hydrogen R&D down to \$195 million, still a slight increase from 2007 and up dramatically from \$153 million in 2006 (see Table). Biomass R&D would climb 25 percent to \$250 million, nearly triple last year's funding, while solar energy R&D would total \$200 million, up 26 percent from 2007 and nearly triple the \$82 million in 2006. The House would turn a requested cut in wind energy R&D into a 17 percent increase to \$58 million, and would save geothermal R&D from proposed elimination with a \$44 million appropriation, nearly double the 2006 funding level. The House would also restore funding to the now-dormant hydropower program with \$22 million. Also

proposed for a big increase is nuclear energy R&D, a renewable energy technology funded in a separate account, up 47 percent to \$162 million in 2008.

The House would once again reverse proposed cuts in many energy conservation and fossil energy R&D programs as it did in 2007. The House would allocate \$504 million for fossil energy R&D, up 2.2 percent instead of a 27 percent requested cut, the net of increases in the Administration's longstanding priority area of coal R&D and steep cuts or proposed eliminations in other fossil fuel programs. The House would sustain coal R&D funding with a \$557 million appropriation, up 30.7 percent, including the requested doubling of funding for the FutureGen program (\$108 million) to develop a carbon-neutral, coal-fired electricity and hydrogen production plant. Funding for the Clean Coal Power Initiative program to develop cleaner coal-based power plants would also increase from \$60 million to \$73 million. But the House would add \$53 million to the request for carbon sequestration R&D to bring the 2008 total to \$132 million, double the funding the program had in 2006. At the same time, the House would once again reverse the proposed eliminations of the oil R&D and gas R&D programs. But in a separate (Interior-Environment) appropriations bill, the House would agree to DOE's request to block \$50 million in mandatory funding for an ultra-deepwater and unconventional natural gas and other petroleum research fund that was created in the Energy Policy Act of 2005 for a 2007 start. Congress declined to block 2007 funding, so DOE and the consortium selected to manage the effort recently finalized a 10-year contract for this research effort, paid for out of oil and gas royalty fees. The House would block 2008 funding in order to shift money to other programs.

The Energy Conservation portfolio is now part of the Energy Supply and Conservation program, and the House would provide increases instead of proposed cuts for its component Vehicle Technologies, Building Technologies and Industrial Technologies parts.

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 4.0 percent or \$148 million to \$3.8 billion in 2008 in the House appropriation** (see Table). The core Weapons Activities program, which funds science-based alternatives to nuclear testing in order to maintain the U.S. nuclear weapons stockpile, would receive far less than the request in the House appropriation (down 6.3 percent to \$5.9 billion), but the forthcoming Senate appropriation is likely to match or exceed the request. A little less than half of this spending goes to R&D activities, for a total of \$2.5 billion in the House (down 6.7 percent). The House would cut funding for most Weapons Activities areas, except for the Inertial Confinement Fusion program, aimed at simulating nuclear weapons fusion under controlled laboratory conditions, which would receive \$524 million (up 7.0 percent) in order to meet a goal of ignition in 2010 for the program's key new facility, the National Ignition Facility (NIF) under construction in California.

The DOE proposal to initiate research on a new generation of nuclear weapons has been opposed by Congress so far, and the **House Energy-Water bill makes that opposition emphatic by zeroing out funding for the Reliable Replacement Warhead (RRW) project** to explore new warhead designs for use with existing nuclear weapons. DOE recently selected Lawrence Livermore to design the RRW, but the project still faces continuing skepticism in Congress over whether the U.S. needs new warheads. Development of the RRW would receive \$89 million in Weapons Activities in 2008 in the DOE budget request, up from just \$28 million this year, but the House would provide no funds as a protest against what report language accompanying the House bill describes as a 'policy vacuum' in which there are no clearly articulated policy statements as to the role of nuclear weapons in 21st century U.S. security needs. Without a rationale for existing nuclear weapons much less future ones, many members of Congress are opposed to the RRW project. The House bill contains instructions for DOE and DOD to develop a comprehensive nuclear defense and nonproliferation strategy with long-term spending requirements, including an assessment of how new warheads such as the RRW might fit into the overall strategy.

Although nuclear weapons funding would fall, the House would provide enormous boosts to nonproliferation R&D and environmental cleanup R&D. The nonproliferation and verification R&D program would receive a record \$484 million in the House (see Table), up 79 percent from the current year. The House would give a high priority to the program's efforts to develop advanced proliferation detection technology and better nuclear explosion monitoring capabilities. The environmental management R&D program to develop better cleanup technologies for nuclear waste from six decades of nuclear weapons making would receive \$108 million, more than five times the current funding level of \$21 million.

Outlook and Next Steps

The full House is expected to debate and approve the Energy-Water bill within the next week; although many amendments are expected and several will be approved, they are unlikely to affect the R&D totals significantly. The Senate Appropriations Committee is expected to mark up its version of the bill by mid-July; the Senate bill is likely to agree with the House's large increase for DOE Science, to contain similar increases for most energy R&D programs, and to boost weapons R&D above House levels. Congress will try to send a final version of the bill to President Bush before the October 1 start of FY 2008. The President has threatened to veto any 2008 appropriations bill that exceeds his request, as the House version does by \$1.1 billion, so the bill may have to go through several rewrites and revotes before it can become law, but most of the science and energy increases in the House bill should make it into the final bill.

(This analysis is one of a series of AAAS R&D Funding Updates on FY 2008 congressional appropriations. The complete series of AAAS R&D Funding Updates, including continually updated analyses of R&D in FY 2008 appropriations, is available on the AAAS R&D Web Site (<http://www.aaas.org/spp/rd>) in the "FY 2008 R&D" or the "What's New" sections.)

- June 13, 2007

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AAAS R&D Web site: <http://www.aaas.org/spp/rd>



Table. DOE R&D in FY 2008 House Appropriations

**Table. Department of Energy
House Appropriations Committee Action on R&D in the FY 2008 Budget
(budget authority in millions of dollars)**

	FY 2007 Estimate	FY 2008 Request	FY 2008 House	Action by House			
				Chg. from Request		Chg. from FY 2007	
				Amount	Percent	Amount	Percent
DOE Appropriations Containing R&D:							
1. Energy Supply & Conservation 1/	969	974	1,247	273	28.0%	278	28.7%
2. Science	3,511	4,052	4,102	50	1.2%	591	16.8%
3. Fossil Energy R&D	493	359	504	145	40.3%	11	2.2%
4. Atomic Energy Defense Activities	3,699	3,796	3,848	52	1.4%	148	4.0%
5. Radioactive Waste Management	60	53	53	0	0.0%	-7	-11.7%
Total DOE R&D	8,732	9,234	9,753	519	5.6%	1,021	11.7%
1. Energy Supply and Conservation 1/							
Efficiency and Renewables 1/	760	761	997	236	31.0%	237	31.1%
- Hydrogen Technology	194	213	195	-18	-8.6%	1	0.5%
- Biomass and Biorefinery Sys.	200	179	250	71	39.5%	50	25.2%
- Solar Energy	159	148	200	52	34.9%	41	25.5%
- Wind Energy	49	40	58	17	43.5%	8	16.6%
- Geothermal Tech.	5	0	44	44	--	39	785.2%
- Hydropower	0	0	22	22	--	22	--
- Vehicle Tech.	188	176	235	59	33.7%	47	25.2%
- Building Tech.	104	86	146	60	69.4%	42	40.4%
- Industrial Tech.	57	46	57	11	23.9%	0	0.8%
- minus demos & other non-R&D	-196	-128	-211	-82	64.3%	-15	7.6%
Electricity Delivery & Reliability	99	88	88	0	0.0%	-11	-11.1%
Nuclear Energy	110	125	162	37	29.7%	52	47.4%
TOTAL Energy Supply 1/	969	974	1,247	273	28.0%	278	28.7%
2. Science							
High Energy Physics	752	782	782	0	0.0%	30	4.1%
Nuclear Physics	423	471	471	0	0.0%	49	11.5%
Fusion Energy Sciences	319	428	428	0	0.0%	109	34.1%
Basic Energy Sciences	1,250	1,498	1,498	0	0.0%	248	19.9%
Adv. Scientific Computing Res.	283	340	340	0	0.0%	57	20.0%
Biological and Environmental Res.	483	532	582	50	9.4%	98	20.4%
TOTAL Science R&D	3,511	4,052	4,102	50	1.2%	591	16.8%
Science Non-R&D Items	287	346	412	66	19.1%	125	43.8%
Total Science Budget (incl nonR&D)	3,797	4,398	4,514	116	2.6%	717	18.9%
3. Fossil Energy R&D 2/ (does not include non-R&D components)							
Coal Research	426	427	557	130	30.5%	131	30.7%
- Clean Coal Power Init.	60	73	73	0	0.0%	13	20.8%
- FutureGen	54	108	108	0	0.0%	54	100.0%
- Carbon sequestration	100	79	132	53	66.4%	32	31.6%
- Other Fuels and Power Sys.	211	167	244	78	46.5%	33	15.5%
Oil Technology	3	0	3	3	--	0	0.0%
Natural Gas Technology	12	0	12	12	--	0	0.0%
UltraDeepwater Unconven. Gas 2/	50	0	0	0	--	-50	-100.0%
Clean Coal Tech. 3/	0	-58	-58	0	0.0%	-58	--
Plant & Cap. Equip. and adjs.	3	-10	-10	0	0.0%	-12	-476.1%
Total Fossil Energy R&D 2/	493	359	504	145	40.3%	11	2.2%

(continued)

Table. DOE R&D in FY 2008 House Appropriations

4. Atomic Energy Defense Activities

National Nuclear Security Administration (NNSA)

Naval Reactors	750	776	776	0	0.0%	26	3.5%
Weapons Activities	2,655	2,730	2,476	-254	-9.3%	-179	-6.7%
<i>(Reliable Replacement Warhead)</i>	36	89	0	-89	-100.0%	-36	-100.0%
<i>(Science Campaigns)</i>	270	273	202	-72	-26.2%	-69	-25.5%
<i>(Adv. Simulation and Computing)</i>	612	586	536	-50	-8.5%	-76	-12.5%
<i>(Inertial Confinement Fusion)</i>	490	412	524	112	27.1%	34	7.0%
<i>(All Other Weapons Acts. R&D)</i>	1,247	1,370	1,215	-155	-11.3%	-32	-2.6%
Nonproliferation & Verification R&D	270	266	484	218	82.1%	214	79.1%
Total NNSA R&D	3,675	3,772	3,736	-36	-0.9%	61	1.7%
Environmental Management	21	21	108	87	414.8%	87	414.8%
Other AEDA R&D	3	3	3	0	0.0%	0	0.0%
TOTAL Atomic Defense R&D	3,699	3,796	3,848	52	1.4%	148	4.0%

AAAS estimates based on FY 2008 appropriations bills. Includes conduct of R&D and R&D facilities.

FY 2007 and FY 2008 request figures based on OMB R&D data and supplemental agency budget data.

Some data adjusted by AAAS from DOE budget documents.

FY 2007 figures include 2007 supplemental appropriations enacted in Public Law 110-28.

Figures are rounded to the nearest million. Changes calculated from unrounded figures.

1/ Combined from the former Energy Supply and Energy Conservation accounts.

2/ There is \$50 million in mandatory funding for ultra-deepwater and unconventional natural gas R&D in FY 2007 and FY 2008, but the FY 2008 request and House appropriation defer these funds.

3/ Rescissions and deferrals of previously appropriated funds.

June 13, 2007 - AAAS estimates of House Appropriations Committee-approved appropriations.

These figures may be amended or rejected by the full House.

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

	FY 2007 Estimate	FY 2008 Request	FY 2008 House	Action by House			
				Chg. from Request Amount	Percent	Chg. from FY 2007 Amount	Percent
Weapons Activities (NNSA)	6,276	6,511	5,879	-632	-9.7%	-396	-6.3%
Other NNSA Activities	2,940	2,876	2,908	32	1.1%	-33	-1.1%
Total NNSA	9,216	9,387	8,787	-600	-6.4%	-429	-4.7%
Defense Environmental Cleanup	5,732	5,364	5,767	403	7.5%	35	0.6%
Nuclear Waste and Other Defense	983	1,056	896	-160	-15.1%	-86	-8.8%
Total DOE defense	15,931	15,807	15,450	-357	-2.3%	-481	-3.0%
Science	3,797	4,398	4,514	116	2.6%	717	18.9%
Energy Supply and Conservation 1/	2,155	2,188	2,767	579	26.5%	613	28.4%
Fossil Energy	593	567	709	142	25.1%	116	19.6%
Other Energy Programs	937	1,186	1,086	-100	-8.4%	149	15.9%
Nondefense Environmental Mngmt.	350	181	286	105	58.1%	-64	-18.2%
Power Marketing Administrations	271	240	240	0	0.0%	-30	-11.1%
Departmental Administration & IG	196	196	191	-6	-2.8%	-5	-2.5%
Total DOE Budget	24,228	24,763	25,243	480	1.9%	1,015	4.2%

Source: Department of Energy budget justification and FY 2008 appropriations bills.

DOE appropriations only (does not include offsets and other mandatory).

FY 2007 figures include 2007 supplemental appropriations enacted in Public Law 110-28.

Includes R&D and non-R&D components. Figures are rounded to the nearest million.

1/ Combined from the former Energy Supply and Energy Conservation accounts.

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