



Federal Research and Development Funding: FY2011

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Summary

President Obama requested \$147.696 billion for research and development (R&D) in FY2011, a \$343 million (0.2%) increase from the estimated FY2010 R&D funding level of \$147.353 billion. Congress plays a central role in defining the nation's R&D priorities, especially with respect to two overarching issues: the extent to which the federal R&D investment can grow in the context of increased pressure on discretionary spending and how available funding will be prioritized and allocated. Low or negative growth in the overall R&D investment may require movement of resources across disciplines, programs, or agencies to address priorities.

As of the end of the 111th Congress, no regular appropriations bill had been enacted by Congress. Two of the 12 regular appropriations bills had passed the House (the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2011, and the Military Construction and Veterans Affairs and Related Agencies Appropriations Act, 2011); none had passed the Senate. To provide for continuity of government operations into FY2011, the 111th and 112th Congress passed a series of continuing resolutions that provided funding for all agencies until enactment of the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10) on April 15, 2011. Division A of the act provides FY2011 appropriations for the Department of Defense; Division B provides full-year continuing funding for FY2011 for all other agencies at their FY2010 levels unless other provisions in the act specify otherwise. With respect to federal R&D funding overall and to several agencies in particular, it is not possible yet to assess the level of funding provided under the act. This report will be updated as additional information about FY2011 R&D funding becomes available.

Under the President's request, six federal agencies would have received 94.8% of total federal R&D spending: the Department of Defense (DOD, 52.5%), Department of Health and Human Services (largely the National Institutes of Health) (21.8%), National Aeronautics and Space Administration (7.4%), Department of Energy (7.6%), National Science Foundation (3.8%), and Department of Agriculture (1.7%). NASA would have received the largest dollar increase for R&D of any agency, \$1.700 billion (18.3%) above its FY2010 funding level; DOD would have received the largest reduction in R&D funding, \$3.542 billion (4.4%) below its FY2010 level.

President Obama requested increases in the R&D budgets of the three agencies that were targeted for doubling in the America COMPETES Act and its reauthorization, and by President Bush under his American Competitiveness Initiative using FY2006 R&D funding as the baseline. The Department of Energy's Office of Science would have received an increase of \$226 million (4.6%), the National Science Foundation an increase of \$551 million (8.0%), and the National Institute of Standards and Technology's core research and facilities an increase of \$48 million (7.3%). P.L. 112-10 provided less than the FY2010 level and less than the President's request for each of these accounts. In aggregate, funding for these accounts under P.L. 112-10 is less than in FY2010 and less than the President's request.

For the past five years, federal R&D funding and execution has been affected by mechanisms used to complete the annual appropriations process—the year-long continuing resolution for FY2007 (P.L. 110-5) and the combining of multiple regular appropriations bills into the Consolidated Appropriations Act, 2008 for FY2008 (P.L. 110-161), the Omnibus Appropriations Act, 2009 (P.L. 111-8), the Consolidated Appropriations Act, 2010 (P.L. 111-117), and P.L. 112-10. Completion of appropriations after the beginning of each fiscal year may cause agencies to delay or cancel some planned R&D and equipment acquisition.

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Overview

The 111th Congress took continuing interest in the health of the U.S. research and development (R&D) enterprise and in providing sustained support for federal R&D activities. However, the 111th Congress was unable to enact any of the regular appropriations bills. Two of the 12 regular appropriations bills passed the House (the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2011, and the Military Construction and Veterans Affairs and Related Agencies Appropriations Act, 2011); none passed the Senate.

To provide for continuity of government operations into FY2011, the 111th and 112th Congress passed a series of continuing resolutions that provided funding for all agencies until enactment of the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10) by the 112th Congress on April 15, 2011. Division A of the act provides FY2011 appropriations for the Department of Defense; Division B provides full-year continuing funding for FY2011 for all other agencies at their FY2010 levels unless other provisions in the act specify otherwise. With respect to federal R&D funding overall and to several agencies in particular, it is not possible yet to assess the level of funding provided under the act. This report will be updated as additional information about FY2011 R&D funding becomes available

The U.S. government supports a broad range of scientific and engineering research and development. Its purposes include addressing specific concerns, such as national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the scientific and engineering workforce; and strengthening U.S. innovation and competitiveness in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of the funding agencies. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the Internet to communications satellites and defenses against disease.

On February 1, 2010, President Obama requested \$147.696 billion for R&D in FY2011, a 0.2% increase over the enacted FY2010 R&D funding level of \$147.353 billion.¹ The President's proposed FY2011 R&D funding included an emphasis on increasing funding for the physical sciences and engineering, an effort consistent with the intent of the America COMPETES Act (P.L. 110-69) and President Bush's American Competitiveness Initiative (ACI). President Obama sought to achieve this objective largely through a 6.6% increase in aggregate funding for the Department of Energy Office of Science, the National Science Foundation, and the Department of Commerce National Institute of Standards and Technology's core laboratory research.

More broadly, in a 2009 speech before members of the National Academy of Sciences, President Obama put forth a goal of increasing the national investment in R&D to more than 3% of the U.S. gross domestic product (GDP). President Obama did not provide details on how this goal might be achieved (e.g., how much would be funded through increases in direct federal R&D funding or through indirect mechanisms such as the research and experimentation tax credit²); however doing so likely would require a substantial increase in public and private investment. In 2007,

¹ Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that does not equal or exceed the inflation rate may reduce real purchasing power.

² The research and experimentation tax credit is referred to frequently as the research and development tax credit or R&D tax credit, through the credit does not apply to development expenditures.

total U.S. R&D expenditures were \$397.629 billion,³ or approximately 2.75% of GDP.⁴ Based on 2008 figures, reaching President Obama's 3% goal would have required a 8.96% real (above inflation) increase in national R&D funding. Increasing direct federal R&D funding by 8.96% in FY2011 would have required an increase of \$12.9 billion above President Obama's request.

In addition, advocates for increased federal R&D funding—including President Obama's science advisor, John Holdren—have raised concerns about the potential harm of a “boom-bust” approach to federal R&D funding (i.e., rapid growth in federal R&D funding followed by much slower growth, flat funding, or even decline).⁵ The biomedical research community experienced a variety of challenges resulting from such a circumstance following the five-year doubling of the NIH budget that was completed in FY2003. With the NIH doubling came a rapid expansion of the nation's biomedical research infrastructure (e.g., buildings, laboratories, equipment), as well as rapid growth in university faculty hiring, students pursuing biomedical degrees, and grant applications to NIH. After the doubling, however, the agency's budget fell each year in real terms from FY2004 to FY2009. Critics assert a variety of damages of this boom-bust cycle, including interruptions and cancellations of promising research, declining share in the number of NIH grant proposals funded, decreased student interest in pursuing graduate studies, and reduced employment prospects for the large number of biomedical researchers with advanced degrees. According to then-NIH Director Elias Zerhouni, the damages have been particularly acute for early- and mid-career scientists seeking a first or second grant.⁶

Analysis of federal R&D funding is complicated by several factors, including the Obama Administration's omission of congressionally directed spending from the FY2011 budget request and inconsistency among agencies in the reporting of R&D. Another complicating factor for FY2009 and FY2010 is the inclusion of funding for R&D, facilities, and equipment, and related activities in the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5). ARRA funds supplement funding provided to agencies in P.L. 110-329 and P.L. 111-8. Some ARRA funding was spent in FY2009 and in FY2010, and the balance of these funds will be spent in subsequent years. For purposes of this report, unless otherwise noted, comparisons of FY2009 and FY2010 R&D funding do not incorporate funding provided under P.L. 111-5. As a result of these and other factors, the R&D agency figures reported by the White House Office of Management and Budget (OMB) and White House Office of Science and Technology Policy (OSTP), and shown in **Table 1**, may differ somewhat from the agency budget analyses that appear later in this report.

³ Preliminary estimate of 2009 U.S. R&D expenditures, National Science Foundation, *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, Arlington, VA, 2008, <http://www.nsf.gov/statistics/nsf08318/>.

⁴ Based on 2008 U.S. GDP of \$14,441.4 billion as reported by the U.S. Department of Commerce Bureau of Economic Analysis, *National Income and Product Accounts Table*, Table 1.1.5, <http://www.bea.gov/national/nipaweb/TableView.asp?SelectedTable=5&Freq=Qtr&FirstYear=2007&LastYear=2009>.

⁵ Jennifer Couzin and Greg Miller, “NIH Budget: Boom and Bust,” *Science*, vol. 316, no. 5823 (April 2007), pp. 356-361, at <http://www.scienceline.org/cgi/content/full/316/5823/356>.

⁶ *Ibid.* For additional information on NIH R&D funding issues, see CRS Report R41705, *The National Institutes of Health (NIH): Organization, Funding, and Congressional Issues*, by Judith A. Johnson and Pamela W. Smith.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide unique insights.

Agency Perspective

The authorization and appropriations process views federal R&D funding primarily from agency and program perspectives. **Table 1** provides data on R&D by agency for FY2009 (actual), FY2010 (estimate), ARRA, and FY2011 (request) as reported by OMB. Under President Obama's FY2011 budget request, six federal agencies would have received 94.8% of total federal R&D funding: the Department of Defense (DOD), 52.5%; the Department of Health and Human Services (HHS) (primarily the National Institutes of Health (NIH)), 21.8%; the National Aeronautics and Space Administration (NASA), 7.4%; the Department of Energy (DOE), 7.6%; the National Science Foundation (NSF), 3.8%; and the Department of Agriculture (USDA), 1.7%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Departments of Commerce (DOC), Homeland Security (DHS), the Interior (DOI), and Transportation (DOT), as well as the Environmental Protection Agency (EPA). In total, these departments and agencies accounted for more than 98% of FY2010 federal R&D funding.

In his FY2011 budget request, President Obama reiterated his intention to double the federal investment in three key science agencies over a decade from their FY2006 levels: DOE's Office of Science (up 4.6% above the estimated FY2010 level), NSF (up 8.0%), and DOC's National Institute of Standards and Technology (NIST) laboratories and construction funds (up 6.9%).⁷ This request essentially continued the American Competitiveness Initiative (ACI) initiated by President Bush to double physical sciences and engineering research in these agencies over 10 years (FY2007-FY2016). In 2007, Congress authorized substantial R&D increases for these agencies under the America COMPETES Act (P.L. 110-69), setting a more aggressive seven-year doubling course.⁸

The largest agency R&D increases in the President's FY2011 request were for NASA, \$1.700 billion; the Department of Health and Human Services, \$979 million (due primarily to a \$956 million increase in R&D funding for NIH); the Department of Energy, \$526 million; and the National Science Foundation, \$479 million. Under President Obama's FY2011 budget request, DOD R&D funding would have been reduced by \$3.542 billion, USDA R&D funding would have been cut by \$143 million, and DHS R&D would have fallen by \$104 million.⁹

⁷ Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Science Agencies in the FY2011 Budget*, February 1, 2010, <http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf>.

⁸ For additional information, see CRS Report RL34328, *America COMPETES Act: Programs, Funding, and Selected Issues*, by Deborah D. Stine.

⁹ *A Renewed Commitment to Science and Technology: Federal R&D, Technology, and STEM Education in the 2010 Budget*, Office of Science and Technology Policy, The White House, May 7, 2009, available at <http://www.ostp.gov/galleries/budget/FY2010RD.pdf>.

Table I. Federal Research and Development Funding by Agency, FY2009-FY2011

(Budget authority, dollar amounts in millions)

Department/Agency	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	Dollar Change, 2010 to 2011	Percent Change, 2010 to 2011
Agriculture	2,437	176	2,591	2,448	-143	-5.5
Commerce	1,393	576	1,516	1,727	211	13.9
Defense	80,821	300	81,090	77,548	-3,542	-4.4
Energy	10,301	2,967	10,693	11,219	526	4.9
Environmental Protection Agency	559	0	622	651	29	4.7
Health and Human Services	30,595	11,063	31,177	32,156	979	3.1
Homeland Security	1,096	0	1,150	1,046	-104	-9.0
Interior	701	74	755	772	17	2.3
NASA	10,887	790	9,286	10,986	1,700	18.3
National Science Foundation	5,379	2,197	5,092	5,571	479	9.4
Transportation	976	0	1,012	1,018	6	0.6
Veterans Affairs	1,020	0	1,162	1,180	18	1.5
Other	1,153	10	1,207	1,374	167	16.7
Total^a	147,318	18,153	147,353	147,696	343	0.2

Sources: Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2011*, Table 21-1; Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010.

a. Totals may differ from the sum of the components due to rounding.

Character of Work, Facilities, and Equipment Perspective

Federal R&D funding can also be examined by the character of work it supports—basic research, applied research, and development—and funding provided for facilities and acquisition of major R&D equipment. (See **Table 2**.) President Obama's FY2011 request included \$31.341 billion for basic research, up \$1.339 billion (4.5%) from FY2010; \$30.276 billion for applied research, up \$1.949 billion (6.9%); \$81.455 billion for development, down \$2.918 billion (3.5%); and \$4.624 billion for facilities and equipment, down \$27 million (0.6%).

Table 2. Federal Research and Development Funding by Character of Work, Facilities, and Equipment, FY2009-FY2011
(Budget authority, dollar amounts in millions)

	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	Dollar Change, 2010 to 2011	Percent Change, 2010 to 2011
Basic research	29,583	7,794	30,002	31,341	1,339	4.5
Applied research	29,054	5,385	28,327	30,276	1,949	6.9
Development	83,866	1,482	84,373	81,455	-2,918	-3.5
Facilities & equipment	4,815	3,492	4,651	4,624	-27	-0.6
Total^a	147,318	18,153	147,353	147,696	343	0.2

Source: Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010.

a. Totals may differ from the sum of the components due to rounding.

Combined Perspective

Combining these perspectives, federal R&D funding can be viewed in terms of each agency's contribution to basic research, applied research, development, and facilities and equipment. (See **Table 3**.) The federal government is the nation's largest supporter of basic research, funding an estimated 57% of U.S. basic research in 2008,¹⁰ primarily because the private sector asserts it cannot capture an adequate return on long-term fundamental research investments. In contrast, industry funded only 17.7% of U.S. basic research in 2008. In FY2010, the Department of Health and Human Services, primarily the National Institutes of Health (NIH), accounts for more than half of all federal funding for basic research.¹¹

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 60.8% in 2008, while the federal government accounted for an estimated 32.4%.¹² Among federal agencies, HHS is the largest funder of applied research, accounting for nearly half of all federally funded applied research in FY2010.¹³

Industry also provides the vast majority of funding for development, accounting for an estimated 84.1% in 2008, while the federal government provided an estimated 14.9%.¹⁴ DOD is the primary federal agency funder of development, accounting for 88.5% of total federal development funding in FY2010.¹⁵

¹⁰ National Science Foundation, *New NSF Estimates Indicate that U.S. R&D Spending Continued to Grow in 2008*, NSF 10-312, January 2010, <http://www.nsf.gov/statistics/infbrief/nsf10312/#fn>. <http://www.nsf.gov/statistics/nsf08318/>.

¹¹ Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2010*, Table 5-1, May 2009.

¹² National Science Foundation, *National Patterns of R&D Resources: 2007 Data Update*, NSF 08-318, 2008, <http://www.nsf.gov/statistics/nsf08318/>.

¹³ Executive Office of the President, Office of Management and Budget, *Analytical Perspectives*, Table 5-1, May 2009.

¹⁴ National Science Foundation, *National Patterns of R&D Resources*, 2008, <http://www.nsf.gov/statistics/nsf08318/>.

¹⁵ Executive Office of the President, Office of Management and Budget, *Analytical Perspectives*, Table 5-1, May 2009.

Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2008-FY2010

(Budget authority, dollar amounts in millions)

	FY2009 Actual ^a	FY2010 Estimate	FY2011 Request
Basic Research			
Health and Human Services	21,140	16,981	17,502
National Science Foundation	6,107	4,291	4,684
Energy	4,505	3,862	4,003
Applied Research			
Health and Human Services	18,836	14,051	14,479
Defense	5,066	4,500	4,479
Energy	3,686	3,131	3,728
Defense	74,100	74,676	70,974
NASA	6,677	5,452	6,126
Energy	3,050	2,612	2,560
Facilities and Equipment			
NASA	2,180	2,267	2,547
Energy	2,027	1,088	928
National Science Foundation	998	458	452

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2011*, Office of Management and Budget, The White House, February 2010.

Note: Top funding agencies based on FY2011 request.

- a. The amounts for FY2009 include funding from P.L. 111-5, the American Recovery and Reinvestment Act of 2009.

Multiagency R&D Initiatives Perspective

Federal R&D funding can also be viewed in terms of multiagency efforts, such as the National Nanotechnology Initiative (see “Multiagency R&D Initiatives” below), and presidential initiatives.

In FY2010 supporting budget documents, President Obama stated that he would seek to double funding for basic research over 10 years (FY2006-FY2016) at the the NSF, NIST laboratories and construction accounts, and the DOE Office of Science (collectively, the “target accounts”)—continuing the goal of President George W. Bush’s American Competitiveness Initiative (ACI).¹⁶ In 2007 Congress established authorization levels for FY2008-FY2010 in the America COMPETES Act (P.L. 110-69) that would put funding for research at these agencies on track to double in approximately seven years. Three years later, with enacted funding levels for FY2008-

¹⁶ Executive Office of the President, Office of Science and Technology Policy, *The President’s Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the 2010 Budget*, May 7, 2009, <http://www.whitehouse.gov/files/documents/ostp/budget/doubling.pdf>.

FY2010 below those authorized in P.L. 110-69, Congress passed the America COMPETES Reauthorization Act of 2010 establishing authorization levels for FY2011-FY2013 for the target accounts at a growth rate consistent with a 10-year doubling path. In FY2011 supporting budget documents, President Obama extended his target for doubling to 11 years (FY2006-FY2017).¹⁷ However, FY2011 enacted funding for the target accounts was below both authorized and requested levels, setting a pace for a 15-year doubling—more than twice the length of time originally envisioned in the America COMPETES Act and about a third longer than the pace set by the 2010 reauthorization.

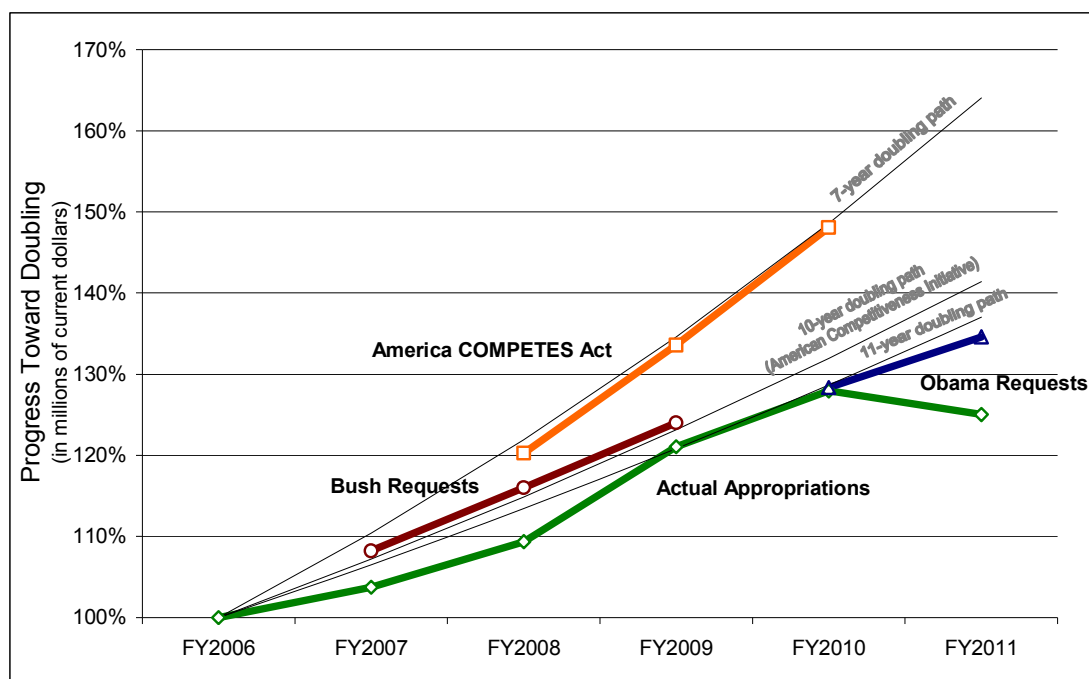
Further, it is unclear whether the Obama Administration still intends to support doubling of the target accounts. Following enactment of the 2011 budget, White House Communications Director Dan Pfeiffer stated on The White House Blog,

Even though we will no longer double the funding of key research and development agencies, you will still see strong investments in National Institute of Standards and Technology, National Science Foundation and the [DOE] Office of Science.

Figure 1 illustrates how requested, actual, and enacted appropriations (for FY2006 through FY2011) for the target accounts, in aggregate, compare to 7- and 10-year doubling rates.

For FY2011, President Obama proposed \$13.255 billion in funding for NSF, DOE's Office of Science, and NIST's core research and facilities, an increase of \$824 million (6.6%) above the FY2010 estimated funding level of \$12.598 billion; Congress appropriated \$12.311 billion for FY2011. The American Recovery and Reinvestment Act of 2009 (P.L. 111-5) also provided funding for each of the three ACI agencies totaling approximately \$5.202 billion (in addition to the enacted levels in P.L. 110-329). (See **Table 4**.)

¹⁷ Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the 2011 Budget*, February 1, 2010, <http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf>.

Figure I. Doubling of Research Funding Effort: Appropriations versus Selected Rates

Source: Prepared by the Congressional Research Service (CRS) using data from the sources cited in **Table 4**; appropriations data does not include funding providing by the American Recovery and Reinvestment Act of 2009.

Notes: The 10-year doubling pace assumes annual increases of 7.2% each year for 10 years. The seven-year double pace assumes annual increases of 10.4% each year for seven years. Through compounding, these rates achieve the doubling of funding in the desired time period. The line passing through the aggregate agency appropriations data points is for illustration purposes only.

Table 4. Agencies Targeted for Research Doubling by President Obama, the America COMPETES Act, and the American Competitiveness Initiative

(dollar amounts in millions)

Agency	FY2006 Actual	FY2007 Actual	FY2008 Actual	FY2009 Actual	FY2009 ARRA	FY2010 Estimate	FY2011 Request	FY2011 Enacted
National Science Foundation	5,646	5,884	6,084	6,469	2,402	6,972	7,424	6,860
Department of Energy/Office of Science	3,632	3,837	4,083	4,807	1,633	4,964	5,121	4,874
National Institute of Standards and Technology/core research ^a	395	434	441	472	220	515	585	507
National Institute of Standards and Technology/facilities	174	59	161	172	360	147	125	70
Total^b	9,846	10,214	10,768	11,920	4,615	12,598	13,255	12,311

Sources: National Institute of Standards and Technology, budget requests for fiscal years 2008, 2009, 2010, and 2011, available at http://www.nist.gov/public_affairs/budget/index.cfm; Department of Energy, budget requests for

fiscal years 2008, 2009, 2010, and 2011, available at <http://www.cfo.doe.gov/crorg/cf30.htm>; National Science Foundation, budget requests for fiscal years 2008, 2009, 2010, and 2011, available at <http://www.nsf.gov/about/budget/>. FY2011 enacted funding levels based on CRS analysis of P.L. 112-10.

- a. NIST core research activities are those performed under its Scientific and Technical Research and Services account.
- b. Totals may differ from the sum of the components due to rounding.

FY2010 Supplemental Funding for Research and Development

On February 12, President Obama submitted to Congress a request for FY2010 supplemental funding for disaster relief related to Hurricane Katrina and the Midwest floods, as well as for funds to implement settlement of certain legal cases. The request did not appear to contain any funding for R&D or related activities.

On March 21, 2010, the Disaster Relief and Summer Jobs Act of 2010 (H.R. 4899), a FY2010 supplemental funding bill, was introduced in the House and was subsequently passed. The House-passed version of H.R. 4899 did not appear to contain any funding for R&D or related activities. On May 14, 2010, the Senate Committee on Appropriations adopted an amendment in the form of a substitute and reported the bill, accompanied by S.Rept. 111-188. On May 27, 2010, the Senate passed H.R. 4899, as amended. The Senate version of H.R. 4899 was named the Supplemental Appropriations Act, 2010, and includes funding for a variety of agencies and purposes, including funding for R&D and related activities. On July 1, 2010, the House passed an amended version of the bill that would, among other things, rescind funds for research and development accounts at the Departments of Commerce, Defense, Energy, Homeland Security, and Interior. Subsequently, the Senate considered the House-amended version of the bill. A cloture vote failed and the amended bill was sent back to the House. On July 27, 2010, the House passed the Senate's May 27 version of the bill; President Obama signed the bill (P.L. 111-212) into law on July 29, 2010.

Multiagency R&D Initiatives

National Nanotechnology Initiative

President Obama's FY2011 budget request sought funding for three multiagency R&D initiatives. Funding for the National Nanotechnology Initiative (NNI) was requested in the amount of \$1.776 billion for FY2011, \$5 million (0.3%) below the estimated FY2010 level of \$1.781 billion. The overall decrease in the FY2011 NNI funding request was due primarily to reductions of \$87 million (20.0%) in funding for DOD nanotechnology R&D compared to its estimated FY2010 funding level, a decrease of \$17 million (4.1%) in funding for NSF, and a decrease of \$6 million (5.3%) in funding for NIST. These decreases were offset, in part, by requested increases in funding for other agencies, primarily DOE (up \$65 million, 17.4%) and HHS¹⁸ (up \$36 million, 9.5%).¹⁹

¹⁸ HHS NNI R&D funding includes funding for NIH, the Food and Drug Administration, and the Centers for Disease Control and Prevention.

¹⁹ Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010. For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview*, (continued...)

Networking and Information Technology Research and Development Program

President Obama requested \$4.281 billion in FY2011 funding for the Networking and Information Technology Research and Development (NITRD) program, \$9 million (0.2%) below the estimated FY2010 level of \$4.290 billion. The NITRD request included a reduction of \$171 million (13.4%) in DOD funding, and increases of \$80 million (7.3%) for NSF, \$38 million (3.1%) for HHS, \$29 million (5.9%) for DOE, and \$15 million (14.4%) for DOC.²⁰

U.S. Global Change Research Program

President Obama proposed \$2.561 billion for the U.S. Global Change Research Program (USGCRP) in FY2010, \$439 million (20.7%) above the estimated FY2010 level of \$2.122 billion. Four agencies were to receive the bulk of the FY2010 USGCRP funding increase: NASA (up \$214 million, 20.0%); DOC, including the National Oceanic and Atmospheric Administration and NIST (up \$77 million, 21.4%); NSF (up \$51 million, 16.0%); and USDA (up \$48 million, 44.0%).²¹

FY2011 Appropriations Status

As of the end of the 111th Congress, no regular appropriations bill had been enacted. Two of the 12 regular appropriations bills had passed the House (the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2011, and the Military Construction and Veterans Affairs and Related Agencies Appropriations Act, 2011); none had passed the Senate.

To provide for continuity of government operations into FY2011, the 111th and 112th Congress passed a series of continuing resolutions that provided funding for all agencies until enactment of the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10) by the 112th Congress on April 15, 2011. Division A of the act provides FY2011 appropriations for the Department of Defense; Division B provides full-year continuing funding for FY2011 for all other agencies at their FY2010 levels unless other provisions in the act specify otherwise. With respect to federal R&D funding overall and to several agencies in particular, it is not possible yet to assess the level of funding provided under the act. This report will be updated as additional information about FY2011 R&D funding becomes available.

The remainder of this report provides a more in-depth analysis of research and development in 12 federal departments and agencies that receive more than 98% of federal R&D funding. Annual appropriations for these agencies are provided through 8 of the 12 regular appropriations bills.

(...continued)

Reauthorization, and Appropriations Issues, by John F. Sargent Jr.

²⁰ Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation*, February 1, 2010.

²¹ Executive Office of the President, Office of Science and Technology Policy, *Investing in the Building Blocks of American Innovation: Federal R&D, Technology, and STEM Education in the 2011 Budget*, Table 1, February 1, 2010. The USGCRP figures do not include Climate Change International Assistance programs in the U.S. Agency for International Development (U.S. AID), \$43 million requested for FY2011. For additional information on the USGCRP, see CRS Report RL33817, *Climate Change: Federal Program Funding and Tax Incentives*, by Jane A. Leggett.

For each agency covered below, **Table 5** shows the corresponding regular appropriations bill that provides funding for the agency, including its R&D activities.

Table 5. Alignment of Agency R&D Funding and Regular Appropriations Bills

Department/Agency	Regular Appropriations Bill
Department of Defense	Department of Defense Appropriations Act
Department of Homeland Security	Department of Homeland Security Appropriations Act
National Institutes of Health	Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act
Department of Energy	Energy and Water Development and Related Agencies Appropriations Act
National Science Foundation	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Commerce National Institute of Standards and Technology National Oceanic and Atmospheric Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
National Aeronautics and Space Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Agriculture	Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act
Department of the Interior	Department of the Interior, Environment, and Related Agencies Appropriations Act
Environmental Protection Agency	Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Transportation	Transportation, Housing and Urban Development, and Related Agencies Appropriations Act

Source: CRS website, FY2011 Status Table of Appropriations, available at <http://www.crs.gov/Pages/appover.aspx>.

Department of Defense²²

Congress supports research and development in the Department of Defense (DOD) through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation primarily supports the development of the nation's future military hardware and software and the technology base upon which those products rely.

Nearly all of what DOD spends on RDT&E is appropriated in Title IV of the defense appropriation bill. (See **Table 6**.) However, RDT&E funds are also appropriated in other parts of the bill. For example, RDT&E funds are appropriated as part of the Defense Health Program and the Chemical Agents and Munitions Destruction Program. The Defense Health Program supports the delivery of health care to DOD personnel and their families. Program funds are requested through the Operations and Maintenance appropriation. The program's RDT&E funds support

²² This section was written by John Moteff, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program have been requested through the Procurement appropriation. The Joint Improvised Explosive Device Defeat Fund (JIEDDF) also contains RDT&E monies. However, the fund does not contain an RDT&E line item as do the two programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which now administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. The JIEDDF funding is not included in the table below. Typically, Congress has funded each of these programs in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

RDT&E funds also have been requested and appropriated as part of DOD's separate funding to support efforts in what the Bush Administration had termed the Global War on Terror (GWOT), and what the Obama Administration refers to as Overseas Contingency Operations (OCO). Typically, the RDT&E funds appropriated for GWOT/OCO activities go to specified Program Elements (PEs) in Title IV. However, they are requested and accounted for separately. The Bush Administration requested these funds in separate GWOT emergency supplemental requests. The Obama Administration, while continuing to identify these funds uniquely as OCO requests, has included these funds as part of the regular budget, not in emergency supplementals. However, the Obama Administration will ask for additional OCO funds in supplemental requests, if the initial OCO funding is not enough to get through the fiscal year.

In addition, GWOT/OCO-related requests/appropriations often include money for a number of transfer funds. These include the Iraqi Freedom Fund (IFF), the Iraqi Security Forces Fund, the Afghanistan Security Forces Fund, the Mine Resistant and Ambush Protected Vehicle Fund (MRAPVF), and, beginning in FY2010, the Pakistan Counterinsurgency Capability Fund. Congress typically makes a single appropriation into each of these funds, and authorizes the Secretary to make transfers to other accounts, including RDT&E, at his discretion.

For FY2011, the Obama Administration requested \$76.131 billion for DOD's baseline Title IV RDT&E, roughly \$4.5 billion (between 5% and 6%) less than the funding available for baseline Title IV RDT&E in FY2010. The FY2011 requests for RDT&E in the Defense Health Program and the Chemical Agents and Munitions Destruction program were \$500 million and \$401 million, respectively. In addition, the Obama Administration requested \$635 million in FY2011 OCO-related RDT&E. It also submitted a supplemental request for additional FY2010 OCO funding, which included \$277 million for RDT&E.

In the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10), Congress provided \$74.957 billion in Title IV RDT&E funding. This was \$1.174 billion below the request and \$5.698 billion below what was available in FY2010. A large share of the reductions were taken from the Systems Development and Demonstration activities of the departments, including reductions due to program adjustments in the Army's manned ground vehicle program, the Navy's Joint Strike Fighter program, terminations of the Air Forces HH-60 search and rescue helicopter program and the Marines Expeditionary Fighting Vehicle, and reductions in the Chemical/Biological Defense Program due in part to schedule delays. Congress also provided \$1.176 billion in RDT&E through the Defense Health Program and \$393 million in RDT&E through the Chemical Agents and Munitions Destruction Program. Congress also provided \$979 billion in OCO RDT&E funding, including \$24 billion for the Defense Health Program.

RDT&E funding can be broken out in a couple of ways. Each of the military departments request and receive their own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency), collectively aggregated within the Defensewide account. RDT&E funding also can be characterized by budget activity (i.e., the type of RDT&E supported). Those budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced technology development, respectively) constitute what is called DOD's Science and Technology Program (S&T) and represent the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components (e.g., the Joint Strike Fighter or missile defense systems), for which an operational need has been determined and an acquisition program established. Budget activity 6.7 supports system improvements in existing operational systems. Budget activity 6.6 provides management support, including support for test and evaluation facilities.

Congress is particularly interested in S&T funding since these funds support the development of new technologies and the underlying science. Ensuring adequate support for S&T activities is seen by some in the defense community as imperative to maintaining U.S. military superiority. This was of particular concern at a time when defense budgets and RDT&E funding were falling at the end of the Cold War. As part of its 2001 Quadrennial Review, DOD established a goal of stabilizing its baseline S&T funding (i.e., Title IV) at 3% of DOD's overall funding. Congress has embraced this goal.

The FY2011 baseline S&T funding request in Title IV is \$11.819 billion, about \$1.928 billion (14%) less than the funding available for baseline S&T in Title IV in FY2010. Furthermore, the S&T request for baseline Title IV is approximately 2.2% of the overall baseline DOD budget request (\$549 billion, not counting funds for the Overseas Contingency Operations), short of the 3% goal. The S&T funding provided in the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10) totaled \$11.982 billion, \$163 million more than requested. Basic research was less than requested, but more than what was available in FY2010.

Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities. DOD is not a large supporter of basic research, when compared to NIH or NSF. However, over half of DOD's basic research budget is spent at universities and represents the major contribution of funds in some areas of science and technology (such as electrical engineering and material science). The FY2011 request for basic research (\$1.999 billion) is roughly \$166 million (8%) less than what was available for Title IV basic research in FY2010.

While the FY2011 request for RDT&E is below the funding provided in FY2010, Congress provided more funding than requested in FY2010, as it has for a number of years. Even so, the FY2011 request is roughly \$2.5 billion below the Administration's FY2010 request. The Administration requested more in FY2011 than FY2010 for basic research and applied research.

Table 6. Department of Defense RDT&E

(in millions of dollars)

Budget Account	FY2010	FY2011 Request		FY2011 Enacted	
	Actual	Base	OCO	Base	OCO
Army	11,711	10,333	151	9,711	143
Navy	19,948	17,693	60	17,736	105
Air Force	27917 ^c	27,247	266	26,517	484
Defensewide	20,890	20,662	157	20,797	223
Dir. Test & Eval.	188	195		195	
Total Title IV - By Account^d	80,655	76,131	635	74,957	955
Budget Activity					
6.1 Basic Research	1,815	1,999		1,947	
6.2 Applied Research	4,984	4,476		4,497	
6.3 Advanced Dev.	6,507	5,344	14	5,539	130
6.4 Advanced Component Dev. and Prototypes	14,469	13,877	75	14,391	52
6.5 Systems Dev. and Demo	16,779	16,453	44	14,486	92
6.6 Management Support ^e	6,098	4,484	5	4,569	
6.7 Op. Systems Dev. ^f	30,003	29,498	497	29,527	682
Total Title IV - by Budget Activity^d	80,655	76,131	635	74,957	955
Title VI - Other Defense Programs					
Defense Health Program	1,444	500		1,176	24
Chemical Agents and Munitions Destruction	351	401		393	
Grand Total	82,036	77,032	635	76,525	979

Source: FY010 actual figures taken from the Department of Defense Budget, Fiscal Year 2012, RDT&E Programs (R-1), February 2011. FY2011 request figures taken from the Department of Defense Budget, fiscal Year 2011, RDT&E Programs (R-1), February 2010. The FY2011 enacted figures taken from H.R. 1473, P.L. 112-10, and from the Explanatory Summary in Congressional Record, April 14, 2011, H2768-H2787.

- a. FY2009 figures do not include \$300 million for Title IV RDT&E provided in the American Recovery and Reinvestment Act (P.L. 111-5).
- b. See **Table 7** below for Congressional action on the FY2010 Supplemental.
- c. Includes \$292 million for Tanker Replacement Transfer Fund.
- d. Total Budget Authority for Account and Budget Activity may not agree due to rounding.
- e. Includes funds for Developmental and Operational Test and Evaluation.
- f. Includes funding for classified programs.

The Senate Appropriations Committee added the Obama Administration's FY2010 OCO Supplemental request to H.R. 4899; see **Table 7**. The Administration requested \$277 million in supplemental RDT&E. The committee recommended \$274 million, eliminating funds for the Army request, reducing funds for classified programs, providing a net decrease in funds for the Air Force, and providing a net increase in funds for the Navy and Defensewide accounts. The House resolved to concur with the Senate's action on RDT&E.

Table 7. FY2010 OCO Supplemental
(in millions of dollars)

Budget Account	Request	House ^a	Senate	Enacted
Army	62	0	0	0
Navy	5	45	45	45
Air Force	188	164	164	164
Defensewide	22	65	65	65
Dir. Test & Eval.				
Total Title IV-By Account^b	277	274	274	274
Budget Activity				
6.1 Basic Research				
6.2 Applied Research				
6.3 Advanced Dev.		16	16	16
6.4 Adv. Component Dev. and Prototypes				
6.5 Sys. Dev. and Demo	66	44	44	44
6.6 Management Support ^c	11	5	5	5
6.7 Op. Systems Dev. ^d	200	209	209	209
<i>Classified programs</i>	<i>200</i>	<i>139</i>	<i>139</i>	<i>139</i>
Total Title IV - by Budget Activity^b	277	274	274	274
Title VI - Other Defense Programs				
Defense Health Program				
Chemical Agents and Munitions Destruction				
Grand Total	277	274	274	274

Source: Senate Rpt. 111-188, accompanying H.R. 4899. P.L. 111-212.

- The House resolved to concur with the Senate amendments to H.R. 4899 related to DOD's RDT&E funding.
- Total Budget Authority for Account and Budget Activity may not agree due to rounding.
- Includes funds for Developmental and Operational Test and Evaluation.
- Includes funding for classified programs. Funding for classified programs in italics below.

Department of Homeland Security²³

The Department of Homeland Security (DHS) requested \$1.344 billion for R&D and related programs in FY2011, a 4% decrease from \$1.407 billion in FY2010.²⁴ This total included \$1.018 billion for the Directorate of Science and Technology (S&T), \$306 million for the Domestic Nuclear Detection Office (DNDO), and \$20 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard. The final appropriation for these activities was \$1.122 billion, including \$767 million for S&T, \$331 million for DNDO, and \$24 million for Coast Guard RDT&E. (See **Table 8**.)

The S&T Directorate is the primary DHS R&D organization.²⁵ Headed by the Under Secretary for Science and Technology, it performs R&D in several laboratories of its own and funds R&D performed by the DOE national laboratories, industry, universities, and others. The Administration requested a total of \$1.018 billion for the S&T Directorate for FY2011. This was 2% more than the FY2010 appropriation, but it included \$109 million for radiological and nuclear countermeasures R&D, an activity formerly funded in DNDO. The request proposed reducing funding for the directorate's other activities by 9%. A proposed reduction of \$39 million for the Infrastructure and Geophysical Division included the termination of local and regional initiatives previously established or funded at congressional direction. The request for Laboratory Facilities included no funds for the planned National Bio and Agro-Defense Facility (NBAF), which received \$32 million in FY2010, but DHS stated that it planned to request a reprogramming of unobligated prior-year funds to support construction of a utility plant at the NBAF site.²⁶ The final appropriation was \$767 million: \$828 million in new funds and a rescission of \$60 million remaining unobligated from prior years. For the most part, Congress did not specify how the final appropriation should be allocated to particular programs.

The construction of NBAF will likely require significant increases in Laboratory Facilities funding over the next several years. It may also result in increased congressional oversight. For construction of NBAF and decommissioning of the Plum Island Animal Disease Center (PIADC), which NBAF is intended to replace, DHS expects to need further appropriations of \$691 million between FY2012 and FY2017. The estimated total federal cost of the NBAF project increased from \$451 million in December 2006 to \$615 million in May 2009. Additional site-specific infrastructure and utility upgrade costs of \$110 million are to be contributed in-kind by Kansas State University and its partners. Decommissioning PIADC is expected to cost another \$190 million. These estimated costs have not changed since May 2009, but the completion schedule has been extended by one year because the process of selling Plum Island is taking longer than

²³ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

²⁴ If the DNDO Systems Acquisition account, which funds little or no R&D, was excluded, then the FY2011 request was \$1.283 billion, a decrease of 7% from FY2010.

²⁵ For more information, see CRS Report RL34356, *The DHS Directorate of Science and Technology: Key Issues for Congress*, by Dana A. Shea and Daniel Morgan.

²⁶ DHS is prohibited from obligating funds for NBAF construction until 90 days after it completes a safety and security assessment, has it evaluated by the National Academy of Sciences, and provides the Academy's report and certain other reports to the House and Senate appropriations committees. (Department of Homeland Security Appropriations Act, 2010, P.L. 111-83, §560) According to the DHS congressional budget justification for FY2011, DHS expects to conduct site preparation at the NBAF site during FY2010 and FY2011, and to begin construction of a utility plant in FY2011, but does not plan to commence construction of the laboratory facility until FY2012.

DHS had planned. In the Department of Homeland Security Appropriations Act, 2009 (P.L. 110-329, Div. D, §540) and the Department of Homeland Security Appropriations Act, 2010 (P.L. 111-83, §540), Congress authorized DHS to use receipts from the sale of Plum Island, subject to appropriation, to offset NBAF construction and PIADC decommissioning costs.²⁷ The final FY2011 appropriation continued this authorization from the FY2010 act.

Congress has been interested for several years in DHS policies and procedures for testing and evaluation (T&E) of large acquisition projects. This interest has especially focused on the T&E role of the S&T Directorate in acquisitions by other DHS components. The Homeland Security Act of 2002 (P.L. 107-296, §306) authorizes the Secretary of Homeland Security, acting through the Under Secretary for Science and Technology, to “issue necessary regulations with respect to ... testing and evaluation activities of the Department.” Under current DHS policy, in establishing T&E policies and procedures for DHS acquisitions, the Under Secretary acts through the Director of the S&T Directorate’s Test and Evaluation and Standards Division (TSD) and a special assistant in the TSD known as the Director of Operational Testing and Evaluation (DOT&E).²⁸ Congressional oversight of DHS acquisition and T&E may therefore focus attention on the S&T Directorate’s funding for Test and Evaluation and Standards.

Statutory authority for the Homeland Security Institute (HSI) expired in April 2009. Under its general authority to establish federally funded R&D centers, the S&T Directorate has replaced HSI with the Homeland Security Studies and Analysis Institute (HSSAI). It has also established a new Homeland Security Systems Engineering and Development Institute (HSSEDI). Both institutes are funded mostly on a cost-reimbursement basis by other S&T programs and other DHS and non-DHS agencies. The institutes attracted outside users in FY2009 at only about one-third the level that DHS had anticipated. Nevertheless, DHS expects them to grow rapidly in FY2010 and continue growing in FY2011. The FY2011 budget justification projected reimbursable obligations of \$187 million in FY2011, more than four times the FY2009 level of \$42 million.

The Domestic Nuclear Detection Office (DNDO) is the primary DHS organization for combating the threat of nuclear attack. It is responsible for all DHS nuclear detection development, testing, evaluation, acquisition, and operational support. Under the Administration’s FY2011 budget, DNDO’s research role was to be transferred to the S&T Directorate. The Administration requested a total of \$306 million for DNDO for FY2011. This was a 20% decrease from the FY2010 appropriation. Excluding the proposed transfer of the Transformational R&D program, the request for the remaining DNDO activities was a 12% increase. In some cases, however, the request proposed substantial shifts in emphasis. The request for Systems Acquisition included \$53 million for human-portable radiation detection systems, versus none in FY2010. The request for Systems Development was reduced by \$31 million. The final appropriation provided \$331 million for DNDO: \$342 million in new funds and a rescission of \$11 million remaining unobligated from prior years. Congress did not specify how the final appropriation should be allocated to programs below the account level.

²⁷ For more information on NBAF, see CRS Report RL34160, *The National Bio- and Agro-Defense Facility: Issues for Congress*, by Dana A. Shea, Jim Monke, and Frank Gottron.

²⁸ DHS, *Acquisition Management Directive*, DHS Directive 102-01, revision 01, authorized by the Under Secretary for Management on January 20, 2010.

Congressional attention has focused in recent years on the testing and analysis DNDO has conducted to support its planned purchase and deployment of Advanced Spectroscopic Portals (ASPs), a type of next-generation radiation portal monitor.²⁹ Congress has included a requirement for secretarial certification before full-scale ASP procurement in each homeland security appropriations act from FY2007 through FY2010. The expected date for certification has been postponed several times. In February 2010, DHS decided that it would no longer pursue the use of ASPs for primary screening, although it will continue developing and testing them for use in secondary screening.³⁰ The final FY2011 appropriation continued the certification requirement from the FY2010 act.

The global nuclear detection architecture overseen by DNDO remains an issue of congressional interest.³¹ According to the FY2011 budget justification, the proposed reduction in funding for Systems Development reflected “a shift in DNDO priorities to developing a wider range of potential solutions to enduring vulnerabilities in the global nuclear detection architecture” and would result in increased funding for “systems studies, as well as testing and piloting existing technologies in new operational environments.” Congress may wish to consider the basis for and implications of these changes in priorities, including how they may affect other elements of the global architecture. Other agencies with a role in the architecture, in addition to DHS, include the DOD, DOE, Department of Justice, Department of State, and the intelligence community.

The mission of DNDO, as established by Congress in the SAFE Port Act (P.L. 109-347, Title V), includes serving as the primary federal entity “to further develop, acquire, and support the deployment of an enhanced domestic system” for detection of nuclear and radiological devices and material (6 U.S.C. 592). The act also eliminated any explicit mention of radiological and nuclear countermeasures from the statutory duties and responsibilities of the Under Secretary for S&T. Congress may consider whether the proposed transfer of DNDO’s research activities to the S&T Directorate is consistent with congressional intent in the SAFE Port Act. Congress may also choose to consider the acquisition portion of DNDO’s mission. Most of DNDO’s funding for Systems Acquisition was eliminated in FY2010, and that year’s budget stated that “funding requests for radiation detection equipment will now be sought by the end users that will operate them.”³² In contrast, the FY2011 request for Systems Acquisition included more funding than ever before for DNDO’s procurement of human-portable radiation detectors on behalf of the Coast Guard, Customs and Border Protection, and the Transportation Security Administration. The reasons for this apparent reversal of policy were not explained in the FY2011 budget justification for DNDO.

²⁹ For more information, see CRS Report RL34750, *The Advanced Spectroscopic Portal Program: Background and Issues for Congress*, by Dana A. Shea, John D. Moteff, and Daniel Morgan.

³⁰ Letter from Dr. William K. Hagan, Acting Director, DNDO, to Senator Lieberman, February 24, 2010, http://hsgac.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=11f7d1f0-c4fe-4105-94e6-bb4a0213f048.

³¹ For more information, see CRS Report RL34574, *The Global Nuclear Detection Architecture: Issues for Congress*, by Dana A. Shea.

³² Executive Office of the President, FY2010 Budget, Appendix, p. 560.

Table 8. Department of Homeland Security R&D and Related Programs
(in millions of dollars)

	FY2010 Enacted	FY2011 Request	FY2011 Enacted
Directorate of Science and Technology	\$1,000	\$1,018	\$767
Management and Administration	143	152	141
R&D, Acquisition, and Operations	856	866	626
<i>Border and Maritime</i>	44	40	<i>n/a</i>
<i>Chemical and Biological</i>	207	201	<i>n/a</i>
<i>Command, Control, and Interoperability</i>	82	75	<i>n/a</i>
<i>Explosives</i>	121	121	<i>n/a</i>
<i>Human Factors / Behavioral Sciences</i>	16	13	<i>n/a</i>
<i>Infrastructure and Geophysical</i>	75	36	<i>n/a</i>
<i>Radiological and Nuclear</i>	—	109	<i>n/a</i>
<i>Innovation</i>	44	44	<i>n/a</i>
<i>Laboratory Facilities</i>	150	122	<i>n/a</i>
<i>Test and Evaluation, Standards</i>	29	23	<i>n/a</i>
<i>Transition</i>	46	42	<i>n/a</i>
<i>University Programs</i>	49	40	<i>n/a</i> ^a
<i>Homeland Security Institute</i>	—	—	<i>n/a</i>
<i>Rescission of Prior-Year Unobligated Balances</i>	(7)	—	(60)
Domestic Nuclear Detection Office	383	306	331
Management and Administration	38	37	37
Research, Development, and Operations	325	208	264
<i>Systems Engineering and Architecture</i>	25	39	<i>n/a</i>
<i>Systems Development</i>	100	69	<i>n/a</i>
<i>Transformational R&D</i>	109	—	<i>n/a</i>
<i>Assessments</i>	32	43	<i>n/a</i>
<i>Operations</i>	38	34	<i>n/a</i>
<i>Forensics</i>	20	23	<i>n/a</i>
<i>Rescission of Prior-Year Unobligated Balances</i>	—	—	(11)
Systems Acquisition	20	61	30
<i>Radiation Portal Monitors Program</i>	—	8	<i>n/a</i>
<i>Securing the Cities</i>	20	—	<i>n/a</i>
<i>Human Portable Radiation Detection Systems</i>	—	53	<i>n/a</i>
U.S. Coast Guard RDT&E	25	20	24
TOTAL	1,407	1,344	1,122

Source: DHS FY2011 budget justification, online at <http://www.dhs.gov/xabout/budget/>, and P.L. 112-10.

Notes: Totals may not add because of rounding.

a. Not less than 80% of the FY2010 amount.

National Institutes of Health³³

President Obama's FY2011 budget requested a total of \$31.8 billion for NIH at the program level, almost a \$1 billion (2.9%) increase over the FY2010 level of \$30.9 billion.³⁴ FY2010 funding was provided in Division D of the Consolidated Appropriations Act, 2010 (P.L. 111-117).³⁵ The Department of Defense and Full-Year Continuing Appropriations Act, P.L. 112-10, provided \$30.6 billion at the program level for the agency in FY2011, \$317 million less than FY2010, about a 1% reduction.³⁶ The FY2011 appropriation was \$1.217 billion less than the FY2011 request, a 3.8% reduction from the request level. See **Table 9**.

Funding for NIH comes primarily from the annual appropriations bill for the Departments of Labor, Health and Human Services, and Education, and Related Agencies (Labor/HHS), with an additional amount for Superfund-related activities from the appropriations bill for the Department of the Interior, Environment, and Related Agencies (Interior/Environment). Those two bills provide NIH's discretionary budget authority. In addition, NIH receives mandatory funding of \$150 million annually that is provided in the Public Health Service (PHS) Act for a special program on diabetes research, and \$8.2 million annually for the National Library of Medicine from a transfer within PHS. Each year since FY2002, Congress has provided that a portion of NIH's Labor/HHS appropriation be transferred to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria. The transfer, usually \$300 million annually, is part of the U.S. contribution to the Global Fund. The total funding available for NIH activities, taking account of add-ons and transfers, is the program level. The "NIH program level" cited in the Administration's FY2011 budget documents does not reflect the Global Fund transfer; **Table 9** shows the program level both before and after the transfer. Discussions in this section refer to the program level after the transfer.

The agency's organization consists of the Office of the NIH Director (OD) and 27 institutes and centers (ICs). OD sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The ICs focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with OD. Congress provides a separate appropriation to 24 of the 27 ICs, to OD, and to a Buildings and Facilities account. (Three centers, not listed in **Table 9**, are funded through the NIH Management Fund.)

³³ This section was written by Pamela Smith, Analyst in Biomedical Policy, and Judith A. Johnson, Specialist in Biomedical Policy, CRS Domestic Social Policy Division.

³⁴ The NIH FY2011 program level request of \$31,947 million was revised on August 20, 2010, to \$31,844 million due to a \$103 million reduction in the NIH Buildings and Facilities account. For further information on NIH in general, see CRS Report R41705, *The National Institutes of Health (NIH): Organization, Funding, and Congressional Issues*, by Judith A. Johnson and Pamela W. Smith.

³⁵ In FY2010, in addition to the funding from its regular appropriations, NIH also had available about \$5.45 billion in emergency supplemental appropriations that had been provided in the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5). NIH had received a total of \$10.4 billion from ARRA, which was obligated in FY2009 and FY2010.

³⁶ P.L. 112-10 provides FY2011 funding for NIH as follows: from the FY2010 base for NIH enacted in P.L. 111-117 (Labor-HHS, \$31,009 million), the amount for NIH in FY2011 is reduced from the FY2010 base by \$50 million (Buildings and Facilities), \$210 million (pro rata reduction in all NIH accounts for institutes and centers and the Office of the Director), and by a 0.2% across-the-board rescission. The enacted Labor/HHS appropriation level for NIH in FY2011 is \$30,688 million; the enacted total NIH program level, after the Global Fund transfer, is \$30,628 million; see **Table 9**.

For FY2011, NIH identified five areas of “exceptional scientific opportunity” in which it planned to target resources. Specific programmatic increases in the request are described below. Where available, information is also given on final FY2011 funding.

Genomics and Other High Throughput Technologies. Technologies such as DNA sequencing, microarrays, small molecule screening, new imaging methods, and computational biology have enabled basic science research on a much more comprehensive scale than in the past. NIH planned to continue work on The Cancer Genome Atlas, cataloging the characteristics of 20 common malignancies, and to undertake complete genome sequencing and analysis of 300 autism spectrum disorder cases. In support of the National Nanotechnology Initiative, NIH requested an increase of \$22 million (6.0%) to a total of \$382 million for nanotechnology research.

Translational Medicine. NIH continues to emphasize the movement of basic science discoveries into development of improved treatments. The request sought to double support for a trans-NIH initiative launched in FY2009, the Therapeutics for Rare and Neglected Diseases (TRND) program, from \$24 million to \$50 million. The program focuses on the pre-clinical stage of drug development in partnership with the private sector. The Clinical and Translational Science Awards (CTSA) program would have increased to a total of \$500 million in support of a consortium of 60 academic health centers doing collaborative research and training. Cancer researchers planned the initiation of 30 new drug trials in FY2011 and a doubling of the number of novel compounds in Phase 1-3 clinical trials by 2016. NIH’s HIV/AIDS research portfolio would have increased 3.2% to about \$3.2 billion. Funding for stem cell research was requested for a \$30 million increase to \$1.1 billion.

Science to Enable Health Reform. In recent years, NIH has expanded its support of projects in fields that could improve the quality and cost-effectiveness of treatments. Examples include comparative effectiveness research, health disparities research, the identification of prevention approaches, personalized medicine, pharmacogenomics, health economics research, and social and behavioral research. A trans-NIH initiative called the Basic Behavioral and Social Sciences Opportunity Network (OppNet) was started in FY2010 with ARRA funds. It aims to enhance the understanding of fundamental mechanisms of behavioral and social functioning to develop new approaches for reducing risky behaviors and improving health. The FY2011 request proposed a \$20 million investment in OppNet, shared 50/50 between OD and support from all the ICs.

Global Health. In addition to the Global Fund transfer (discussed above), NIH has long supported research on worldwide health threats. As part of the Obama Administration’s Global Health Initiative, the FY2011 budget proposed increased emphasis on researching prevention, diagnostics, and therapeutics for neglected diseases in the developing world. NIH works in partnership with other funding organizations such as the Bill and Melinda Gates Foundation. Although the request detailed no specific funding amounts for overall NIH work on global health, the Fogarty International Center’s budget would have increased by 4.3% from \$70 million to \$73 million. In the enacted appropriation, Fogarty received \$69 million.

Reinvigorating the Biomedical Research Community. The FY2011 budget requested a 6.0% increase in stipends for pre- and post-doctoral trainees supported by the Ruth L. Kirschstein National Research Service Awards program. The increase of \$42 million (to a total of \$824 million) was part of the Administration’s emphasis on supporting science, technology, engineering, and mathematics (STEM) education programs. In FY2010 NIH contributed \$12 million in ARRA funds to DOE for the construction of a promising research tool, the National

Synchrotron Light Source-II. NIH planned to provide an additional \$33 million in FY2011. The high-performance light source is expected to become operational in 2015.

Research Project Grants. Of the funds appropriated to NIH each year, about 84% goes to extramural research as grants, contracts, and other awards. The funding supports research performed by more than 300,000 scientists and technical personnel who work at over 3,100 universities, hospitals, medical schools, and other research institutions around the country and abroad. The primary funding mechanism for supporting investigator-initiated research is the competitive, peer-reviewed research project grant (RPG). In the FY2011 request, funding for RPGs, at \$17.1 billion, represented about 53% of NIH's budget. The request would have supported about 37,000 awards, 195 RPGs more than the projection for FY2010 (excluding ARRA). Within that total, 9,052 competing RPG awards were expected to receive support, 199 fewer than in FY2010. ("Competing" awards means new grants plus competing renewals of existing grants.) For noncompeting continuation awards the request provided a 2% increase (for inflation) and a 2.0% increase in the average cost of competing RPGs (raising that cost to about \$443,000 per award). Estimated support for RPGs under the final FY2011 appropriation was \$16.4 billion, including 8,717 competing grants and about 36,600 total RPG awards.³⁷

Other Funding Mechanisms. Changes proposed in the request for other funding mechanisms within the NIH budget included increased support for research centers, up \$56 million (1.9%) to \$3.090 billion. Support for grants in the Other Research category would have increased by \$47 million (2.6%) to a total of \$1.854 billion. The requested level for training would have provided a stipend increase and support 17,164 Full-Time Training Positions, 92 (0.5%) fewer than in FY2010. R&D contracts were proposed to increase by \$86 million (2.5%) to \$3.546 billion, including \$300 million for the Global HIV/AIDS Fund. The NIH intramural research program, representing about 10% of the NIH budget, would have increased by \$109 million (3.2%) to a total of \$3.394 billion. The request included a proposed increase of \$73 million (5.0%) to a total of \$1.525 billion for research management and support. As has been the case for the past five years, no new funding was requested for extramural research facilities construction and renovation (ARRA provided \$1.0 billion for this purpose). The original request amount of \$126 million for Buildings and Facilities was reduced by \$103 million to \$23 million on August 20, 2010.³⁸ The final FY2011 funding levels provided through P.L. 112-10 included \$2.994 billion for research centers, \$1.813 billion for other research grants, support for 16,802 training positions, \$3.391 billion for R&D contracts (including the Global Fund), \$3.287 billion for the intramural research program, and \$1.519 billion for research management and support.

The OD appropriation covers its own leadership and management operations and a variety of cross-cutting programs. The request would have provided \$1.220 billion for OD in FY2011, an increase of \$43 million (3.7%) over FY2010. The President requested funding of \$194 million for continuation of the National Children's Study, a 0.3% increase. The request included \$100 million (up \$3 million) for research on medical countermeasures against nuclear, radiological, and chemical threats. A total of \$196 million (up \$15 million and 8.3%) was requested for several program coordination offices that work with the ICs, including \$10 million in the Office of Behavioral and Social Sciences Research for the OppNet initiative described earlier. The final

³⁷ Information on the breakout of the FY2011 appropriation by funding mechanism was supplied by the NIH Budget Office on June 23, 2011. By that time, some of the data for FY2010 had changed from the estimates available at the time of the FY2011 President's request.

³⁸ See http://www.whitehouse.gov/sites/default/files/omb/assets/budget_amendments/amendment_08_20_10_0.pdf.

appropriation provided \$1.167 billion for OD, including \$191 million for the National Children's Study.

Also funded through the OD account is the NIH Common Fund, which supports NIH Roadmap initiatives and other trans-institute research. The NIH Roadmap for Medical Research is a set of trans-NIH research activities designed to support high-risk/high-impact research in emerging areas of science or public health priorities. For FY2011, the President requested \$562 million for the Common Fund/Roadmap, up \$18 million (3.2%) from FY2010. The final appropriation provided \$543 million, about level with FY2010 funding. Some Roadmap programs that have been supported for five years would transition to the ICs for continued support. The Common Fund supported a number of initiatives with ARRA money.

NIH and three of the other Public Health Service agencies within HHS are subject to a budget tap called the PHS Program Evaluation Set-Aside. Section 241 of the PHS Act (42 U.S.C. § 238j) authorizes the Secretary to use a portion of eligible appropriations to assess the effectiveness of federal health programs and to identify ways to improve them. The set-aside has the effect of redistributing appropriated funds for specific purposes among PHS and other HHS agencies. Section 205 of the FY2010 Labor/HHS appropriations act capped the set-aside at 2.5%, instead of the 2.4% maximum that had been in place for several years. The FY2011 budget proposed to increase the set-aside to 2.9%, but the final appropriation retained the 2.5% level. NIH, with the largest budget among the PHS agencies, becomes the largest "donor" of program evaluation funds, and is a relatively minor recipient. By convention, budget tables such as **Table 9** do not subtract the amount of the evaluation tap, or of other taps within HHS, from the agencies' appropriations.³⁹

Table 9. National Institutes of Health
(in millions of dollars)

Institutes and Centers (ICs)	FY2010 Actual ^a	FY2011 Request	FY2011 Enacted ^b
Cancer (NCI)	5,098	5,265	5,059
Heart, Lung, and Blood (NHLBI)	3,094	3,188	3,070
Dental and Craniofacial Research (NIDCR)	413	424	410
Diabetes, Digestive, and Kidney Diseases (NIDDK)	1,809	1,858	1,792
Neurological Disorders and Stroke (NINDS)	1,634	1,681	1,622
Allergy and Infectious Diseases (NIAID) ^c	4,815	4,977	4,776
General Medical Sciences (NIGMS)	2,048	2,125	2,034
Child Health and Human Development (NICHD)	1,327	1,369	1,318
Eye (NEI)	706	724	701
Environmental Health Sciences (NIEHS)	695	707	684
Aging (NIA)	1,108	1,142	1,100

³⁹ For further information on the Evaluation Set-Aside, see CRS Report R41737, *Public Health Service (PHS) Agencies: Overview and Funding, FY2010-FY2012*, coordinated by C. Stephen Redhead and Pamela W. Smith.

Institutes and Centers (ICs)	FY2010 Actual ^a	FY2011 Request	FY2011 Enacted ^b
Arthritis, Musculoskeletal, and Skin Diseases (NIAMS)	538	556	534
Deafness and Communication Disorders (NIDCD)	418	429	415
Nursing Research (NINR)	145	150	144
Alcohol Abuse and Alcoholism (NIAAA)	462	475	458
Drug Abuse (NIDA)	1,067	1,094	1,051
Mental Health (NIMH)	1,494	1,540	1,477
Human Genome Research (NHGRI)	524	534	511
Biomedical Imaging and Bioengineering (NIBIB)	316	326	314
Minority Health and Health Disparities (NIMHD) ^d	211	219	210
Research Resources (NCRR)	1,267	1,309	1,258
Complementary and Alternative Medicine (NCCAM)	129	132	128
Fogarty International Center (FIC)	70	73	69
National Library of Medicine (NLM)	340	365	337
Office of Director (OD)	1,177	1,220	1,167
Common Fund (non-add)	(544)	(562)	(543)
Buildings & Facilities (B&F) ^e	100	23	50
Subtotal, Labor/HHS Appropriation	31,005	31,904	30,688
Superfund (Interior appropriation to NIEHS) ^f	79	82	79
Total, NIH discretionary budget authority	31,084	31,986	30,767
Pre-appropriated Type I diabetes funds ^g	150	150	150
PHS Evaluation Tap funding ^h	8	8	8
NIH program level before Global Fund transfer (cited in HHS budget documents)	31,243	32,144	30,926
Global Fund transfer (AIDS/TB/Malaria) ^c	-300	-300	-297
Total, NIH program level after Global Fund transfer	30,943	31,844	30,628

Source: FY2010 Actual and FY2011 Enacted columns based on NIH operating plan at http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan_nih.pdf. FY2011 Request column adapted by CRS from National Institutes of Health, *FY2011 Justification of Estimates for Appropriations Committees*, Tabular Data, p. TD-1, <http://officeofbudget.od.nih.gov/pdfs/FY11/Tabular%20Data.pdf>. Details may not add to totals due to rounding.

- FY2010 Actual reflects real transfer of \$1 million from HHS Office of the Secretary to NIMH, \$4.6 million transfer to Health Resources and Services Administration Ryan White Program, as well as comparable adjustments for transfers of funds from ICs to NLM.
- P.L. 112-10 provides FY2011 funding for NIH as follows: from the base of the FY2010 funding level enacted in P.L. 111-117 (\$31,009 million in the Labor-HHS title and \$79 million in the Interior/Environment title), the amount for NIH is reduced by \$50 million (Buildings and Facilities), \$210 million (pro rata reduction in all NIH accounts for institutes and centers and the Office of the Director), and by a 0.2% across-the-board rescission. The amount for NIMH reflects real transfer of almost \$1 million from HHS Office of the

- Secretary for the Interagency Autism Coordinating Committee. The NIH FY2011 operating plan is found at http://www.hhs.gov/asfr/ob/docbudget/2011operatingplan_nih.pdf.
- c. NIAID totals include funds for transfer to the Global Fund to Fight HIV/AIDS, Tuberculosis, and Malaria (\$300 million in FY2010 and \$297 million in FY2011).
 - d. Sec. 10334(c) of the Patient Protection and Affordable Care Act (P.L. 111-148, as amended) redesignated the Center as an Institute.
 - e. The FY2011 request for Buildings & Facilities was reduced by \$103 million, from \$126 million to \$23 million, on August 20, 2010. See http://www.whitehouse.gov/sites/default/files/omb/assets/budget_amendments/amendment_08_20_10_0.pdf.
 - f. Separate account in the Interior/Environment appropriations for NIEHS research activities related to Superfund.
 - g. Mandatory funds available to NIDDK for Type 1 diabetes research under PHS Act § 330B (provided through P.L. 110-275 and P.L. 111-309). Funds have been appropriated through FY2013.
 - h. Additional funds for NLM from PHS Evaluation Set-Aside (§ 241 of PHS Act).

Department of Energy⁴⁰

The Administration requested \$12.797 billion for Department of Energy (DOE) R&D and related programs in FY2011, including activities in three major categories: science, national security, and energy. This request was 7.2% more than the FY2010 appropriation of \$11.941 billion. The enacted FY2011 appropriation was \$11.590 billion. (See **Table 10** for details.)

The request for the DOE Office of Science was \$5.121 billion, an increase of 4.4% from the FY2010 appropriation of \$4.904 billion. The Administration's stated goal is to double the funding of the Office of Science.⁴¹ This continues a plan initiated by the Bush Administration in January 2006. The original target under both Administrations was to achieve the doubling goal in the decade from FY2006 to FY2016. The current policy no longer specifies a completion date. The 4.4% increase requested for FY2011 was less than the 7.2% annual growth rate required to achieve a doubling in 10 years. The America COMPETES Reauthorization Act of 2010 (P.L. 111-358) authorized \$5.247 billion for the Office of Science in FY2011. The enacted FY2011 appropriation was \$4.843 billion.

The Administration's budget request proposed increases for most of the research programs of the Office of Science. The largest was for basic energy sciences. Among other changes, the request for this program included \$34 million for a new energy innovation hub on materials for batteries and energy storage and \$24 million for the existing hub on fuels from sunlight.⁴² The Administration proposed to initiate eight energy innovation hubs in FY2010, but Congress funded only three. The aim of the hubs is "to address basic science and technology hindering the nation's secure and sustainable energy future" by assembling multidisciplinary teams of researchers "spanning science, engineering, and other disciplines, but focused on a single critical national need identified by the Department."⁴³ The request tripled funding for Office of Science graduate

⁴⁰ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁴¹ For more information, see CRS Report R41951, *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by John F. Sargent Jr.

⁴² Previously, the fuels from sunlight hub was funded by the DOE Office of Energy Efficiency and Renewable Energy.

⁴³ DOE FY2011 budget justification, vol. 4, p. 86.

fellowships to \$15 million. In fusion energy sciences, it proposed decreasing the U.S. contribution to International Thermonuclear Experimental Reactor (ITER) from \$135 million in FY2010 to \$80 million in FY2011 because of delays in the construction schedule. The current estimate for ITER's total project cost remains between \$1.45 billion and \$2.2 billion. Despite a slip of several years in the expected start-up date for ITER, DOE stated in February 2011 that "the costs associated with the schedule delays to date ... are manageable within the existing ... cost range."⁴⁴ Damage to component test facilities in Japan, however, caused by the Fukushima earthquake and tsunami in March 2011, may result in additional delays.⁴⁵ The enacted FY2011 appropriation provided less than the request for each of the six major research programs of the Office of Science. For details, see **Table 10**.

The request for DOE national security R&D was \$3.850 billion, a 10.6% increase from \$3.481 billion in FY2010. The request included a proposed increase of \$58 million in funding for experiments and analysis in support of advanced certification of nuclear weapons. It proposed an increase of \$125 million for the naval reactors program, to accelerate the continuing design of reactors for the Ohio-class ballistic missile submarine, modernization of the land-based prototype reactor, and recapitalization of program infrastructure. It included an increase of \$34 million for nonproliferation and verification R&D to support testing and evaluation of new technologies for treaty monitoring. The enacted FY2011 appropriation provided \$3.697 billion, including more than the request for nonproliferation and verification R&D and less than the request in the other major categories. For details, see **Table 10**.

The request for DOE energy R&D was \$3.825 billion, up 7.6% from \$3.556 billion in FY2010. In the energy efficiency and renewable energy program, requested changes included a \$98 million increase for solar and wind energy; a \$37 million increase for energy efficiency; a \$37 million decrease for hydrogen and fuel cell technologies; and \$50 million for the RE-ENERGYSE program on education and workforce development in energy science and engineering, for which Congress appropriated no funds in FY2010. The request included an increase of \$37 million for nuclear energy and proposed to restructure the program to focus more on long-term R&D rather than short-term demonstration projects. In fossil energy R&D, the request provided no funds for natural gas technologies or unconventional fossil energy technologies; DOE budget documents described this proposal as "consistent with Administration policy to phase out fossil fuel subsidies."⁴⁶ The enacted FY2011 appropriation included \$376 million less than the request for energy efficiency and renewable energy and smaller reductions in each of the other major categories. For details, see **Table 10**.

The Administration requested \$300 million for the Advanced Research Projects Agency–Energy (ARPA-E). This agency received no appropriation for FY2010. The bulk of its prior funding was provided by the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5).⁴⁷ In recommending no funds for ARPA-E in FY2010, the House Committee on Appropriations explained that ARRA funds remained available and that "the decision not to provide any

⁴⁴ DOE FY2012 congressional budget justification, vol. 4, p. 234.

⁴⁵ Geoff Brumfiel, "Japan Quake Rocks Fusion Project: Damaged Facilities Force Further Delay to ITER Experiment," *Nature*, May 31, 2011.

⁴⁶ DOE FY2011 budget justification, vol. 3, pp. 701 and 710.

⁴⁷ For more information on ARPA-E, see CRS Report RL34497, *Advanced Research Projects Agency - Energy (ARPA-E): Background, Status, and Selected Issues for Congress*, by Deborah D. Stine.

additional funding ... [did] not in any way suggest a lack of commitment to this program by the Committee."⁴⁸ The enacted FY2011 appropriation for ARPA-E was \$180 million.

Table 10. Department of Energy R&D and Related Programs

(in millions of dollars)

	FY2010 Enacted	FY2011 Request	FY2011 Enacted
Science	4,904	5,121	4,843
Basic Energy Sciences	1,636	1,835	1,678
High Energy Physics	810	829	795
Biological and Environmental Research	604	627	612
Nuclear Physics	535	562	540
Fusion Energy Sciences	426	380	375
Advanced Scientific Computing Research	394	426	422
Other	499	462	412
National Security	3,481	3,850	3,697
Weapons Activities ^a	2,198	2,395	2,358 ^b
Naval Reactors	945	1,070	959
Nonproliferation and Verification R&D	317	352	361
Defense Environmental Cleanup Technology Devel.	20	32	19
Energy	3,556	3,825	3,050
Energy Efficiency and Renewable Energy ^c	1,973	1,970	1,594
Fossil Energy R&D	672	587	445
Nuclear Energy	787	824	726
Electricity Delivery & Energy Reliability R&D	125	144	105
Advanced Research Projects Agency–Energy	0	300	180
Total	11,941	12,797	11,590

Source: DOE FY2011 budget justification, online at <http://www.cfo.doe.gov/budget/11budget/>, P.L. 112-10, and H.Rept. 112-118.

Notes:

- a. Including Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Science, Engineering except Enhanced Surety and Enhanced Surveillance, Inertial Confinement Fusion, Advanced Simulation and Computing, Science Technology and Engineering Capability, and a prorated share of Readiness in Technical Base and Facilities. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems, but these funds are not included in the table because detailed funding schedules for those subprograms are classified.
- b. Estimated by CRS. Some sub-account amounts in this category were not specified by P.L. 112-10 or stated in H.Rept. 112-118.
- c. Excluding Weatherization and Intergovernmental Activities.

⁴⁸ H.Rept. 111-203, p. 120.

National Science Foundation⁴⁹

The National Science Foundation (NSF) supports basic research and education in the non-medical sciences and engineering. Congress established the Foundation as an independent federal agency in 1950 and directed it to “promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes.”⁵⁰ The NSF is a primary source of federal support for U.S. university research. It is also responsible for significant shares of the federal science, technology, engineering, and mathematics (STEM) education program portfolio and federal STEM student aid and support.⁵¹

NSF’s FY2011 Current Plan⁵² includes a total of \$6.806 billion for activities at the Foundation.⁵³ This amount is \$166.3 million (-2.4%) less than the FY2010 actual level of \$6.972 billion⁵⁴ and \$618.5 million (-8.3%) less than the President’s FY2011 request for \$7.424 billion. (See **Table 11.**)

At the time it was released, the President’s FY2011 budget request sought to continue an ongoing effort to double funding for the NSF, NIST laboratories and construction accounts, and the DOE Office of Science (collectively, the “targeted accounts”).⁵⁵ The status of the so-called “doubling path” policy for the targeted accounts is now uncertain. FY2011 enacted funding for the targeted accounts was below authorized levels and set a pace for a 15-year doubling—more than twice the length of time envisioned in the 2007 America COMPETES Act (P.L. 110-69) and about a third longer than the pace set by the 2010 reauthorization (P.L. 111-358). Further, although the FY2011 version of the *President’s Plan for Science and Innovation* set an 11-year doubling path,⁵⁶ following enactment of the 2011 budget, White House Communications Director Dan Pfeiffer stated on The White House Blog,

⁴⁹ This section was written by Heather B. Gonzalez and Christine M. Matthews, Specialists in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁵⁰ The National Science Foundation Act of 1950 (P.L. 81-507), Purpose.

⁵¹ For more information on the NSF, see CRS Report 95-307, *U.S. National Science Foundation: An Overview*, by Christine M. Matthews.

⁵² P.L. 112-10 appropriates to NSF at the major account level and directs the Foundation to prepare additional budgetary information within 60 days of enactment. NSF has provided CRS with FY2011 Current Plan information for major accounts, but has not provided budgetary data for some major sub-accounts or for individual programs. The FY2011 Current Plan excludes a transfer of \$54.0 million to the U.S. Coast Guard for icebreaking services.

⁵³ This amount includes the across-the-board rescission from P.L. 112-10, Section 1119; funding levels from P.L. 112-10, Sections 1317 and 1318; and FY2010 enacted levels from P.L. 111-117 for specified accounts as per P.L. 112-10, Section 1101. It excludes \$54.0 million that was transferred to the U.S. Coast Guard in FY2011.

⁵⁴ The FY2010 actual level excludes both a \$54.0 million transfer to U.S. Coast Guard as per P.L. 111-117 and \$600.2 million in American Recovery and Reinvestment Act (ARRA, P.L. 110-5) funds.

⁵⁵ For a detailed discussion and analysis of the doubling effort, see CRS Report R41951, *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by John F. Sargent Jr., *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by John F. Sargent Jr.

⁵⁶ Executive Office of the President, Office of Science and Technology Policy, “The President’s Plan for Science and Innovation: Doubling Funding for Key Science Agencies in the 2012 Budget,” press release, February 14, 2011, <http://www.whitehouse.gov/sites/default/files/microsites/ostp/FY12-doubling-fs.pdf>.

Even though we will no longer double the funding of key research and development agencies, you will still see strong investments in National Institute of Standards and Technology, National Science Foundation and the [DOE] Office of Science.⁵⁷

The NSF organizes its budget into six major accounts: Research and Related Activities (RRA), Education and Human Resources (EHR), Major Research Equipment and Facilities Construction (MREFC), Agency Operations and Award Management (AOAM), Office of the Inspector General (OIG), and the National Science Board (NSB). The RRA, EHR, and MREFC accounts represent the core of the NSF's research and education program activities and funding.⁵⁸

The FY2011 Current Plan for RRA is \$5.510 billion, \$105.5 million (-1.9%) below the FY2010 actual level of \$5.615 billion and \$509.0 million (-8.5%) below the President's FY2011 budget request for \$6.019 billion. RRA primarily supports basic research. Typically the Mathematics and Physical Sciences Directorate receives the most RRA funding—about a quarter (\$1.308 billion or 23.7%) of the RRA FY2011 portfolio goes to this directorate (down from \$1.368 billion or 24.4% in FY2010). The RRA directorate with the largest annual percentage increase—FY2011 Current Plan levels over FY2010 actual—is the Computer and Information Science and Engineering (CISE) Directorate, with an increase of \$16.4 million (2.6%, \$635.1 million total) over the FY2010 actual level of \$618.7 million. All other RRA directorates and offices experienced reductions or were held constant between FY2010 and FY2011. Three directorates' proportional shares of RRA funding increased in FY2011 (CISE, Biological Sciences (BIO), and Geosciences (GEO)), while the proportional shares of three directorates (Mathematical and Physical Sciences (MPS), and Social, Behavioral, and Economic Sciences (SBE)) and the offices of Polar Programs (OPP) and Integrative Activities (IA) fell.⁵⁹

Most RRA funds are distributed through a merit-based, peer review system to U.S. colleges and universities. Questions about NSF's research-related activities include whether NSF-supported research is sufficiently high-risk, whether the peer review process favors certain institutions or investigators, whether the Foundation receives enough funding to support the number of competitive proposals it receives, and whether there is appropriate balance between basic and applied research in the NSF portfolio. Congress has responded to these questions in a variety of ways. These include directing NSF to pursue high-risk, high-reward basic research and research in particular fields, such as climate change.⁶⁰ Similarly, Congress established the Experimental Program to Stimulate Competitive Research program (EPSCoR, \$154.4 million in FY2011 request) in response to concerns about the geographic distribution of NSF's research grants.⁶¹

⁵⁷ Dan Pfeiffer, The White House Blog, "Details of the Bipartisan Budget Deal," April 9, 2011, <http://www.whitehouse.gov/blog/2011/04/09/details-bipartisan-budget-deal>.

⁵⁸ Although these accounts exist in isolation in standard budget tables, funds from different accounts may be merged at the program level and in many cases NSF's education, facilities, and research activities are deeply integrated as a matter of practice.

⁵⁹ Other RRA accounts held constant.

⁶⁰ Congress has directed the NSF to increase its high-risk, high-reward investments in both statutory and appropriations authorization acts. For example, see U.S. Congress, Conference Committee, *Departments of Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2010*, conference report to accompany H.R. 3288, 111th Cong., 1st Sess., H.Rept. 111-366 (Washington, DC: GPO, 2009), p. 766. H.R. 3288 became the Consolidated Appropriations Act of 2010 (P.L. 111-117).

⁶¹ Initial support for EPSCoR was contained in P.L. 95-392 (H.Rept. 95-1265), Department of Housing and Urban Development-Independent Agencies Appropriation Act, 1979. For more information, see CRS Report RL30930, *U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR)*, by Christine M. Matthews.

The NSF asserts that international research partnerships are critical to maintaining a competitive advantage, addressing global issues, and capitalizing on global economic opportunities. For FY2011, the Administration requested \$53.3 million for the Office of International Science and Engineering (OISE). OISE serves as a liaison with research institutes and foreign agencies, and facilitates coordination and implementation of NSF research and education efforts.

The FY2011 request for NSF also supported several interagency R&D priorities, including the National Nanotechnology Initiative (\$401.3 million), U.S. Global Change Research Program (\$369.9 million), Homeland Security activities (\$405.4 million), and Networking and Information Technology R&D (\$1.170 billion).

The FY2011 Current Plan funding level for EHR is \$861.0 million.⁶² This amount is \$11.7 million (-1.3%) less than the FY2010 actual level of \$872.8 million and \$31.0 million (-3.5%) less than the President's FY2011 request for \$892.0 million. The President's FY2011 EHR budget request included \$107.6 million in support of its goal of tripling the number of new Graduate Research Fellowship program awardees by FY2013.⁶³ Other FY2011 requests for EHR programs included Discovery Research K-12 (\$118.7 million), Mathematics and Science Partnership (\$58.2 million), Robert Noyce Scholarship Program (\$55.0 million), Integrative Graduate Education and Research Traineeship (\$29.5 million),⁶⁴ and Informal Science Education (\$64.4 million). Program-level information for EHR in FY2011 is unavailable. The Division of Human Resource Development (HRD)—which hosts many of NSF's broadening participation programs for underrepresented populations—increased its proportional share of the EHR portfolio in FY2011 and received the only year-over-year increase in EHR funding.⁶⁵ Funding for all other EHR divisions—including those focused on undergraduates, graduates, and STEM education R&D—decreased in both proportional and absolute terms between FY2010 and FY2011.⁶⁶

NSF's FY2011 budget request proposed a realignment of the Foundation's minority-serving institution (MSIs) programs (e.g., Historically Black Colleges and Universities—Undergraduate Program). NSF's MSI programs include both educational and R&D components.⁶⁷ Under the Administration's proposal, NSF's different MSI programs would have been consolidated into the Comprehensive Broadening Participation of Undergraduates (CBPU) in STEM program.

⁶² The EHR portfolio is focused on, among other things, increasing the technological literacy of all citizens; preparing the next generation of science, engineering, and mathematics professionals; and closing the achievement gap of underrepresented groups in all scientific fields. Among the questions raised about NSF's STEM education programs are those that center on how to evaluate program effectiveness or respond to student achievement gaps; on coordination of and funding levels for the federal STEM education effort; and on support for STEM students and STEM education programs at minority-serving institutions (MSIs) of higher education.

⁶³ The Graduate Research Fellowship (GRF) program also receives funds from other NSF accounts. The total Administration request for GRF in FY2011 was \$158.2 million.

⁶⁴ The Integrative Graduate Education and Research Traineeship (IGERT) also receives R&RA funds. The FY2011 request for IGERT included \$29.5 million from EHR and \$32.3 million from R&RA, for a total of \$61.8 million.

⁶⁵ HRD received \$165.5 million in FY2011, an \$18.0 million (13.0%) increase over the FY2010 actual level of \$138.5 million.

⁶⁶ Based on data provided to CRS by House Appropriations Committee staff in e-mail communication from July 19, 2011.

⁶⁷ For example, the HBCU program offers Research Initiation Awards (RIA) for HBCU faculty in STEM fields. RIA awards, "are intended to help further the faculty member's research capability and effectiveness, to improve research and teaching at his or her home institution, and to involve undergraduate students in research experiences." National Science Foundation, "Historically Black Colleges and Universities-Undergraduate Program (HBCU-UP)" *National Science Foundation Website*, January 6, 2011, http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=5481.

Hispanic-Serving Institutions (HSIs) would have been eligible for CBPU funds.⁶⁸ The FY2011 request for the consolidated program was \$103.1 million, \$13.0 million more than combined funding for NSF's MSI programs in FY2010 (estimated). Some analysts objected to this change and argued for keeping NSF's MSI programs as separate programs, noting that MSIs serve different populations with different needs. However, keeping the programs separate might result in less availability of funds for HSIs because NSF has not established, and Congress has not specifically appropriated funds for, a separate HSI program at the Foundation.⁶⁹ Congressional appropriators and authorizers rejected the Administration's FY2011 request to consolidate NSF's MSI programs.⁷⁰

The FY2011 Current Plan funding level for MREFC is \$117.1 million. This amount is \$48.8 million (-29.4%) less than the FY2010 actual level of \$165.9 and \$48.1 million (-29.1%) less than the President's FY2011 request for \$165.2 million. In its FY2011 budget request, NSF anticipated construction of the National Ecological Observatory Network (NEON, \$20.0 million)⁷¹ and sought continued support for four ongoing construction projects: Advanced Laser Interferometer Gravitational Wave Observatory (\$23.6 million); Atacama Large Millimeter Array (\$13.9 million); Advanced Technology Star Telescope (\$17.0 million); and Ocean Observatories Initiative (\$90.7 million).

MREFC funds the acquisition and construction of major research facilities and equipment that support research intended to extend the boundaries of science, engineering, and technology. NSF gives highest priority to ongoing projects and second highest priority to projects that have been approved by the National Science Board for new starts. To qualify for support, NSF requires MREFC projects to have "the potential to shift the paradigm in scientific understanding and/or infrastructure technology."⁷² There has been considerable debate in the academic and scientific communities and in Congress about the management and oversight of major MREFC projects and the prioritization of potential projects. One continuing question has focused on the process for including major projects in the upcoming budget cycle. In a management report on major projects, NSF contended that because of the changing nature of science and technology, it is necessary to have the flexibility to reconsider facilities at the various stages of development.⁷³ In addition, NSF asserts that it must be able to respond effectively to possible changes in interagency participation, international and cooperative agreements, or co-funding for major facilities. NSF maintains that while some concepts may evolve into major research projects, others may prove infeasible for project support.

FY2011 Current Plan funding for the AOAM, NSB, and OIG accounts are \$299.4 million, \$4.5 million, and \$14.0 million, respectively. These amounts are similar to FY2010 actual levels and are \$29.8, \$0.3, and \$0.4 million less than the Administration's FY2011 request, respectively.

⁶⁸ Of NSF's MSI programs, HSIs may only apply for the Louis Stokes Alliances for Minority Participation program. Under the CBPU, HSIs would have also been eligible for funds now reserved for other MSIs.

⁶⁹ Sec. 7033 of the America COMPETES Act (P.L. 110-69) directed the NSF to establish a program for HSIs. However, the Foundation has not yet done so.

⁷⁰ See Senate Committee on Appropriations, *Departments of Commerce and Justice, and Science, and Related Agencies Appropriations Bill, 2011*, 111th Congress, 2nd Sess., Report to accompany S. 3636, S.Rept. 111-229, July 22, 2010, p. 138; and, Sec. 512 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

⁷¹ NEON will compile data on the effects of climate changes, land use changes, invasive species on natural resources, and biodiversity. The data from NEON is intended to have local, regional, and national uses.

⁷² *National Science Foundation: FY2011 Budget Request to Congress*, February 1, 2010.

⁷³ See, for example, National Science Foundation, *Large Facilities Manual*, NSF10-4, September 2009, 66 pp.

Table II. National Science Foundation
(in millions of dollars)

	FY2010 Actual^a	FY2011 Request	FY2011 Current Plan^b
Biological Sciences	714.8	767.8	711.6
Computer & Information Sci. & Eng.	618.7	684.5	635.1
Engineering	775.9	825.7	762.7
Geosciences	891.9	955.3	884.8
Math & Physical Sciences	1,368.0	1,409.9	1,308.3
Social, Behavioral, & Economic Sciences	255.3	268.8	247.2
Office of Cyberinfrastructure	214.7	228.1	209.9
Office of International Sci. & Eng.	47.8	53.3	49.0
U.S. Polar Programs	451.8	528.0	439.40
Integrative Activities	274.9	295.9	260.3
U.S. Arctic Research Comm.	1.6	1.6	1.6
Subtotal Res. & Rel. Act	5,615.3	6,018.8	5,509.9
Education & Human Resources	872.8	892.0	861.0
Major Research Equipment & Facilities Construction	165.9	165.2	117.1
Agency Operations & Award Management	299.9	329.2	299.4
National Science Board	4.4	4.8	4.5
Office of Inspector General	14.0	14.4	14.0
Total NSF^c	6,972.2	7,424.4	6,805.9

Source: National Science Foundation, *FY2011 Budget Request to Congress*, Arlington, VA, February 1, 2010. Summary Tables.

- Funding for FY2010 excludes a transfer of \$54.0 million to the U.S. Coast Guard per P.L. 111-117 and \$600.2 million in America Recovery and Reinvestment Act (P.L. 111-5) funds.
- P.L. 112-10 appropriates to NSF at the major account level and directs the Foundation to prepare additional budgetary information within 60 days of enactment. NSF has provided CRS with FY2011 Current Plan information for major accounts, but has not provided budgetary data for some major sub-accounts or for individual programs. The FY2011 Current Plan excludes a transfer of \$54.0 million to the U.S. Coast Guard for icebreaking services.
- The totals do not include carryovers or retirement accruals. Totals may not add due to rounding.

Department of Commerce

National Institute of Standards and Technology⁷⁴

The National Institute of Standards and Technology (NIST) is a laboratory of the Department of Commerce with a mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of precompetitive, generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance techniques that underpin U.S. commerce, technological progress, improved product reliability, manufacturing processes, and public safety.

The final FY2011 appropriations legislation, P.L. 112-10, funds NIST at \$750.1 million, 12.4% below the FY2010 appropriation of \$856.6 million and 18.4% below the President's budget request of \$918.9 million. Support for primarily in-house R&D under the Scientific and Technical Research and Services (STRS) account (including the Baldrige National Quality Program) totals \$507.0 million, 1.6% less than the FY2010 figure of \$515.0 million and 13.3% less than the \$584.5 million the Administration proposed. The Manufacturing Extension Partnership (MEP) program receives \$128.4 million, 3.0% more than the FY2010 appropriation of \$124.7 million and 1.0% below the Administration's budget proposal figure of \$129.7 million. The \$44.8 million for the Technology Innovation Program (TIP) represents a decrease of 35.9% from the \$69.9 million appropriated in FY2010 and is 43.9% less than the \$79.9 million the President requested. The construction budget declines 52.4% from FY2010 funding of \$147.0 million to \$69.9 million and is 44.0% below the Administration's proposal of \$124.8 million. (See **Table 12.**)

Continued support for NIST extramural programs—currently the Manufacturing Extension Partnership and the Technology Investment Program—directed toward increased private sector commercialization has been a major issue. Some Members of Congress have expressed skepticism over a “technology policy” based on providing federal funds to industry to develop pre-competitive generic technologies. This approach, coupled with pressures to balance the federal budget, led to significant reductions in appropriations for several of these NIST activities. The Advanced Technology Program (ATP) and the MEP, which accounted for more than 50% of the FY1995 NIST budget, were proposed for elimination. In 2007, ATP was terminated and replaced by the Technology Innovation Program.⁷⁵

While much of the legislative debate has focused on extramural efforts, increases in spending for the NIST laboratories that perform the research essential to the mission responsibilities of the agency have tended to remain small. As part of the American Competitiveness Initiative, announced by former President Bush in the 2006 State of the Union address, the Bush Administration stated its intention to double funding over 10 years for “innovation-enabling research” done at NIST through its “core” programs (defined as internal research in the STRS account and the construction budget). In April 2009, President Obama stated his decision to

⁷⁴ This section was written by Wendy H. Schacht, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁷⁵ For additional information on the MEP and TIP programs, see CRS Report RS22815, *The Technology Innovation Program*, and CRS Report 97-104, *Manufacturing Extension Partnership Program: An Overview*, both by Wendy H. Schacht.

double the budget of key science agencies, including NIST, over the next 10 years. While additional funding has been forthcoming, it remains to be seen how support for internal R&D at NIST will evolve and how this might affect financing of extramural programs such as TIP and MEP.⁷⁶

Table 12. NIST
(in millions of dollars)

NIST Program	FY2010 (P.L. 111-117) Enacted	FY2011 Request	FY2011 (P.L. 112-10) Enacted
STRS ^a	515.0	584.5	507.0
TIP	69.9	79.9	44.8
MEP	124.7	129.7	128.4
Construction	147.0	124.8	69.9
NIST Total^b	856.6	918.9	750.1

Sources: NIST website (available at http://www.nist.gov/public_affairs/budget.htm), P.L. 111-117, P.L. 112-10, and Administration's Budget Request.

- a. Includes funding for the Baldrige National Quality Program.
- b. Figures may not add up because of rounding.

National Oceanic and Atmospheric Administration⁷⁷

The National Oceanic and Atmospheric Administration (NOAA) conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; supplies information on the oceans and atmosphere; and conserves coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.⁷⁸ The reorganization was intended to unify the nation's environmental activities and to provide a systematic approach for monitoring, analyzing, and protecting the environment.

NOAA's R&D efforts focus on three areas: climate; weather and air quality; and ocean, coastal, and Great Lakes resources. For FY2011, President Obama requested \$734.0 million in R&D funding for NOAA, a 7.2% increase in funding from the FY2010 level of \$684.7 million. R&D accounted for 13.2% of NOAA's total FY2011 discretionary budget request of \$5.543.5 billion.

NOAA's administrative structure has evolved into five line offices that reflect its diverse mission, including the National Ocean Service (NOS); the National Marine Fisheries Service (NMFS); the National Environmental Satellite, Data, and Information Service (NESDIS); the National Weather Service (NWS); and the Office of Oceanic and Atmospheric Research (OAR). In addition to

⁷⁶ For additional information on NIST, see CRS Report 95-30, *The National Institute of Standards and Technology: An Appropriations Overview*.

⁷⁷ This section was written by Harold F. Upton, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

⁷⁸ "Reorganization Plan No. 4 of 1970," 35 *Fed. Reg.* 15627-15630, October 6, 1970; also, see <http://www.lib.noaa.gov/noaainfo/heritage/ReorganizationPlan4.html>.

NOAA's five line offices, Program Support (PS), a cross-cutting budget activity, includes the Office of Marine and Aviation Operations (OMAO).

OAR is the primary center for R&D within NOAA. The FY2011 request would have provided OAR with \$430.1 million for R&D, 58.6% of the total NOAA FY2011 R&D request and 92.5% of the total OAR request. The OAR request would have been a 6.1% increase from the FY2010 appropriation of \$405.5 million. The OAR R&D FY2011 request included \$77.1 million for R&D equipment. **Table 13** provides FY2010 enacted and FY2011 requested R&D funding levels for other NOAA line offices. At this time NOAA R&D funding in the FY2011 enacted (P.L. 112-10) NOAA budget are not available. NOAA funding for FY2011 has only been identified at the account level while NOAA R&D funding is for specific activities or programs. NOAA budget totals for FY2010 enacted, FY2011 requested, and FY2011 enacted are included in **Table 13** to provide context in lieu of R&D FY2011 enacted funding levels.

R&D activities highlighted by NOAA included developing a dedicated program to produce climate assessments at national and regional scales; sustaining a carbon observation and analysis system; supporting the Earth Observing System to provide climate change data; monitoring of ocean acidification; improving water forecasting services for extreme events such as floods; demonstrating the advantages of using multi-function phased array radar for weather forecasting; and supporting creation of integrated ecosystem assessments.⁷⁹

Table 13. NOAA R&D
(in millions of dollars)

NOAA Line Office	FY2010 Actual	FY2011 Request	FY2011 Enacted
NOS	71.9	80.8	
NMFS	54.6	69.2	
OAR	405.5	430.1	
NWS	41.2	27.0	
NESDIS ^a	25.7	37.8	
OMAO	85.8	89.1	
Total R&D	684.7	734.0	
Total NOAA	4,737.5	5,543.5	4,586.0

Sources: Emily Larkin, NOAA Budget Office, personal communication, February 23, 2010.

Note: FY2010 and FY2011 enacted and request columns include R&D equipment for OAR (\$73.5 million in FY2010 and \$77.1 million in FY2011), NESDIS (\$9.5 million in FY2011), and OMAO (\$96.6 million in FY2010 and \$89.1 million in FY2011).

- a. NOAA at the direction of OMB, is no longer including four Joint Polar Satellite System (formerly NPOESS) sensors in NESDIS R&D.

⁷⁹ Ibid.

National Aeronautics and Space Administration⁸⁰

The Administration requested \$16.190 billion for NASA R&D in FY2011. This amount was 18.3% more than the \$13.687 billion appropriated for FY2010. The NASA Authorization Act of 2010 (P.L. 111-267) authorized FY2011 R&D funding of \$15.429 billion. The final FY2011 appropriation was \$14.863 billion. (See **Table 14**.) The greater share of NASA's budget devoted to R&D in FY2011, relative to FY2010, results primarily from the retirement of the space shuttle, which is considered an operational program, not R&D.

For several years, budget priorities throughout NASA were driven by the Vision for Space Exploration. The Vision was announced by President Bush in January 2004 and endorsed by Congress in the NASA Authorization Act of 2005 (P.L. 109-155) and the NASA Authorization Act of 2008 (P.L. 110-422). Under the Vision, NASA's primary goal was to return humans to the Moon by 2020. To implement this goal, NASA's Constellation Systems program initiated development of the Orion crew vehicle and the Ares I rocket for carrying humans into low Earth orbit, as well as the heavy-lift Ares V rocket, the Altair lunar lander, and lunar surface systems for the planned Moon mission. In 2009, the Augustine committee conducted an independent review of NASA's human spaceflight activities.⁸¹ The committee found that the program outlined by the Vision would require additional NASA funding of \$3 billion per year, even if a return to the Moon were delayed by a few years.

The Administration's FY2011 request for Exploration, the account that funded Constellation Systems, was \$4.263 billion, a 12.8% increase from \$3.780 billion in FY2010. But the request proposed to end Constellation Systems and cancel the goal of returning humans to the Moon. Instead of Orion and Ares I, the Administration proposed \$812 million to spur development of commercial crew transport services to low Earth orbit. Instead of Ares V and the lunar systems, it proposed \$1.551 billion to enable future human exploration by conducting robotic precursor missions and R&D on technologies such as advanced in-space propulsion and in-situ resource production. In the 2010 authorization act, Congress agreed to support commercial services for crew access to low Earth orbit, but it directed NASA to develop spacecraft for human exploration beyond Earth orbit—a Multipurpose Crew Vehicle (MPCV) and a heavy-lift launch vehicle called the Space Launch System (SLS)—not just technology to enable such missions. The final FY2011 appropriation for Exploration was \$3.801 billion, including funds for the MPCV and SLS; the act did not specify whether this total also included funds for commercial crew development.

The Consolidated Appropriations Act, 2010 (P.L. 111-117) prohibited NASA from using FY2010 or prior-year funds to terminate or eliminate “any program, project, or activity of the architecture for the Constellation program” or to create or initiate any new program, project, or activity.⁸² Some analysts and policy makers expressed concern that NASA contracting decisions and other actions during FY2010 were in violation of the appropriations provision.⁸³ NASA officials replied

⁸⁰ This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁸¹ Review of U.S. Human Spaceflight Plans Committee, *Seeking a Human Spaceflight Program Worthy of a Great Nation*, October 2009, http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf. The committee that developed this report is known as the Augustine committee after its chairman, Norman Augustine.

⁸² P.L. 111-117, Division B, Title III.

⁸³ See, for example, the letter from 27 Members of Congress to NASA Administrator Charles Bolden, February 12, 2010, online at <http://www.posey.house.gov/UploadedFiles/LetterToBolden-CancellingConstellation-Feb15-2010.pdf>.

that they were continuing the Constellation program during FY2010 in full compliance with the law, even though they intended to terminate the program in FY2011. During the first half of FY2011, the restriction on terminating Constellation remained, as NASA operated under a series of continuing resolutions. The restriction was lifted in the final appropriation.

The requested \$5.006 billion for Science in FY2011 was 11.4% more than the FY2010 funding of \$4.493 billion. The largest proposed increase was for Earth science. This included \$171 million to fund a replacement for the Orbital Carbon Observatory (OCO), which was launched in February 2009 but failed to reach orbit, and \$150 million as the first year of a five-year, \$2.1 billion global climate initiative. The climate initiative and other increases would accelerate the development and launch of several Earth science missions recommended in 2007 by a National Academies decadal survey.⁸⁴ The authorization act matched the Administration's request. The final appropriation was \$4.935 billion; it did not specify how that amount should be allocated among Earth science and other activities.

The Administration proposed \$572 million in FY2011 for a new Space Technology program. This program's focus would be technologies that are applicable to multiple missions in the long term, as opposed to components needed for specific systems in the short term. It would seek to advance technologies from the point of early-stage innovation to the demonstration of flight readiness. The authorization act authorized \$350 million for Space Technology. The final appropriation did not include a new account for Space Technology, but because some of the activities to be included in the program were previously funded by other accounts, it is possible that they may continue to be funded by those accounts in FY2011.

The Administration's budget proposed extending operation of the International Space Station (ISS) to at least 2020 and requested increased funding to promote utilization of the existing ISS national laboratory by paying the launch costs of non-NASA users. The authorization act supported the extension of operations and authorized funding at the requested level. The final appropriation did not specify how much of the Space Operations account should be devoted to the ISS, but its funding for Space Operations overall was nearly the same as the Administration's request. The first commercial cargo flights to resupply the ISS are scheduled during FY2011.

Table 14. NASA R&D
(in millions of dollars)

	FY2010 Enacted	FY2011 Request	FY2011 Auth.	FY2011 Enacted
Science	\$4,493	\$5,006	\$5,006	\$4,935
<i>Earth Science</i>	1,421	1,802	1,802	n/a ^a
<i>Planetary Science</i>	1,341	1,486	1,486	n/a ^a
<i>Astrophysics</i>	1,104	1,076	1,076	n/a ^a
<i>Heliophysics</i>	627	642	642	n/a ^a
Aeronautics	507	580	580	534
Space Technology	—	572	350	—

⁸⁴ National Research Council, *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond*, 2007, <http://www.nap.edu/catalog/11820.html>.

	FY2010 Enacted	FY2011 Request	FY2011 Auth.	FY2011 Enacted
Exploration	3,780	4,263	3,868	3,801
<i>Constellation Systems</i>	3,325	—	—	—
<i>Advanced Capabilities</i>	454	—	—	—
<i>Constellation Transition</i>	—	1,900	—	—
<i>Commercial Spaceflight</i>	—	812	—	—
<i>Exploration R&D</i>	—	1,551	—	—
<i>Multipurpose Crew Vehicle</i>	—	—	1,120	1,198 ^b
<i>Space Launch System/Heavy-Lift Launch Vehicle</i>	—	—	1,631	1,796 ^b
<i>Other</i>	—	—	1,117	807
International Space Station	2,317	2,780	2,780	2,774 ^c
Subtotal R&D	11,097	13,201	12,583	12,044
Other NASA Programs ^d	4,084	2,291	2,912	2,905 ^c
Cross-Agency Support ^e	3,095	3,111	3,111	3,105
<i>Associated with R&D</i>	2,262	2,651	2,526	2,502
<i>Associated with Other</i>	833	460	585	603
Construction & Environmental Compliance & Remediation ^e	448	397	394	394
<i>Associated with R&D</i>	328	339	320	317
<i>Associated with Other</i>	121	59	74	77
Total R&D	13,687	16,190	15,429	14,863
Total NASA	18,724	19,000	19,000	18,448

Source: FY2010 enacted and FY2011 request from NASA's FY2011 congressional budget justification, online at <http://www.nasa.gov/news/budget/>. FY2011 authorized from P.L. 111-267. FY2011 enacted from P.L. 112-10.

Notes: n/a = not available.

- P.L. 112-10 does not specify how much of the FY2011 enacted amount for Science is for each category within the account.
- In P.L. 112-10, the FY2011 enacted amounts for Multipurpose Crew Vehicle and Heavy-Lift Launch Vehicle are "not less than" the amounts shown here.
- Estimated by CRS. P.L. 112-10 does not specify how much of the FY2011 enacted amount for Space Operations is for International Space Station, Space Shuttle, and Space and Flight Support.
- Space Shuttle, Space and Flight Support, Education, and Inspector General.
- Allocation between R&D and non-R&D is estimated by CRS in proportion to the underlying program amounts in order to allow calculation of a total for R&D. The Cross-Agency Support and Construction and Environmental Compliance and Remediation accounts consist mostly of indirect costs for other programs assessed in proportion to their direct costs.

Department of Agriculture⁸⁵

The FY2011 appropriation for research and education activities in the U.S. Department of Agriculture (USDA) is \$2.592 billion, a decrease of \$403.5 million (-13.5%) from the FY2010 level of \$2.995 billion and \$384.7 million (-12.9%) below the President's request. (See **Table 15**.) The Agricultural Research Service (ARS) is USDA's in-house basic and applied research agency, and operates approximately 100 laboratories nationwide. The ARS laboratories focus on efficient food and fiber production, development of new products and uses for agricultural commodities, development of effective biocontrols for pest management, and support of USDA regulatory and technical assistance programs. Included in the total support for USDA in FY2011 is \$1.135 billion for ARS, \$58.5 million (-4.9%) below the FY2010 level and \$88.5 million (-7.2%) below the President's request. In ARS, the Administration had proposed a reduction of \$40.0 million in funding add-ons designated by Congress for research at specific locations. The amounts from the discontinued projects are to be redirected to critical research priorities of the Administration that include genetic and genomic databases, domestic and global market opportunities, new varieties and hybrids of feedstocks, animal health and feed efficiency, and new healthier foods with decreased caloric density. The Administration had proposed an increase of \$3.0 million for improved animal protection to enhance food and production security and an increase of \$6.4 million for research on children's nutrition and health. In addition, an increase of \$5.0 million has been targeted for research to safeguard food supply by developing and validating sensing technologies for pathogens, toxins, and chemical residues. Neither the Administration nor committee action designated any amounts for buildings and facilities in FY2011 for the ARS. However, \$1.8 million has been set aside for a review of USDA research facilities. It is anticipated that such a review would serve as a framework for developing a service-wide capital improvement strategy for future investments that parallel program goals.

The National Institute of Food and Agriculture (NIFA), formerly the Cooperative State Research, Education, and Extension Service (CSREES), was established in Title VII, §7511 of the Food, Conservation, and Energy Act of 2008 (P.L. 110-246, also known as the 2008 farm bill). In FY2011, NIFA will be focused on larger and longer research efforts that will "... create substantial impacts in addressing critical issues facing the long-term viability of agriculture." NIFA is responsible for developing linkages between the federal and state "components of a broad-based, national agricultural research, extension, and higher education system."⁸⁶ NIFA distributes funds to State Agricultural Experiment Stations, State Cooperative Extension Systems, land-grant universities, and other institutions and organizations that conduct agricultural research, education, and outreach. Included in these partnerships is funding for research at 1862 land-grant institutions, 1890 historically black colleges and universities, 1994 tribal land-grant colleges, and Hispanic-serving institutions. Funding is distributed to the states through competitive awards, statutory formula funding, and special grants. The FY2011 appropriation provides \$1.217 billion for NIFA, \$268.8 million (-18.1%) below the FY2010 level and \$283.1 million (-18.9%) below the President's request. The NIFA FY2011 appropriation includes the proposed elimination of \$141.0 million in congressional add-ons. Funding for formula distribution in FY2011 to the state Agricultural Experiment Stations (denoted as the "Hatch Act Formula" in **Table 15**) is \$236.8

⁸⁵ This section was written by Christine M. Matthews, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁸⁶ U.S. Department of Agriculture, *U.S. Department of Agriculture FY2011 Budget Summary and Annual Performance*, February 2010, p. 116.

million, \$21.8 million (10.1%) above the FY2010 level and the President's request. One of the primary goals of the President's FY2011 NIFA appropriation has been to emphasize and prioritize competitive, peer-reviewed allocation of research funding. Programs are to be designed that are more responsive to critical national issues such as agricultural security, local and regional emergencies, zoonotic diseases, climate change, childhood obesity, pest risk management, and development of biofuels that assure agricultural productivity and sustainability. Support has been given for a competitive program directed at developing training and expanding use of web-based and other technology applications. Funding has been provided for programs that improve the quality of rural life and provide stress assistance programs to individuals engaged in agriculture-related occupations. Another focus in FY2011 has been on programs that support minority-serving institutions and their recipients.

NIFA is also responsible for administering the agency's primary competitive research grants program, the Agriculture and Food Research Initiative (AFRI). The FY2011 appropriation provides \$265.0 million for AFRI, \$3.0 million (1.1%) above the FY2010 level and \$163.8 million (-38.2%) below the President's request. In addition to supporting fundamental and applied science in agriculture, USDA has maintained that the AFRI makes a significant contribution to developing the next generation of agricultural scientists by providing graduate students with opportunities to work on research projects. A focus of these efforts has been to provide increased opportunities for minority and under-served communities in agricultural science. AFRI funding has been directed at research involved in developing alternative methods of biological and chemical conversion of biomass, and research on the impact of a renewable fuels industry on the economic and social dynamics of rural communities. The Administration had proposed support for initiatives in agricultural genomics, emerging issues in food and agricultural security, the ecology and economics of biological invasions, and plant biotechnology. Research has also been designed that extends beyond water quality issues to include water availability, reuse, and conservation.

The FY2011 appropriation for USDA provides \$82.0 million for the Economic Research Service (ERS), level with FY2010 and \$5.2 million (-6.0%) less than the President's request. ERS supports both economic and social science information analysis on agriculture, rural development, food, and the environment. ERS collects and disseminates data concerning USDA programs and policies to various stakeholders. Funding for the National Agricultural Statistics Service (NASS), at \$156.8 million in FY2011, is \$5.2 million (-3.2%) below the FY2010 level and \$7.9 million (-4.8%) below the President's request. The appropriation has provided support to improve research efforts in analyzing the impacts of bioenergy production, and to examine concerns pertaining to feedstock storage, transportation networks, and the vagaries in commodity production. Additional research areas include production and utilization of biomass materials; stocks and prices of distillers' grains; and current and proposed ethanol production plants. Funding for NASS has allowed for the restoration of the chemical use data series on major row crops; post harvest chemical use; and alternating annual fruit, nuts, and vegetable chemical use. Also, funding has been provided to support the second year of the 2012 Census of Agriculture's five year cycle. Data from the Census of Agriculture are to be used to measure trends and new developments in the agricultural community.

Table 15. U.S. Department of Agriculture R&D
(in millions of dollars)

	FY2010 Actual	FY2011 Request	FY2011 Enacted^d
Agricultural Research Service			
Product Quality/Value Added	\$105.0	113.0	
Livestock Production	81.0	85.0	
Crop Production	234.0	220.0	
Food Safety	108.0	114.0	
Livestock Protection	79.0	83.0	
Crop Protection	203.0	213.0	
Human Nutrition	86.0	91.0	
Environmental Stewardship	202.0	240.0	
National Agricultural Library	22.0	23.0	
Repair, Maintenance, and Other Programs	74.0	42.0	
Subtotal	1,194.0	1,224.0	1,135.5
Buildings and Facilities	71.0	0.0	0.0
Total, ARS	1,265.0	1,224.0	1,135.5
National Institute of Food and Agriculture (NIFA)^a			
Hatch Act Formula	215.0	215.0	236.8
Cooperative Forestry Research	29.0	29.0	33.0
Earmarked Projects and Grants	141.0	0.0	2.8
Agriculture & Food Research Initiative	262.0	428.8	265.0
Federal Administration	18.0	14.5	18.3
Higher Education Programs ^b	48.0	61.9	51.0
Other Programs	79.0	94.2	93.2
Total, Research and Education Activities^c	792.0	843.4	700.1
Extension Activities			
Smith-Lever Sections 3b&c	298.0	297.5	295.0
Extension and Integrated Programs	49.0	42.7	28.6
1890 Colleges, Tuskegee, & West Virginia State University Colleges	91.0	44.4	66.2
Other Extension Programs	57.0	94.6	90.3
Total, Extension Activities	495.0	479.2	480.1
Integrated Activities	60.0	24.9	37.0
Mandatory Programs	139.0	152.9	0.0
Total, NIFA^c	1,486.0	1,500.3	1,217.2

	FY2010 Actual	FY2011 Request	FY2011 Enacted ^d
Economic Research Service	82.0	87.2	82.0
National Agricultural Statistics Service	162.0	164.7	156.8
Total, Research, Education, and Economics	2,995.0	2,976.2	2,591.5

Sources: U.S. Department of Agriculture, *FY2011 Budget Summary and Annual Performance Plan*.

Notes: Research activities carried out in support of Homeland Security are reflected under the Food Safety, Livestock Protection, and Crop Protection program areas, including \$64.3 million in FY2009.

- Formerly CSREES. NIFA was established in Title VII of the 2008 Farm Bill.
- Higher Education includes capacity building grants, Hispanic-Serving Institution Education Grants Program, Two-Year Postsecondary, and Agriculture in the K-12 Classroom, Higher Education Challenge Grants, Improve the Quality of Life in Rural America, and others.
- Program totals may or may not include set-asides (non-add) or contingencies .
- FY2011 enacted program levels may change as they are in the process of being set following discussions with USDA and the Office of Management and Budget. (Per telephone conversation with USDA budget analyst, May 3, 2011). Please see P.L. 112-10 (H.R. 1473), The Department of Defense and Full-Year Continuing Appropriations Act, 2011.

Department of the Interior⁸⁷

President Obama requested \$812.8 million for Department of the Interior (DOI) R&D in FY2011, an increase of \$27.5 million (2.3%) above FY2010 funding of \$785.3 million. (See **Table 16**.) The FY2011 appropriations process was completed with enactment of the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10), which included the Department of the Interior and its agencies. The act provided a total of \$802.1 million in R&D funding for DOI, \$4.1 million (0.5%) more than in FY2010, and \$27.1 million (-3.3%) less than the amount requested by the President.

The U.S. Geological Survey (USGS) is the primary supporter of R&D within DOI, accounting for approximately 84% of the department's total FY2010 R&D appropriations. President Obama proposed \$679.2 million for USGS R&D in FY2011, an increase of \$18.6 million (2.8%) above the estimated FY2010 level. USGS R&D is conducted under several activity/program areas: global change, geographic research, geological resources, water resources, biological research, and enterprise information. The act provided a total of \$640.0 million in R&D funding for USGS, \$21.1 million (-3.2%) less than in FY2010 and \$39.2 million (-5.8%) less than the request.

In past years, the Department of the Interior had not reported R&D funded through the Fish and Wildlife Service (FWS). For FY2011, DOI added FWS to its R&D calculations and asked the FWS to count their R&D activities for previous years. According to DOI, this was prompted by the addition of \$10 million for global change research funding for FWS in FY2009, and the President's request for \$15 million in FY2011. The R&D funding data for FWS is included, together with other DOI agencies, in **Table 16**. In FY2011, FWS received \$47.0 million for R&D.

⁸⁷ This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

On March 21, 2010, the Disaster Relief and Summer Jobs Act of 2010 (H.R. 4899), a FY2010 supplemental funding bill, was introduced in the House and was subsequently passed. The House-passed version of H.R. 4899 did not appear to contain any funding for R&D or related activities. On May 14, 2010, the Senate Committee on Appropriations adopted an amendment in the form of a substitute and reported the bill, accompanied by S.Rept. 111-188. As reported, the Senate version of H.R. 4899 was named the Supplemental Appropriations Act, 2010, and included funding for a variety of agencies and purposes, including funding for R&D and related activities. These additional funds included \$29.0 million for the Department of the Interior for “increased inspections, enforcement, investigations, environmental and engineering studies, and other activities related to emergency offshore oil spill incidents in the Gulf of Mexico.” Neither the bill nor S.Rept. 111-188 specified how much of these funds were to be used to fund R&D.

Table 16. Department of the Interior R&D
(in millions of dollars)

	FY2010 Actual	FY2011 Request	FY2011 (P.L. 112-10)
U.S. Geological Survey	661.1	679.2	640.0
Bureau of Land Management	12.0	9.7	9.7
Bureau of Reclamation	13.0	15.2	15.1
Minerals Management Service ^a	45.5	46.2	57.1
National Park Service	33.7	33.7	33.2
Fish and Wildlife Service	32.8	45.8	47.0
Total, DOI R&D^b	798.1	829.3	802.1

Source: CRS analysis of unpublished data provided to CRS by the Department of the Interior budget office, August 9, 2011, unless otherwise noted.

- a. The Minerals Management Service has been renamed the Bureau of Ocean Energy Management, Regulation, and Enforcement.
- b. Totals may differ from the sum of the components due to rounding.

Environmental Protection Agency⁸⁸

The U.S. Environmental Protection Agency (EPA), the regulatory agency responsible for carrying out a number of environmental pollution control laws, funds a broad portfolio of R&D activities to provide the necessary scientific tools and knowledge to support decisions relating to preventing, regulating, and abating environmental pollution. Beginning in FY2006, EPA has been funded within the Interior, Environment, and Related Agencies appropriations bill. Most of EPA’s scientific research activities are funded within the agency’s Science and Technology (S&T) appropriations account. This account is funded by a “base” appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account. These transferred funds are dedicated to research on more effective methods to clean up contaminated sites.

⁸⁸ This section was written by Robert Esworthy, Specialist in Environmental Policy, CRS Resources, Science, and Industry Division.

Title VII of Division B under P.L. 112-10, the Department of Defense and Full-Year Continuing Appropriations Act, 2011, provided \$840.3 million (includes the 0.2% across-the-board rescission⁸⁹), including transfers from the Hazardous Substance Superfund account for FY2011. The total FY2011 enacted appropriations for the S&T account was \$34.6 million (39.5%) below the FY2010 appropriations of \$874.9 million included in P.L. 111-88⁹⁰ and supplemental funding in P.L. 111-212.⁹¹ The President's FY2011 budget request included \$871.2 million for the EPA S&T account (including transfers). The FY2011 appropriations included in P.L. 112-10 for the EPA's S&T account represented 9.7% of the total \$8.68 billion provided for the agency overall for FY2011. As indicated in **Table 17** below, the \$26.8 million transferred from the Superfund account into the S&T account for FY2011 is the same as FY2010,⁹² and \$2.3 million more than the \$24.5 million proposed in the FY2011 request. FY2011 funding for EPA's S&T program activities were not specified at the sub-account level in P.L. 112-10, however, subsequent information regarding FY2011 funding below the account level has been reported in EPA's FY2011 Operating Plan⁹³ and in the House Appropriations Committee Report (H.Rept. 112-151) accompanying its FY2012 Interior and Environment Appropriations bill (H.R. 2584).

As indicated in **Table 17**, the total FY2011 enacted base appropriations for the S&T account reflected decreases of varying levels when compared with the enacted FY2010 appropriations and the President's FY2011 budget request⁹⁴ for nearly all of the individual EPA research program and activity line items identified within the account. There are a few exceptions where the amount enacted for FY2011 remained relatively flat compared to the prior year appropriation. The largest decrease for FY2011 within the S&T account was for EPA's homeland security activities.⁹⁵ As indicated in the table, the \$46.2 million FY2011 enacted amount was nearly \$19.1 million (29.2%) below the FY2010 appropriation of \$65.3 million, and \$5.1 million (10%) less than the FY2011 \$51.3 million request.

⁸⁹ P.L. 112-10, Section 1119, Title I, Div. B.

⁹⁰ Title II of P.L. 111-88, the Interior, Environment, and Related Agencies appropriations for FY2010. For information on FY2010 funding for all EPA appropriations accounts see CRS Report R40685, *Interior, Environment, and Related Agencies: FY2010 Appropriations*.

⁹¹ Title II of P.L. 111-212, the Supplemental Appropriations Act, 2010, signed into law July 29, 2010, provided additional supplemental FY2010 appropriations for oil spill response and recovery efforts in the Gulf of Mexico associated with the *Deepwater Horizon* incident. Of these funds in Title II, \$2.0 million was provided for EPA within the S&T account, as requested by the Administration, for research of the potential long-term human and environmental risks and impacts from the releases of crude oil, and the application of chemical dispersants and other measures to mitigate these releases.

⁹² P.L. 112-10 did not specify the amount to be transferred to the S&T account from the Hazardous Substance Superfund account. For EPA, under general provisions Sec. 1101(a)(4) and Sec. 1104 in Title I of Division B in P.L. 112-10, unless otherwise expressly provided in Division B of the act, "... requirements, authorities, conditions, limitations, and other provisions..." in P.L. 111-88, Division A, "...shall continue..."

⁹³ *U.S. Environmental Protection Agency FY2011 Enacted Operating Plan*, May 16, 2011, provided directly to CRS by the EPA Office of Congressional and Intergovernmental Relations. P.L. 112-10, Section 1768, Title VII, Div. B, that required that within 30 days of enactment of P.L. 112-10, EPA and other departments and agencies included under Title VII of Division B submit spending, expenditures, or operating plans at a level below the account level to the Committees on Appropriations of the House and Senate.

⁹⁴ See EPA's *FY 2011 Annual Performance Plan and Congressional Justification: Science and Technology*, <http://www.epa.gov/ocfo/budget/>.

⁹⁵ Under the Bioterrorism Act of 2002, and Homeland Security Presidential Directives 7, 9, and 10, EPA is the lead federal agency for coordinating security of the Nation's water systems, and plays a role in developing early warning monitoring and decontamination capabilities associated with potential attacks using biological contaminants.

The activities typically funded within the S&T account include research conducted by universities, foundations, and other non-federal entities with EPA grants, and research conducted by the agency at its own laboratories and facilities. R&D at EPA headquarters and laboratories around the country, as well as external R&D, is managed primarily by EPA's Office of Research and Development (ORD). A large portion of the S&T account funds EPA's R&D activities managed by ORD, including the agency's research laboratories and research grants. The account also provides funding for the agency's applied science and technology activities conducted through its program offices (e.g., the Office of Water). Many of the programs implemented by other offices within EPA have a research component, but the research is not necessarily the primary focus of the program.

The EPA S&T account incorporates elements of the former EPA Research and Development (R&D) account, as well as a portion of the former Salaries and Expenses, and Program Operations accounts, which had been in place until FY1996.⁹⁶ Because of the differences in the scope of the activities included in these accounts, apt comparisons before and after FY1996 are difficult. Although the Office of Management and Budget (OMB) reports⁹⁷ historical and projected budget authority (BA) amounts for R&D at EPA (and other federal agencies), OMB documents do not describe how these amounts explicitly relate to the requested and appropriated funding amounts for the many specific EPA program activities. The R&D BA amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T account. (BA as reported by OMB is included in **Table 17** below for purpose of comparison.) This is an indication that not all of the EPA S&T account funding is allocated to R&D.

The operation and administration of the agency's laboratories and facilities necessitate significant expenditures for rent, utilities, and security. Funding for these expenses ranged from 8% to 11% of the total S&T account for the FY2008-FY2011 enacted appropriations. Prior to FY2007, a significant portion of the funding for these expenses had been requested and appropriated within EPA's Environmental Programs and Management (EPM) appropriations account. This change affects comparisons of the S&T appropriations over time. For example, the majority of operation and administrative expenses were funded within the EPM account in FY2006 and prior fiscal year appropriations. Funding provided within the S&T account for these expenses represented less than 1% of the total S&T appropriation for FY2006 and prior fiscal years.

Some Members of Congress and an array of stakeholders have continually raised concerns about the adequacy of funding for scientific research at EPA. The adequacy of funding for EPA's scientific research activities has been part of a broader question about the adequacy of overall federal funding for a broad range of scientific research activities administered by multiple federal agencies. Some Members of Congress, scientists, and environmental organizations have expressed concern about the downward trend in federal resources for scientific research over

⁹⁶ EPA's most recent annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts established by Congress during the FY1996 appropriations process.

⁹⁷ The Office of Management and Budget (OMB) reports R&D budget authority (BA) amounts in its Analytical Perspectives accompanying the annual President's budget, but amounts for specific programs are not included. For example, for EPA R&D, OMB reported actual BA of \$559 million for FY2009, estimated BA of \$622 million for FY2010, and \$651 million proposed for FY2011. The R&D budget authority amounts reported by OMB are typically significantly less than amounts appropriated/requested for the S&T account. This is an indication that not all of the EPA S&T account funding is allocated to R&D. See OMB, *Fiscal Year 2011 Budget of the United States: Analytical Perspectives – Special Topics/Research and Development* pgs. 339-344, <http://www.gpoaccess.gov/usbudget/fy11/index.html>.

time. The debate continues to center around the question of whether the regulatory actions of federal agencies are based on “sound science,” and how scientific research is applied in developing federal policy.

Table 17. Environmental Protection Agency S&T Account

(in millions of dollars)

Environmental Protection Agency	FY2010 Enacted (P.L. 111-88)	FY2011 Request	FY2011 Enacted (P.L. 112-10)
Science and Technology Appropriations Account			
Air Toxics and Quality	\$121.9	\$124.8	\$120.5
Climate Protection	19.8	16.9	16.8
Enforcement	15.4	15.9	15.3
Homeland Security	65.3	51.3	46.2
Indoor Air and Radiation	1.2	1.2	1.3
IT/Data Management/Security	4.4	4.1	3.7
Operations & Admin.	72.9	70.5	69.7
Pesticide Licensing	6.6	6.7	6.6
Research: Clean Air	102.7	107.3	102.4
- Research: Global Change	20.8	22.0	20.8
Research: Clean Water	111.1	121.1	117.3
Research: Congressional Priorities	5.7	0.0	0.0
Research: Human Health & Ecosystems	248.8	256.2	243.9
- Research: Endocrine disruptor	11.4	17.4	15.9
- Research: STAR fellowships	11.1	17.3	16.0
- FY2010 Supplemental (P.L. 111-212)	2.0	0.0	0.0
Research: Land Protection	14.1	13.8	13.4
Research: Sustainability	27.3	25.3	25.5
Research: Pesticides and Toxics	27.3	27.6	27.3
Water: Human Health Protection	3.6	3.8	3.8
—Subtotal S&T Account Base Appropriations	\$848.1	\$846.7	\$813.5
—Transfer in from Hazardous Substance Superfund Account	\$26.8	\$24.5	\$26.8
Total Science and Technology	\$874.9	\$871.2	\$840.3
EPA R&D Budget Authority Report by OMB	\$622.0 est.	\$651.0 est.	N/A

Source: Prepared by CRS. Numbers may not add due to rounding. The FY2010 appropriation are based on amounts reported in the Conference Report (H.Rept. 111-316), accompanying the FY2010 Interior, Environment

and related Agencies appropriations (P.L. 111-88), and include the FY2010 Supplemental under P.L. 111-212, Title II. FY2011 requested amounts are from U.S. *Environmental Protection Agency FY2011 Annual Performance Plan and Congressional Justification*, <http://www.epa.gov/ocfo/budget>., and FY2011 enacted amounts include the 0.2% across-the-board rescission and are based on reported in the House Report (H.Rept. (112-151, July 19, 2011) accompanying the FY2012 Interior, Environment and Related Agencies appropriations bill as reported by the House Appropriations Committee (H.R. 2584), and U.S. *Environmental Protection Agency FY2011 Enacted Operating Plan*, May 16, 2011, provided directly to CRS by the EPA Office of Congressional and Intergovernmental Relations. OMB Budget Authority estimates are as presented in Table 21-1 in *Fiscal Year 2012 Budget of the United States: Analytical Perspectives – Special Topics/Research and Development* pgs. 342-343, <http://www.gpoaccess.gov/usbudget/fy11/index.html>.

Department of Transportation⁹⁸

President Obama requested \$1.022 billion for Department of Transportation (DOT) R&D in FY2011, an increase of 0.5% above the FY2010 enacted level. (See **Table 18**.) Two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for most of the department’s R&D funding (approximately 84% in FY2010).

The President requested \$400.4 million for FAA R&D and R&D facilities, a decrease of \$11.3 million (2.7%) from the FY2010 enacted level. Most of the substantial proposed changes in FAA R&D funding were related to the agency’s Next Generation Air Transportation System (NextGen) program which seeks to address challenges posed by air traffic growth by increasing the nation’s airspace capacity and efficiency and by reducing emissions and noise. Changes requested for NextGen R&D funding included elimination of funding for demonstrations and infrastructure (\$33.8 million); a reduction of \$5.9 million for environmental research on aircraft technologies, fuels and metrics; and increases of \$28.9 million for system development, \$4.9 million for air-ground integration, \$2.4 million for alternative fuels for general aviation, and \$1.7 million for self-separation. In addition, the agency’s proposed budget included a reduction of \$13.0 million for advanced technology development and prototyping.⁹⁹

President Obama requested no increase in R&D funding for the FHWA, proposing \$442.0 million for FY2011, identical to the agency’s funding for FY2010, both in aggregate and for each specific activity area.¹⁰⁰ According to the agency’s budget request:

The Administration is developing a comprehensive approach for surface transportation reauthorization, which includes [research, development, test, and evaluation (RDT&E)]. Consequently, the Budget contains no policy recommendations for programs subject to reauthorization [which includes R&D], including Federal-aid highways.

Instead, the Budget displays baseline funding levels for all surface programs. Future authorizations for RDT&E with the Federal-aid highway program may include activities associated with deployment of safety initiatives, a restructured infrastructure program, and a

⁹⁸ This section was written by John F. Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

⁹⁹ Federal Aviation Administration, U.S. Department of Transportation, *Budget Estimates Fiscal Year 2011*, February 2010.

¹⁰⁰ Federal Highway Administration, U.S. Department of Transportation, *Budget Estimates Fiscal Year 2011*, February 2010.

variety of activities associated with environmental improvement and streamlining, security improvements, and outreach and dissemination.¹⁰¹

On July 29, 2010, the House passed H.R. 5850, the Transportation, Housing, and Urban Development, and Related Agencies Appropriations Act, 2011. The act would have provided R&D funding for DOT agencies of approximately \$1,013.1 million, roughly equal to the FY2010 and request levels.

The 111th Congress did not complete action on the Transportation, Housing and Urban Development, and Related Agencies Appropriations Act, 2011, or any of the other FY2011 appropriations bills. In April 2011, the 112th Congress passed the Department of Defense and Full-Year Continuing Appropriations Act, 2011 (P.L. 112-10) providing FY2011 funding for all federal agencies, including the Department of Transportation. In general, the law appropriates funds to the agencies at the FY2010 level unless otherwise specified. In particular, the law reduces the FAA's RE&D account by \$20.5 million to \$170 million in FY2011. This would reduce total FAA funding from \$412 million in FY2010 to approximately \$391 million in FY2011. The bill also reduces DOT's Planning, Research and Development account by \$6 million from its FY2010 funding level. The level of detail in the law, however, does not allow for a complete assessment of how the specified changes will affect overall agency and departmental R&D funding for FY2011. This report will be updated as more information becomes available from the department, agencies, or Congressional committees. (See **Table 18.**)

Table 18. Department of Transportation R&D

(in millions of dollars)

	FY2010 Estimate	FY2011 Request	FY2011 Enacted Estimate (P.L. 112-10)
Federal Highway Administration	442.0 ^a	442.0 ^a	492 ^b
Federal Aviation Administration	411.6 ^d	400.4 ^d	391
Other agencies ^e	163.3	179.5	c
Total, DOT R&D^f	1,016.9	1,021.9	c

Source: DOT FY2011 agency budget justifications; unpublished tables provided by OMB to CRS in February 2010; private communications between OMB and CRS; H.R. 5850; and H.Rept. 111-564; and P.L. 112-10.

Notes: N/A = not available.

- a. Federal Highway Administration, U.S. Department of Transportation, *Budget Estimates, Fiscal Year FY2011, Federal Highway Administration*, February 2010, <http://www.dot.gov/budget/2011/budgetestimates/fhwa.pdf>.
- b. FY2011 contract authority for research programs; data provided by the FHWA budget office on August 10, 2011.
- c. R&D funding cannot be determined from P.L. 112-10.

¹⁰¹ Ibid.

- d. Federal Aviation Administration, U.S. Department of Transportation, *Budget Estimates, Fiscal Year FY2011, Federal Aviation Administration*, February 2010, <http://www.dot.gov/budget/2011/budgetestimates/faa.pdf>; private e-mail correspondence with the Office of Management and Budget dated February 19, 2010.
- e. "Other agencies" includes National Highway Traffic Safety Administration, Federal Railroad Administration, Federal Transit Administration, Research and Innovative Technology Administration, Federal Motor Carrier Safety Administration, Pipeline and Hazardous Materials Safety Administration, and the Office of the Secretary. Figures derived from FY2011 agency budget justifications and unpublished tables provided by OMB to CRS in February 2010.
- f. Totals may differ from the sum of the components due to rounding.

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