Federal Research and Development Funding: FY2012

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Summary

President Obama has requested $147.911 billion for research and development (R&D) in FY2012, a $772 million (0.5%) increase from the FY2010 actual R&D funding level of $147.139 billion. Congress will play 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 year-long funding for FY2011 appropriations has not yet been completed, this report compares the President's FY2012 request to FY2010 appropriations. Analysis of federal R&D funding is complicated by several factors, including the Obama Administration's omission of congressionally directed spending from the FY2012 budget request. This report will be updated as Congress acts on FY2012 appropriations bills.

Under the President's request, six federal agencies would receive 94.8% of total federal R&D spending: the Department of Defense (DOD, 51.8%), Department of Health and Human Services (largely the National Institutes of Health, 21.9%), National Aeronautics and Space Administration (6.6%), Department of Energy (DOE, 8.8%), National Science Foundation (NSF, 4.3%), and Department of Agriculture (1.5%). The Department of Energy would receive the largest R&D dollar increase for FY2012 of any agency, $2.153 billion (19.9%) above its FY2010 funding level. The DOD would receive the largest reduction in R&D funding, $3.969 billion (-4.9%) less than its FY2010 level.

President Obama's request includes increases in the R&D budgets of the three agencies that were targeted for doubling over 7 years by the America COMPETES Act, and over 10 years by the America COMPETES Reauthorization Act of 2010 and by President Bush under his American Competitiveness Initiative, as measured using FY2006 R&D funding as the baseline. Under President Obama's FY2012 budget, the DOE Office of Science would receive an increase of $512 million (10.4%) over its FY2010 funding level, the NSF budget would rise by $795 million (11.4%), and the National Institute of Standards and Technology's core research and facilities construction funding would grow by $111.1 million (17.0%).

President Obama continues support for three multi-agency R&D initiatives. The President's FY2012 request includes $2.132 billion in funding for the National Nanotechnology Initiative, $201 million (10.4%) above the FY2010 funding level. The Networking and Information Technology Research and Development program would receive $3.868 billion in FY2012 funding under the President's request, an increase of $74 million (2.0%) from the FY2010 level. The President's request proposes $2.633 billion for the U.S. Global Change Research Program in FY2012, $446 million (20.4%) above the FY2010 level.

For the past five years, federal R&D funding and execution has been affected by mechanisms used to complete the annual appropriations process—multiple short-term continuing resolutions for FY2011, 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), and the Consolidated Appropriations Act, 2010 (P.L. 111-117). Completion of appropriations after the beginning of each fiscal year may cause agencies to delay or cancel some planned R&D and equipment acquisition.

Contents

Overview 1
Federal R&D Funding Perspectives 3
- Agency Perspective 3
- Character of Work, Facilities, and Equipment Perspective 4
- Combined Perspective 5
- Multiagency R&D Initiatives Perspective 7

Multiagency R&D Initiatives 9
- National Nanotechnology Initiative 9
- Networking and Information Technology Research and Development Program 10
- U.S. Global Change Research Program 10

FY2012 Appropriations Status 10
Department of Defense 11
Department of Homeland Security 14
National Institutes of Health 18
Department of Energy 22
National Science Foundation 25
Department of Commerce 29
- National Institute of Standards and Technology 29
- National Oceanic and Atmospheric Administration 31

National Aeronautics and Space Administration 33
Department of Agriculture 36
Department of the Interior 39
Environmental Protection Agency 40
Department of Transportation 43

Figures

Figure 1. Doubling of Research Funding: Appropriations and Authorizations versus Selected Rates 8

Tables

Table 1. Federal Research and Development Funding by Agency, FY2010-FY2012 4
Table 2. Federal Research and Development Funding by Character of Work, Facilities, and Equipment, FY2010-FY2012 5
Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2010-FY2012 6
Table 4. Funding for Agencies Targeted for Doubling by President Obama, the America COMPETES Act, and the American Competitiveness Initiative 9

Table 5. Alignment of Agency R&D Funding and Regular Appropriations Bills 11
Table 6. Department of Defense RDT&E 13
Table 7. Department of Homeland Security R&D and Related Programs 17
Table 8. National Institutes of Health Funding 21
Table 9. Department of Energy R&D and Related Programs 24
Table 10. National Science Foundation 29
Table 11. NIST 31
Table 12. NOAA R&D 33
Table 13. NASA R&D 35
Table 14. U.S. Department of Agriculture R&D 38
Table 15. Department of the Interior R&D 40
Table 16. Environmental Protection Agency S&T Account 43
Table 17. Department of Transportation R&D 44

Contacts

Author Contact Information 45

Overview

The 112th Congress continues to take a strong interest in the health of the U.S. research and development (R&D) enterprise and in providing support for federal R&D activities. However, widespread concerns about the federal debt and recent and projected federal budget deficits are driving difficult decisions involving prioritization of R&D within the context of the entire federal budget and among competing priorities within the federal R&D portfolio. 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.

Status of FY2011 Appropriations and Its Effect on the Analysis in This Report

As of the time of the release of this report, the federal government is operating on a continuing resolution (P.L. 112-6) set to expire on April 8, 2011. During the 111th Congress, 2 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. Since the beginning of FY2011, federal departments and agencies have been funded under a series of interim continuing resolutions (CRs).[1] On September 29, 2010, the Senate passed a continuing resolution (H.R. 3081, Continuing Appropriations Act, 2011, as amended) providing funding for federal agencies through December 3, 2010, including their R&D activities, "at a rate for operations as provided in the applicable appropriations Acts for fiscal year 2010 and under the authority and conditions as provided in such acts." On September 30, 2010, the House passed H.R. 3081 and President Obama signed it into law (P.L. 111-242). Five subsequent continuing resolutions have extended funding through December 18, 2010 (P.L. 111-290), December 21, 2010 (P.L. 111-317), March 4, 2011 (P.L. 111-322), March 18, 2011 (P.L. 112-4), and April 8, 2011 (P.L. 112-6).[2] Congress is currently considering options for completing the FY2011 appropriations process. In the absence of full-year FY2011 appropriations, this report compares the President's FY2012 budget request to FY2010 appropriations.

Congress will play a central role in defining the nation's R&D priorities as it makes decisions with respect to the size and distribution of aggregate, agency, and programmatic R&D funding. Some Members of Congress have expressed concerns about the level of federal funding in light of the current federal fiscal condition, deficit, and debt. Recent action by the House on H.R. 1, the Full-Year Continuing Appropriations Act, 2011, would reduce funding for R&D at some agencies in FY2011 and re-allocate these funds for non-R&D activities. As Congress acts to complete the FY2012 appropriations process it faces 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.

[1] For more detailed discussion of recent continuing resolutions as well as information on the history, nature, scope, and duration of continuing resolutions, see CRS Report RL30343, *Continuing Resolutions: Latest Action and Brief Overview of Recent Practices*, by Sandy Streeter.

[2] For information on the history, nature, scope, and duration of continuing resolutions, see CRS Report RL30343, *Continuing Resolutions: Latest Action and Brief Overview of Recent Practices*, by Sandy Streeter.

President Obama's proposed FY2012 budget, released on February 14, 2011, includes $147.911 billion for R&D in FY2012, a 0.5% increase over the actual FY2010 R&D funding level of $147.139 billion.[3] Adjusted for inflation, the President's FY2012 R&D request represents a decrease of 2.2% from the FY2010 level.[4] This report provides government-wide, multi-agency, and individual agency analyses of the President's FY2012 request as it relates to R&D and related activities.

Among its provisions, the President's proposed FY2012 R&D funding maintains 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 the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). These acts seek to achieve this objective by authorizing increased funding for three agencies with a strong R&D emphasis in these disciplines: 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 and R&D facilities construction funding. Appropriations provided to these agencies has fallen short of the levels authorized in P.L. 110-69. (See "Multiagency R&D Initiatives" for detailed information.)

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 (R&E) tax credit[5]); however, doing so likely would require a substantial increase in public and private investment. In 2008, total U.S. R&D expenditures were $397.629 billion,[6] or approximately 2.77% of GDP.[7] Based on 2008 figures, reaching President Obama's 3% goal would require an 8.4% real increase (above inflation) in national R&D funding. Increasing direct federal R&D funding by 8.4% in FY2012 would have required an increase of $12.4 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).[8] The biomedical research community experienced a variety of challenges resulting from such a circumstance following the five-year doubling of the NIH

[3] 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.

[4] As calculated by CRS using the GDP (chained) price index from Table 10.1, Gross Domestic Product and Deflators Used In The Historical Tables: 1940–2016, from the President's FY2012 budget. Available at http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/hist10z1.xls.

[5] The research and experimentation tax credit is frequently referred to as the research and development tax credit or R&D tax credit, through the credit does not apply to development expenditures. For additional information about the R&E tax credit, see CRS Report RL31181, *Research and Experimentation Tax Credit: Current Status and Selected Issues for Congress*, by Gary Guenther.

[6] Preliminary estimate of 2009 U.S. R&D expenditures, National Science Foundation, *National Patterns of R&D Resources:2008*, NSF 10-314, Arlington, VA, March 2010, http://www.nsf.gov/statistics/nsf10314/.

[7] Based on 2009 U.S. GDP of $14,369.1 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.

[8] Jennifer Couzin and Greg Miller, "NIH Budget: Boom and Bust," *Science*, vol. 316, no. 5823 (April 2007), pp. 356-361, at http://www.scienceonline.org/cgi/content/full/316/5823/356.

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 there have been a variety of damages from 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.[9]

Analysis of federal R&D funding is complicated by several factors, including the Obama Administration's omission of congressionally directed spending from the FY2012 budget request and inconsistency among agencies in the reporting of R&D. As a result of this 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.

Another factor complicating analysis of the President's FY2012 budget request is the inclusion of the Wireless Innovation (WIN) Fund, a part of the Administration's Wireless Innovation and Infrastructure Initiative. The WIN Fund would receive $3 billion over seven years (FY2012-FY2018) from receipts generated through electromagnetic spectrum auctions. According to the President's request, the WIN funds would support research, test beds, and applications development to support leading-edge wireless technologies and applications for public safety, Smart Grid, telemedicine, distance learning, and other broadband capabilities and to facilitate spectrum relocation. Under the President's budget, if the WIN Fund is established, several agencies would receive funding for these purposes, among them the Department of Defense, the Department of Energy, the Department of Commerce, and the National Science Foundation.

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 FY2010 (actual) and FY2012 (request) as reported by OMB, and has a column for FY2011 that will be completed when Congress completes action for the fiscal year.

Under President Obama's FY2012 budget request, six federal agencies would receive 94.8% of total federal R&D funding: Department of Defense (DOD), 51.8%; Department of Health and Human Services (HHS) (primarily the National Institutes of Health, NIH), 21.9%; Department of Energy (DOE), 8.8%; National Aeronautics and Space Administration (NASA), 6.6%; National

[9] 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.

Science Foundation (NSF), 4.3%; and Department of Agriculture (USDA), 1.5%. 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), and the Environmental Protection Agency (EPA). In total, these agencies account for more than 98% of current and requested federal R&D funding.

The largest agency R&D increases in the President's FY2012 request are for DOE, $2.153 billion (19.9%); HHS, $919 million (2.9%, due entirely to a $1.019 billion increase in R&D funding for NIH); NSF, $875 million (16.1%); NASA, $559 million (6.0%); and DOC, $376 million (28.0%). Under President Obama's FY2012 budget request, DOD R&D funding would be reduced by $3.969 billion (-4.9%), USDA R&D by $461 million (-17.7%), Department of Veterans Affairs R&D by $144 million (-12.4%), and EPA R&D by $11 million (-1.9%).

Table 1. Federal Research and Development Funding by Agency, FY2010-FY2012

(Budget authority, dollar amounts in millions)

Department/Agency	FY2010 Actual	FY2011	FY2012 Request	Dollar Change, 2010 to 2012	Percent Change, 2010 to 2012
Agriculture	2,611		2,150	-461	-17.7
Commerce	1,344		1,720	376	28.0
Defense	80,602		76,633	-3,969	-4.9
Energy	10,836		12,989	2,153	19.9
Environmental Protection Agency	590		579	-11	-1.9
Health and Human Services	31,424		32,343	919	2.9
Homeland Security	887		1,054	167	18.8
Interior	776		727	-49	-6.3
NASA	9,262		9,821	559	6.0
National Science Foundation	5,445		6,320	875	16.1
Transportation	1,069		1,215	146	13.7
Veterans Affairs	1,162		1,018	-144	-12.4
Other	1,131		1,342	211	18.7
Total[a]	**147,139**		**147,911**	**772**	**0.5**

Sources: Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2012,* Table 22-1.

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 FY2012 request includes $32.895 billion for basic research, up $3.498 billion (11.9%) from FY2010; $33.182 billion for applied research, up

$3.383 billion (11.4%); $79.414 billion for development, down $3.891 billion (-4.7%); and $2.420 billion for facilities and equipment, down $2.218 billion (-47.8%). It is important to note that with the projected completion of construction of the International Space Station (ISS) in FY2011, beginning in FY2012 NASA funding for operation of the facility is accounted for as research; previously, NASA ISS funding was accounted for as "facilities and equipment."

Table 2. Federal Research and Development Funding by Character of Work, Facilities, and Equipment, FY2010-FY2012

(Budget authority, dollar amounts in millions)

	FY2010 Actual	FY2011	FY2012 Request	Dollar Change, 2010 to 2012	Percent Change, 2010 to 2012
Basic research	29,937		32,895	3,498	11.9
Applied research	29,799		33,182	3,383	11.4
Development	83,305		79,414	-3,891	-4.7
Facilities and equipment	4,638		2,420	-2,218	-47.8
Total[a]	**147,139**		**147,911**	**772**	**0.5**

Source: Executive Office of the President, Office of Science and Technology Policy, *Innovation, Education, and Infrastructure*, Table 1, February 14, 2011.

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 57.0% 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 (with state governments, universities, and other non-profit organizations funding the remaining 25.3%). In the President's FY2012 budget request, 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,

[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 2012*, Table 22-1, February 14, 2011.

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

accounting for nearly half of all federally funded applied research in the President's FY2012 budget request.[13]

Industry also provides the vast majority of funding for development. Industry accounted 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 87.7% of total federal development funding in the President's FY2012 budget request.[15]

Table 3. Top R&D Funding Agencies by Character of Work, Facilities and Equipment, FY2010-FY2012

(Budget authority, dollar amounts in millions)

	FY2010 Actual	FY2012 Request	Dollar Change, 2010 to 2012	Percent Change, 2010 to 2012
Basic Research				
Health and Human Services	16,082	16,614	532	3.3
National Science Foundation	4,636	5,310	674	14.5
Energy	3,971	4,200	229	5.8
Applied Research				
Health and Human Services	15,177	15,559	382	2.5
Energy	3,407	4,830	1,423	41.8
Defense	4,984	4,787	-197	-4.0
Development				
Defense	73,734	69,664	-4,070	-5.5
NASA	5,461	5,135	-326	-6.0
Energy	2,520	2,859	339	13.5
Facilities and Equipment				
Energy	938	1,100	162	17.3
National Science Foundation	482	443	-39	-8.1
Commerce	269	282	13	4.8

Source: *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2012*, Office of Management and Budget, The White House, February 14, 2011.

Note: Top funding agencies based on FY2012 request.

[13] Executive Office of the President, Office of Management and Budget, *Analytical Perspectives*, Table 22-1, February 14, 2011, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2012/assets/spec.pdf.

[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 22-1, February 14, 2011.

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"), and presidential initiatives.

In 2006, President Bush announced his American Competitiveness Initiative which, in part, sought to double funding for basic research over 10 years (FY2006-2016) at three agencies—NSF, DOE's Office of Science, and NIST.

In 2007, Congress authorized substantial increases for these agencies under the America COMPETES Act (P.L. 110-69), setting a more aggressive seven-year doubling course.[16] However, funding provided for these agencies in the Consolidated Appropriations Act, 2008 (P.L. 110-161), the Omnibus Appropriations Act, 2009 (P.L. 111-8), and the Consolidated Appropriations Act, 2010 (P.L. 111-117) fell below these targets. 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** for individual and aggregate agency appropriations for FY2006-FY2010, and the request for FY2012.) In 2010, Congress authorized appropriations levels for FY2011-FY2013 for these agencies in the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).[17] However the agency authorization levels in this act represent increases of 5.8% to 7.1% per year, growth rates that would result in doubling in about 10 to 12 years.

In his FY2010 *Plan for Science and Innovation*, President Obama stated that he, like President Bush, would seek to double funding for basic research over 10 years (FY2006 to FY2016) at the ACI agencies.[18] In FY2011 supporting budget documents, President Obama extended the period over which he would seek to double these agencies' budgets to 11 years (FY2006 to FY2017).[19] In his FY2012 budget request, President Obama reiterated his intention to double the federal investment for these agencies from their FY2006 levels, though his budget request intentionally does not specify the timeframe during which this is to take place.[20] In addition, the Historical Tables of the President's FY2012 budget—which also provide outyear projections of agency budget authority—show budget authority for the National Science Foundation initially dipping in FY2013, then remaining essentially flat through FY2016.

The FY2012 budget requests for the three agencies are: DOE's Office of Science (up 10.7% above the estimated FY2010 level), NSF (up 13.0%), and DOC's National Institute of Standards and Technology (NIST) core laboratory research[21] and R&D facilities construction funds (up

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

[17] For additional information, see CRS Report R41231, *America COMPETES Reauthorization Act of 2010 (H.R. 5116) and the America COMPETES Act (P.L. 110-69): Selected Policy Issues*, coordinated by Heather B. Gonzalez.

[18] 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.

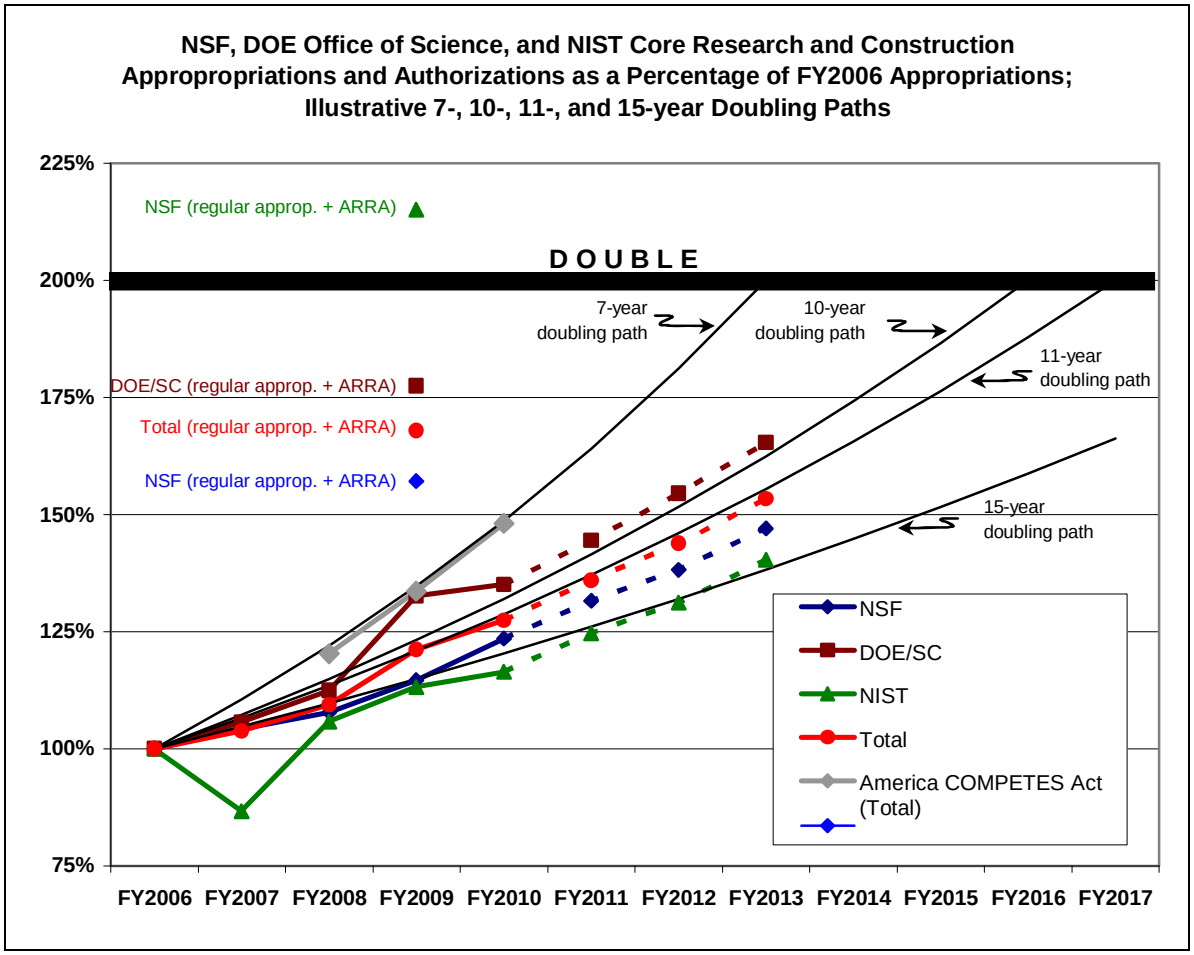
[19] Executive Office of the President, Office of Science and Technology Policy, *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the 2011 Budget*, February 1, 2010, http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf.

[20] Telephone conversation with OSTP staff, May 23, 2011.

[21] NIST core laboratory research is the scientific and technical research and services account.

15.1%).[22] Aggregate funding for these agencies in FY2012 would rise to $13.947 billion, an increase $1.409 billion (11.2%) above the FY2010 actual aggregate funding level of $12.538 billion. **Figure 1** shows funding of the agencies as a percentage of their FY2006 funding level, and illustrates how actual (FY2006-FY2010) and authorized appropriations (FY2011 through FY2013) compare to different doubling rates using FY2006 as the base year. The thick black line labeled "DOUBLE" is the 200% line, indicating twice as much funding as received in FY2006. The data used in **Figure 1** is in current dollars, not constant dollars, therefore the effect of inflation on the purchasing power of these funds is not taken into consideration.

Figure 1. Doubling of Research Funding: Appropriations and Authorizations versus Selected Rates



Source: Prepared by the Congressional Research Service (CRS) using agency budget justifications for fiscal years 2008, 2009, 2010, 2011, and 2012; the President's FY2012 budget request; and agency authorization levels from the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) for FY2011-FY2013.

Notes: Separate data points for each agency and total funding are included for FY2009 that represent the total level of funding received under both regular appropriations and the American Recovery and Reinvestment Act of 2009.The

[22] Executive Office of the President, Office of Science and Technology Policy, *Innovation, Education, and Infrastructure*, February 14, 2011, http://www.whitehouse.gov/sites/default/files/microsites/ostp/FY12-rd-fs.pdf.

seven-year double pace assumes annual increases of 10.4%, the 10-year doubling pace assumes annual increases of 7.2%, the 11-year doubling pace assumes annual increases of 6.5%, and the 15-year doubling assumes annual increases of 4.7%. Through compounding,, these rates achieve the doubling of funding in the specified time period. The lines connecting annual agency/total appropriations is for illustration purposes only. Agency data for FY2006-FY2010 based on appropriations (actual); America COMPETES Act figures based on levels authorized by the act. Agency and total figures for FY2011-FY2013 (connected with dotted lines) are based on agency authorization levels in the America COMPETES Reauthorization Act of 2010. NIST data includes funding only for scientific and technical research and services (STRS) and construction accounts. DOE/SC is the Department of Energy's Office of Science; NSF is the National Science Foundation; NIST is the National Institute of Standards and Technology; ARRA is the American Recovery and Reinvestment Act of 2009 (P.L. 111-5).

Table 4. Funding for Agencies Targeted for 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 Actual	FY2011	FY2012 Request
NSF	5,646	5,884	6,084	6,469	2,402	6,972		7,767
DOE/Office of Science	3,632	3,837	4,083	4,807	1,633	4,904		5,416
NIST/core research[a]	395	434	441	472	220	515		679
NIST/facilities	174	59	161	172	360	147		85
Total[b]	9,846	10,214	10,768	11,920	4,615	12,538		13,947

Sources: National Institute of Standards and Technology, budget requests for fiscal years 2008, 2009, 2010, 2011, and 2012, available at http://www.nist.gov/public_affairs/budget/index.cfm; Department of Energy, budget requests for fiscal years 2008, 2009, 2010, 2011, and 2012, available at http://www.cfo.doe.gov/crorgcf30.htm; National Science Foundation, budget requests for fiscal years 2008, 2009, 2010, 2011, and 2012 available at http://www.nsf.gov/about/budget/.

a. NIST core research is performed under its Scientific and Technical Research and Services account.

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

Multiagency R&D Initiatives

National Nanotechnology Initiative

President Obama's FY2012 budget request provides funding for three multiagency R&D initiatives. Funding for the National Nanotechnology Initiative (NNI) is requested in the amount of $2.130 billion for FY2012, $217 million (11.3%) above the FY2010 actual level of $1.931 billion. The overall increase in the FY2012 NNI funding request is due, in part, to funding for what the administration refers to as "signature initiatives:" Nanoelectronics for 2020 and Beyond; Sustainable Manufacturing: Creating the Industries of the Future; and Nanotechnology for Solar Energy Collection and Conversion. Under the Administration's FY2012 request, nanotechnology funding would increase at the Department of Energy by $237 million (63.3%) over its FY2010 funding level, at the Department of Health and Human Services by $24 million (5.0%), at NASA by $13 million (64.0%), and at the National Science Foundation by $11 million (2.5%). Funding for FY2012 would fall for the Department of Defense by $71 million (-16.2%), the Department of

Homeland Security by $12 million (-53.4%), and the Department of Agriculture by $4 million (-18.2%). Nanotechnology funding for other NNI agencies would remain flat in FY2012.[23]

Networking and Information Technology Research and Development Program

President Obama has requested $3.868 billion in FY2012 funding for the Networking and Information Technology Research and Development (NITRD) program, $74 million (2.0%) above the FY2010 actual level. The NITRD request includes reductions of $261 million (-19.9%) in DOD funding and $21 million (-3.1%) for HHS funding, and increases of $153 million (13.8%) for NSF, $108 million (24.1%) for DOE, $53 million (49.3%) for DOC, $35 million (69.7%) for DHS, and $9 million for NASA (11.0%).[24]

U.S. Global Change Research Program

President Obama has proposed $2.633 billion for the U.S. Global Change Research Program (USGCRP) in FY2012, $446 million (20.4%) above the FY2010 actual level of $2.187 billion. Four agencies would receive the bulk of the FY2010 USGCRP funding increase: NASA (up $215 million, 19.1%); NSF (up $106 million, 33.0%); DOC, including the National Oceanic and Atmospheric Administration and NIST (up $56 million, 15.4%); and DOE (up $54 million, 31.5%).[25]

FY2012 Appropriations Status

The remainder of this report provides a more in-depth analysis of R&D in 12 federal departments and agencies that, in aggregate, receive more than 98% of federal R&D funding. Annual appropriations for these agencies are provided through 8 of the 12 regular appropriations bills. For each agency covered below, **Table 5** shows the corresponding regular appropriations bill that provides funding for the agency, including its R&D activities.

In addition to this report, CRS produces individual reports on each of the appropriations bills. These reports can be accessed via the CRS website at http://crs.gov/Pages/clis.aspx?cliid=73. Also, the status of each appropriations bills is or will be available on the CRS webpage, *FY2012 Status Table of Appropriations*, available at http://www.crs.gov/Pages/appover.aspx. This report will be updated as relevant appropriations bills are passed by the House or the Senate.

[23]National Science and Technology Council, The White House, *The National Nanotechnology Initiative: Research and Development Leading to a Revolution in Technology and Industry, Supplement to the President's FY2012 Budget*, February 2011. For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent Jr.

[24] Executive Office of the President, Office of Science and Technology Policy, *Innovation, Education, and Infrastructure*, Table 2, February 14, 2011.

[25] Executive Office of the President, Office of Science and Technology Policy, *Innovation, Education, and Infrastructure*, Table 2, February 14, 2011. For additional information on the USGCRP, see CRS Report RL33817, *Climate Change: Federal Program Funding and Tax Incentives*, by Jane A. Leggett.

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 Defense[26]

Congress supports research and development in the Department of Defense (DOD) primarily through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation 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, the Chemical Agents and Munitions Destruction Program, and the National Defense Sealift Fund. 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 congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. Congress appropriates funds for this program in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

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

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. Congress appropriates funds for this program also in Title VI. The National Defense Sealift Fund supports the procurement, operation and maintenance, and research and development of the nation's naval reserve fleet and supports a U.S. flagged merchant fleet that can serve in time of need. Requests for this fund are made as part of the Navy's Procurement appropriation. Congress appropriates funds for this program in Title V (Revolving and Management Funds) of the defense appropriations bill.

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 three 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.

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 FY2012, the Obama Administration requested $75.325 billion for DOD's baseline Title IV RDT&E. The FY2012 request is $5.330 billion (nearly 7%) below the actual total obligational authority available in FY2010. In addition to the $75.325 billion baseline request, the Administration requested $100 million as DOD's share of the Wireless Innovation Fund. This fund (approximately $3 billion distributed through various departments) is part of the President's initiative to expand coverage and usage of the nation's wireless networks and to encourage innovation in wireless devices. The Defense Advanced Research Projects Agency (DARPA) will manage the $100 million for DOD.

For FY2012, the Administration requested an additional $664 million in RDT&E through the Defense Health Program, $407 million in RDT&E through the Chemical Agents and Munitions Destruction program, and $48 million in RDT&E through the National Defense Sealift Fund. To support overseas contingencies, the Administration requested $397 million in OCO-related RDT&E. The Administration also requested $2 million in RDT&E for DOD's Office of the Inspector General.

RDT&E funding can be broken out in different 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 6.6 provides management support, including support for test and evaluation facilities. Budget activity 6.7 supports system improvements in existing operational systems.

Congressional policymakers are 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.

The FY2012 baseline S&T funding request in Title IV is $12.246 billion (not including the $100 million for the Wireless Innovation Fund), about $1.060 billion (8%) less than the total obligational authority available for baseline S&T in Title IV 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 FY2012 request for basic research ($2.078 billion) is roughly $263 million (14%) more than what was available for Title IV basic research in FY2010.

The table below does not yet include funding levels for FY2011, given the uncertainty regarding the outcome of ongoing budget negotiations. However, policymakers may note that the Administration requested less funding for RDT&E in FY2011 than was appropriated in FY2010. Therefore, while many agencies are unlikely to see their FY2011 requests met, DOD may end up with more money for RDT&E in FY2011 than was requested.

Table 6. Department of Defense RDT&E

(in millions of dollars)

	FY2010	FY2011	FY2012 Request	
Budget Account	**Base + OCO Actual**	**Base + OCO Enacted**	**Base**	**OCO**
Army	11,711		9,684	9
Navy	19,948		17,956	54
Air Force	27,917		27,738	142
Defensewide	20,890		19,856[a]	192

Dir. Test & Eval.	188	191	
Total Title IV - By Account[b]	**80,655**	**75,425**	**397**
Budget Activity			
6.1 Basic Research	1,815	2,078	
6.2 Applied Research	4,984	4,687	
6.3 Advanced Dev.	6,507	5,581[a]	
6.4 Advanced Component Dev. and Prototypes	14,469	13,727	2
6.5 Systems Dev. and Demo	16,779	15,664	11
6.6 Management Support[c]	6,098	4,175	18
6.7 Op. Systems Dev.[d]	30,003	29,512	366
Classified programs	*17,671*	*17,605*	
Total Title IV—by Budget Activity[b]	**80,655**	**75,425**	**397**
Title V—Revolving and Management Funds			
National Defense Sealift Fund	73	48	
Title VI—Other Defense Programs			
Office of Inspector General		2	
Defense Health Program	1,444	664	
Chemical Agents and Munitions Destruction	351	407	
Grand Total[b]	**82,523**	**76,546**	**397**

Source: CRS, adapted from the Department of Defense Budget, Fiscal Year 2012, RDT&E Programs (R-1), February 2011.

a. For FY2012, this figure includes the $100 million for DARPA's Wireless Innovation Fund.

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

c. Includes funding for the Director of Test and Evaluation.

d. Includes funding for classified programs. Figure for classified programs noted in italics below.

Department of Homeland Security[27]

The Department of Homeland Security (DHS) has requested $1.528 billion for R&D and related programs in FY2012, a 9.2% increase from FY2010. This total includes $1.176 billion for the Directorate of Science and Technology (S&T), $332 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. (See **Table 7**.)

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

The S&T Directorate is the primary DHS R&D organization.[28] 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 has requested $1.176 billion for the S&T Directorate for FY2012. This is 17.6% more than the FY2010 appropriation of $1.000 billion. An increase of $126 million for Laboratory Facilities would support the beginning of construction at the National Bio and Agro-Defense Facility (NBAF). Funding for University Programs would decrease $12 million, in part through the elimination of the National Transportation Security Center of Excellence. In the new Research, Development, and Innovation budget line, about $109 million of the request would fund radiological and nuclear R&D activities currently conducted in DNDO. Also in Research, Development, and Innovation, the request includes an increase of $18 million for cybersecurity R&D.

In late 2010, the S&T Directorate announced a reorganization and released a new strategic plan. The reorganization reduced the number of direct reports to the Under Secretary and was accompanied by a change in budget structure, with most of the previous budget lines combined into two new categories: Acquisition and Operations Support and Research, Development, and Innovation. (The FY2010 budget presented in the new categories is shown as "FY2010 Comparable" in **Table 7**.) According to DHS, the new strategy and organization will result in more robust partnerships with other DHS components, a smaller number of larger projects, and more emphasis on transitioning technology into the field rather than long-term research.

The construction of NBAF will likely result in increased congressional oversight over the next several years. 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 $541 million between FY2013 and FY2017, in addition to the $150 million requested for FY2012. 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. According to DHS, the likely value of those receipts "has been found to be considerably overestimated."[29]

The Domestic Nuclear Detection Office 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 FY2012 budget, however, much of DNDO's research role would be transferred to the S&T Directorate. The Administration has requested a total of $332 million for DNDO for FY2012. This is an 11.5% decrease from the FY2010 appropriation of $375 million.[30] Systems Acquisition would receive $84 million in FY2012 versus $20 million in FY2010. Systems Development would be reduced by $30 million.

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

[28] 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.

[29] DHS FY2012 budget justification, p. S&T RDA&O 24. 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.

[30] The decrease is more than accounted for, however, by the proposed transfer of the Transformational and Applied Research program to the S&T Directorate. If the $109 million appropriated for that program in FY2010 is excluded, the FY2012 request for the remaining DNDO activities represents an increase of 25%.

(ASPs), a type of next-generation radiation portal monitor.[31] Congress 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 to develop and test them for use in secondary screening.[32] The FY2012 request includes funds to purchase and deploy 44 ASPs for secondary screening.

The global nuclear detection architecture overseen by DNDO remains an issue of congressional interest.[33] The Systems Engineering and Architecture activity includes a GNDA development program as well as programs to develop and assess GNDA activities in various mission areas.

For the first time, the Administration's FY2012 request includes funds for the Securing the Cities program, which was previously funded at congressional direction. According to DHS, this program aligns with a new DNDO emphasis on developing surge capabilities and working with state and local law enforcement agencies. The program was previously limited to the New York area; it is to be expanded to an additional city in FY2012.

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 same act 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 its 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."[34] In contrast, the FY2012 request for Systems Acquisition includes funding for ASPs that would be operated by Customs and Border Protection, as well as human-portable radiation detectors for the Coast Guard, Customs and Border Protection, and the Transportation Security Administration. The reasons for this apparent reversal of policy are not explained in either the FY2011 or the FY2012 DNDO budget justification.

[31] 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.

[32] 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.

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

[34] Executive Office of the President, FY2010 Budget, Appendix, p. 560.

Table 7. Department of Homeland Security R&D and Related Programs

(in millions of dollars)

	FY2010 Enacted	FY2010 Comparable	FY2011 Enacted	FY2012 Request
Directorate of Science and Technology	**$1,000**	**$1,000**		**$1,176**
Management and Administration	143	143		149
R&D, Acquisition, and Operations	856	856		1,027
Acquisition and Operations Support	*—*	*86*		*54*
Laboratory Facilities	*150*	*150*		*276*
Research, Development, and Innovation	*—*	*577*		*660*
University Programs	*49*	*49*		*37*
Border and Maritime	*44*	*—*		*—*
Chemical and Biological	*207*	*—*		*—*
Command, Control, and Interoperability	*82*	*—*		*—*
Explosives	*121*	*—*		*—*
Human Factors / Behavioral Sciences	*16*	*—*		*—*
Infrastructure and Geophysical	*75*	*—*		*—*
Innovation	*44*	*—*		*—*
Test and Evaluation, Standards	*29*	*—*		*—*
Transition	*46*	*—*		*—*
Rescission of Prior-Year Unobligated Balances	*(7)*	*(7)*		*—*
Domestic Nuclear Detection Office	**375**	**375**		**332**
Management and Administration	38	38		41
Research, Development, and Operations	317	317		206
Systems Engineering and Architecture	*25*	*25*		*32*
Systems Development	*100*	*100*		*70*
Transformational R&D	*109*	*109*		*—*
Assessments	*32*	*32*		*43*
Operations	*38*	*38*		*37*
Forensics	*20*	*20*		*25*
Rescission of Prior-Year Unobligated Balances	*(8)*	*(8)*		*—*
Systems Acquisition	20	20		84
Radiation Portal Monitors Program	*0*	*0*		*37*
Securing the Cities	*20*	*20*		*27*
Human Portable Radiation Detection Systems	*0*	*0*		*20*
U.S. Coast Guard RDT&E	**25**	**25**		**20**
TOTAL	**1,399**	**1,399**		**1,528**

Source: FY2010 enacted from P.L. 111-83 and H.Rept. 111-298. FY2012 request from DHS FY2012 budget justification, online at http://www.dhs.gov/xabout/budget/. FY2010 comparable amounts for S&T Acquisition and

Operations Support and S&T Research, Development, and Innovation from U.S. House of Representatives, Committee on Science, Space, and Technology, Subcommittee on Technology and Innovation, *An Overview of Science and Technology Research and Development Programs and Priorities at the Department of Homeland Security*, hearing charter, March 15, 2011, p. 2.

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

National Institutes of Health[35]

For FY2012 the Obama Administration has requested $32.0 billion for NIH, an increase of $745 million (2.4%) over FY2010. The agency will focus on implementing a new translational medicine program in FY2012 as well as emphasize three other broad scientific areas including advanced technologies, comparative effectiveness research, and support for young investigators.[36]

For the new program, NIH is proposing to establish a new center, the National Center for Advancing Translational Sciences (NCATS) to catalyze the development of new diagnostics and therapeutics. To do so, NIH proposes to abolish the existing National Center for Research Resources (NCRR) and transfer its Clinical and Translational Science Awards (CTSA) program to NCATS.[37] The FY2012 request proposes $485 million for CTSA, a program which funds a national consortium of medical research institutions that work together to accelerate treatment development, engage communities in clinical research efforts, and train clinical and translational researchers. Another component of NCATS will be the Therapeutics for Rare and Neglected Diseases (TRND) program; the request would double support for TRND in FY2012 to $50 million. TRND is currently funded on an NIH-wide basis.

NCATS may also incorporate the new Cures Acceleration Network (CAN), which was authorized but not funded, in the new health reform law (P.L. 111-148). The purpose of CAN is to support the development of high need cures and facilitate their FDA review. P.L. 111-148 authorized $500 million for FY2010 and such sums as may be necessary for subsequent fiscal years for CAN. The law also specified that other funds appropriated under the Public Health Service Act may not be allocated to CAN. The NIH request proposes $100 million for CAN in FY2012. If CAN receives funding, NIH would determine which medical products are "high need cures," and then make awards to research entities or companies in order to accelerate the development of such high need cures.

In addition to the new program, NIH will emphasize three scientific areas in FY2012:

1. Technologies to Accelerate Discovery. NIH will support further development and application of advanced technologies (such as DNA sequencing, microarray technology, nanotechnology, new imaging modalities, and computational biology) to further understanding of complex diseases, such as cancer and Alzheimer's disease, to enable development of more effective therapies.

[35] This section was written by Judith A. Johnson, Specialist in Biomedical Policy, CRS Domestic Social Policy Division.

[36] Translational medicine focuses on converting basic research discoveries into clinical applications that benefit patients.

[37] NIH, *Justification of Estimates for Appropriations Committees, FY2012, Vol. I, Overview*, p. ES-12.

2. Enhancing the Evidence Base for Health Care Decisions. NIH plans to use comparative effectiveness research methodologies to assist in developing individually-tailored treatments (personalized medicine) by testing candidate therapies in a group of Health Maintenance Organizations (HMOs) caring for more than 13 million patients.
3. New Investigators, New Ideas. NIH will emphasize two of its programs that support young scientists. The NIH Director's New Innovator Award program provides first-time independent awards to outstanding investigators; the Administration requests $80 million to support these awards in FY2012. The second program, announced in October 2010, called the Early Independence Program, will support talented junior scientists, allowing them to by-pass the traditional postdoctoral training period and move directly to an independent research career. NIH requests $8.4 million for this program in FY2012.

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 also receives $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, currently $300 million, 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. Because the "NIH program level" cited in the Administration's FY2012 budget documents does not reflect the Global Fund transfer, **Table 8** 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 and 27 institutes and centers. The Office of the Director (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 institutes and centers (collectively called 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 the Office of the Director. As shown in **Table 8**, Congress provides a separate appropriation to 24 of the 27 ICs, to OD, and to a Buildings and Facilities account. (The other three centers, not included in the table, are funded through the NIH Management Fund.)

Research Project Grants. Of the funds appropriated to NIH each year, more than 80% go out to the extramural research community in the form of grants, contracts, and other awards. The funding supports research performed by more than 325,000 scientists and technical personnel who work at more than 3,000 universities, hospitals, medical schools, and other research institutions around the country and abroad. The primary funding mechanism for support of the full range of investigator-initiated research is competitive, peer-reviewed research project grants (RPGs).

In the FY2012 request, total funding for RPGs, at $16.9 billion, represents about 53% of NIH's budget. The request proposes to support an estimated 36,852 awards, 43 more grants than in

FY2010 (excluding ARRA funds). Within that total, 9,158 would be competing RPGs, 228 fewer than in FY2010. ("Competing" awards means new grants plus competing renewals of existing grants.) For noncompeting (continuation) RPGs, the FY2012 budget provides an inflation-adjustment increase of 1%.

Other Funding Mechanisms. The FY2012 request includes an increase of 4% for training stipends for individuals supported by the Ruth L. Kirschstein National Research Service Awards program.[38] The budget request would raise funding for the program by $19 million to $794 million, a 2.5% increase, which would allow NIH to support 16,831 full-time training positions, 330 fewer than in FY2010.[39] Changes proposed in the request for other funding mechanisms within the NIH budget include a decrease in support for research centers, down $41 million (-1.3%) to $3.036 billion; an increase of $25 million (1.4%) for other research grants for a total of $1.820 billion; an $89 million (2.8 %) increase to $3.245 billion for R&D contracts (excluding the funding to be transferred for the Global HIV/AIDS Fund); $50 million more (1.5%) for the NIH intramural research program, for a total of $3.382 billion; an increase of $30 million (2.0%) to a total of $1.538 billion for research management and support; and an increase of $109 million (17.2%) for the Office of the Director, for a total of $742 million. Buildings and Facilities would increase by almost $26 million (23.7%) to $134 million.

Also funded through the OD account is the NIH Common Fund, which supports emerging areas of scientific opportunity, public health challenges, or knowledge gaps that deserve special emphasis and might benefit from collaboration between two or more institutes or centers. For FY2012, the President requests $556.9 million for the Common Fund, up $12.9 million from FY2010.

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 FY2012 budget proposes to increase the set-aside to 3.2%. 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 8** do not subtract the amount of the evaluation tap, or of other taps within HHS, from the agencies' appropriations.

[38] NIH, *Justification of Estimates for Appropriations Committees, FY2012, Vol. I, Overview*, p. ES-18.

[39] NIH, *Justification of Estimates for Appropriations Committees, FY2012, Vol. I, Overview*, p. ES-26.

Table 8. National Institutes of Health Funding

(dollars in millions)

Component	FY 2010 Actual[a]	FY 2011	FY 2012 Request
Cancer (NCI)	5,101		5,196
Heart/Lung/Blood (NHLBI)	3,095		3,148
Dental/Craniofacial Research (NIDCR)	413		420
Diabetes/Digestive/Kidney (NIDDK)	1,807		1,838
Neurological Disorders/Stroke (NINDS)	1,635		1,664
Allergy/Infectious Diseases (NIAID)[b]	4,816		4,916
General Medical Sciences (NIGMS)	2,051		2,102
Child Health/Human Development (NICHD)	1,329		1,352
Eye (NEI)	707		719
Environmental Health Sciences (NIEHS)	689		701
Aging (NIA)	1,110		1,130
Arthritis/Musculoskeletal/Skin (NIAMS)	539		548
Deafness/Communication Disorders (NIDCD)	419		426
Mental Health (NIMH)	1,490		1,517
Drug Abuse (NIDA)	1,059		1,080
Alcohol Abuse/Alcoholism (NIAAA)	462		469
Nursing Research (NINR)	146		148
Human Genome Research (NHGRI)	516		525
Biomedical Imaging/Bioengineering (NIBIB)	316		322
Minority Health/Health Disparities (NIMHD)[c]	211		215
Research Resources (NCRR)	1,268		1,298
Complementary/Alternative Medicine (NCCAM)	129		131
Fogarty International Center (FIC)	70		71
National Library of Medicine (NLM)	351		387
Office of Director (OD)	1,177		1,298
Common Fund (non-add)	544		557
Buildings & Facilities (B&F)	100		126
Subtotal, Labor/HHS Appropriation	31,005		31,748
Superfund (Interior approp to NIEHS)[d]	79		81
Total, NIH discretionary budget authority	31,084		31,829
Pre-appropriated Type 1 diabetes funds[e]	150		150
PHS Evaluation Tap funding[f]	8		8
Total, NIH program level	31,243		31,987
Total, NIH program level (less Global Fund)	30,943		31,687

Source: Adapted by CRS from NIH, *Justification of Estimates for Appropriations Committees, Fiscal Year 2012*, ST-2, at http://officeofbudget.od.nih.gov/pdfs/FY12/Tab%203%20-%20Supplementary%20Tables.pdf. Details may not add to totals due to rounding.

a. 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.

b. Includes funds for transfer to the Global Fund for HIV/AIDS, Tuberculosis, and Malaria ($300 million in each of FY2010, FY2011, and FY2012). Bioshield transfer of $304 million was not provided under the FY2011 CR.

c. Section 10334(c) of P.L. 111-148 redesignated the Center as an Institute.

d. Separate account in the Interior-Environment appropriations for NIEHS research activities related to Superfund.

e. Funds available to NIDDK for diabetes research under PHS Act § 330B (provided by P.L. 110-275 and P.L. 111-309). Funds have been appropriated through FY2013.

f. Additional funds for NLM from PHS Evaluation Set-Aside (§ 241 of PHS Act).

Department of Energy[40]

The Administration has requested $14.447 billion for Department of Energy (DOE) R&D and related programs in FY2012, including activities in three major categories: science, national security, and energy. This request is 21.0% more than the FY2010 appropriation of $11.941 billion. (See **Table 9** for details.)

The request for the DOE Office of Science is $5.416 billion, an increase of 10.4% from the FY2010 appropriation of $4.904 billion. The Administration has stated that it intends to double the combined R&D funding of the Office of Science and two other agencies[41] over the decade from FY2006 to FY2016.[42] This policy continues a goal first established by the Bush Administration as part of its American Competitiveness Initiative. The 10.4% increase requested for FY2012 relative to FY2010, however, is less than two years of 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 $5.614 billion for the Office of Science in FY2012.

Four of the six research programs of the Office of Science would receive increases under the Administration's budget proposal. The largest increase would be for basic energy sciences. Among other changes, this program would allocate $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 (currently funded by the DOE Office of Energy Efficiency and Renewable Energy).[43]

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

[41] The National Science Foundation and the National Institute of Standards and Technology's core laboratory research and construction accounts.

[42] 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 2011 Budget*, February 1, 2010, http://www.whitehouse.gov/sites/default/files/doubling%2011%20final.pdf.

[43] The Administration proposed to initiate eight energy innovation hubs in FY2010, but Congress funded only three. The FY2012 budget request would fund six hubs. The three new hubs would focus on batteries and energy storage, critical materials, and Smart Grid technologies and systems. 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 (continued...)

The biological and environmental research program would receive a $69 million increase for foundational genomics research. Funding for high energy physics would decline 2%, partly because of the end of operations at the Tevatron facility in Illinois. In fusion energy sciences, the U.S. contribution to International Thermonuclear Experimental Reactor (ITER) would drop from $135 million to $105 million. The current estimate for ITER's total project cost remains between $1.45 billion and $2.2 billion.

The request for DOE national security R&D is $4.175 billion, a 19.9% increase from $3.481 billion in FY2010. A $209 million increase for the naval reactors program would 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. Funding for nonproliferation and verification R&D would increase $100 million, including $56 million to fund contractor pension payments resulting from the transition of management contracts at Los Alamos and Lawrence Livermore National Laboratories. Funding for nuclear weapons activities includes a similar increase of $168 million for contractor pensions.

The request for DOE energy R&D is $4.856 billion, up 36.6% from $3.556 billion in FY2010. In the energy efficiency and renewable energy program, funding for hydrogen and fuel cell technologies would decrease $70 million, but most other activities would increase rapidly. R&D on energy-efficient technologies for homes, vehicles, and industries would more than double, and solar energy R&D would increase 88%. In fossil energy R&D, the coal program would be reduced by $102 million, and "consistent with the Administration's policy to phase out fossil fuel subsidies," no funds would be provided for natural gas technologies or unconventional fossil energy technologies.[44]

The Advanced Research Projects Agency–Energy (ARPA-E) would receive $650 million under the Administration request. This agency received no appropriation for FY2010. The bulk of its funding to date has been provided by the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5).[45] 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 additional funding ... [did] not in any way suggest a lack of commitment to this program by the Committee."[46] The Administration request for ARPA-E in FY2012 includes $100 million in mandatory funding from a proposed Wireless Innovation Fund supported by the proceeds of spectrum auctions.

(...continued)

researchers "spanning science, engineering, and other disciplines, but focused on a single critical national need identified by the Department." (DOE FY2011 budget justification, vol. 4, p. 86)

[44] DOE FY2012 budget justification, vol. 3, pp. 513 and 517.

[45] 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.

[46] H.Rept. 111-203, p. 120.

Table 9. Department of Energy R&D and Related Programs

($ in millions)

	FY2010 Enacted	FY2012 Request
Science	**$4,904**	**$5,416**
Basic Energy Sciences	1,636	1,985
High Energy Physics	810	797
Biological and Environmental Research	604	718
Nuclear Physics	535	605
Fusion Energy Sciences	426	400
Advanced Scientific Computing Research	394	466
Other	499	445
National Security	**3,481**	**4,175**
Weapons Activities[a]	2,198	2,572
Naval Reactors	945	1,154
Nonproliferation and Verification R&D	317	418
Defense Environmental Cleanup Technology Development	20	32
Energy	**3,556**	**4,856**
Energy Efficiency and Renewable Energy[b]	1,973	2,806
Fossil Energy R&D	672	453
Nuclear Energy	787	754
Electricity Delivery & Energy Reliability R&D	125	193
Advanced Research Projects Agency–Energy	0	650
Total[c]	**11,941**	**14,447**

Source: FY2010 enacted from P.L. 111-85 and H.Rept. 111-278. FY2012 request from DOE FY2012 budget justification, online at http://www.cfo.doe.gov/budget/12budget/index12.html.

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, National Security Applications, 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. Excluding Weatherization and Intergovernmental Activities.

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

National Science Foundation[47]

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."[48] The NSF is a primary source of federal support for U.S. university research, especially in certain fields such as mathematics and computer science. 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.

The President's FY2012 budget request for the NSF is $7,767.0 million, a $794.8 million increase (11.4%) over the FY2010 actual level.[49] Most of the requested increase would go to NSF's Research and Related Activities account. The remainder would go to other Foundation accounts, including those that primarily support education, agency operations, and research facilities and equipment. Overall, the distribution of the FY2012 requested increase is largely consistent with the existing distribution of funds across the NSF.[50] (See **Table 10** for details.)

The President's FY2012 request for increased funding at the NSF is part of a long-term effort to double federal support for basic research in the physical sciences and engineering. To that end, the effort seeks to double research funding at the NSF, Department of Energy's Office of Science, and National Institute of Standards and Technology laboratories. The Administration states that these increases are "key to our nation's prosperity and to preserving America's place as the world leader in science and technology."[51] Other advocates stress that increases are necessary to rebalance the federal R&D portfolio, which has skewed toward health-related R&D for the past several decades.[52]

Congress set statutory authorization levels consistent with the doubling effort in both the 2007 America COMPETES Act (P.L. 110-69) and its 2010 reauthorization (P.L. 111-358). However, actual appropriations to NSF and other targeted research accounts have not been consistent with statutory authorizations since the 2006 baseline.[53] Further, some policymakers in the 112th Congress have expressed concerns about NSF funding in light of the current federal fiscal condition, deficit, and debt. Some analysts prefer alternative policy options, such as tax or

[47] This section was written by Heather B. Gonzalez, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division. Numbers are rounded.

[48] The National Science Foundation Act of 1950 (P.L. 81-507). For more information about how the NSF plans to implement its mandate, see National Science Foundation, *Empowering the Nation through Discovery and Innovation: NSF Strategic Plan for Fiscal Years (FY) 2001-2016*, February 2011, http://www.nsf.gov/news/strategicplan/.

[49] National Science Foundation, *FY2012 Budget Request to Congress*, February 14, 2011, http://www.nsf.gov/about/budget/fy2012/pdf/00a_fy2012.pdf.

[50] Based on CRS analysis. Data available upon request.

[51] 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," press release, May 7, 2009, p. 1, http://www.whitehouse.gov/files/documents/ostp/budget/doubling.pdf.

[52] The National Academy of Sciences, Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, National Academies Press, 2007, http://www.nap.edu/catalog/11463.html.

[53] Based on CRS analysis. Data available upon request.

regulatory reforms, to increased research appropriations. Others support increased appropriations for research, but raise concerns about the practical effects of what some characterize as a "boom-bust" cycle in R&D support.[54] There have been some legislative efforts to reduce Foundation funding in FY2011.[55]

Another issue raised in the general debate about funding for NSF focuses on the Foundation's ability to effectively manage its grants. This is relevant to R&D policy because much of the Foundation's R&D funding is distributed via the grant process. In a House hearing, NSF's Inspector General Allison C. Lerner testified that—among other issues—the Foundation faces ongoing challenges in ensuring that grant recipients comply with grant terms and conditions. According to Lerner's testimony, the NSF attributes this problem, at least in part, to staffing constraints. Lerner postulated that, "If the Foundation's budget continues to grow, the resulting increase in awards to monitor will compound this challenge."[56]

Research and Related Activities (R&RA) is the largest account at the NSF. It is also the largest source of R&D funding at the Foundation. The total Administration request for R&RA in FY2012 is $6.254 billion. Of this, $5.031 billion (80.4%) would fund basic research activities. Another $539.7 million (8.6%) would fund applied research and $209.8 million (3.4%) would support R&D facilities and major equipment. R&RA is divided into 11 subaccounts, which are organized by broad discipline (e.g., Engineering) and activity (e.g., Integrative Activities).

The FY2012 Administration request for R&RA represents a $638.2 million increase (11.4%) over the FY2010 actual level. All major R&RA sub-accounts would see increases over FY2010 actual levels—ranging from 1.3% for the U.S. Arctic Research Commission to 22.3% for Integrative Activities. Of the total proposed growth in the R&RA account, $242.1 million (37.9%) would go to two directorates: Engineering (ENG) and Computer and Information Science and Engineering (CISE).

R&RA funds are typically awarded through a merit-based competitive process to U.S. colleges and universities. Some policymakers assert that this process favors certain institutions and states. In response to these concerns, the NSF launched the Experimental Program to Stimulate Competitive Research (EPSCoR) program in 1978. The EPSCoR program seeks to increase the research competitiveness of states with historically low federal research funding rates. Assessments of the effectiveness of EPSCoR vary. NSF's FY2012 budget documents indicate that the Foundation plans to have EPSCoR independently evaluated.[57] Previously, concerns have focused on the program's "graduation rate" and review process, among other things.[58] The

[54] For more information see, CRS Report R41231, *America COMPETES Reauthorization Act of 2010 (H.R. 5116) and the America COMPETES Act (P.L. 110-69): Selected Policy Issues*, coordinated by Heather B. Gonzalez.

[55] H.R. 1, as passed by the House on February 18, 2011, would reduce funding for the R&RA, EHR, and MREFC accounts.

[56] Testimony of NSF Inspector General Allison C. Lerner, in U.S. Congress, House Committee on Appropriations, Subcommittee on Commerce, Justice, Science, and Related Agencies, *Oversight of the National Science Foundation (NSF) and the National Aeronautics and Space Administration (NASA)*, hearings, 112th Cong., 1st sess., February 11, 2011, P. 3, http://appropriations.house.gov/_files/NSFIGAllisonCLerner.pdf.

[57] National Science Foundation, "Integrative Activities," *FY2012 Budget Request to Congress*, February 14, 2011, p. IA-4, http://www.nsf.gov/about/budget/fy2012/pdf/00a_fy2012.pdf.IA-4

[58] The term "graduation rate" in this context typically refers to states that transition out of EPSCoR after increasing their shares of federal R&D funding. For more information about EPSCoR, see CRS Report RL30930, *U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR)*, by Christine M. Matthews, *U.S. National Science Foundation: Experimental Program to Stimulate Competitive Research (EPSCoR)*, by Christine (continued...)

Administration's FY2012 request for EPSCoR is $160.5 million, a $13.4 million increase (9.1%) over the FY2010 actual level of $147.1 million.

Other R&RA sub-accounts and programs seek to address certain long-term trends in R&D. These include the Office of International Science and Engineering (OISE) and the newly created Integrated NSF Support Promoting Interdisciplinary Research and Education (INSPIRE) program. Observers of U.S. R&D activities have long noted (1) the increasing globalization of research activities[59] and (2) decreasing distinctions between historically disparate academic fields.[60] OISE seeks to support international collaborations and partnerships that help achieve U.S. research objectives, including foreign policy objectives. INSPIRE will endeavor to support interdisciplinary research by individuals or teams of researchers. The Administration proposes $58 million for OISE in FY2012, an increase of $10.2 million (21.3%) over the FY2010 actual level, and $12.4 million for INSPIRE.

Other accounts that support R&D at the National Science Foundation include the Major Research Equipment and Facilities Construction (MREFC) and the Education and Human Resources (EHR) accounts. Although EHR primarily funds STEM education programs, the Foundation indicates that it supports R&D in this account as well.

The FY2012 MREFC account request for $224.7 million is a $58.8 million increase (35.4%) over the FY2010 actual level. It includes increases for the National Ecological Observatory Network (NEON, $87.9 million) and Ocean Observatories Initiative (OOI, $102.8 million) projects. Most other MREFC projects would be reduced. The NSF requests no new MREFC funds for the Alaska Region Research Vessel or IceCube Neutrino Observatory in FY2012, both of which are now fully funded.

The President has asked for $911.2 million for EHR, a $38.4 million increase (4.4%) over the FY2010 actual level. Under the FY2012 proposal all major EHR sub-accounts would receive an increase over FY2010 actual levels. Of the increase, $21.5 million (55.9%) would go to the Division of Human Development (HRD) for a new program to increase the participation of underrepresented populations in undergraduate STEM education, and $10.3 million (26.8%) would go to the Division of Graduate Education (DGE) to help fund 2,000 new Graduate Research Fellowships. The Administration also proposes program changes in EHR.

The Administration requests $357.7 million for the Agency Operations & Award Management account, a $57.9 million (19.3%) increase over the FY2010 actual level. Most of the requested increase would fund a new NSF headquarters.[61] The Administration also seeks increases of $1.0

(...continued)

M. Matthews.

[59] National Science Board, Globalization of Science and Engineering Research: A Companion to Science and Engineering Indicators 2010 (NSB-10-3), 2010, http://www.nsf.gov/statistics/nsb1003/.

[60] Committee on Facilitating Interdisciplinary Research, National Academy of Sciences, National Academy of Engineering, Institute of Medicine, *Facilitating Interdisciplinary Research*, National Academies Press, 2004, http://www.nap.edu/catalog.php?record_id=11153.

[61] The current NSF Headquarters lease expires in 2013. According to the NSF, "In December 2010, GSA submitted a prospectus to Congress requesting authorization to enter into a new 15-year operating lease for the Foundation. GSA anticipates that the procurement of a new lease, the design, renovation and/or construction of a new headquarters, and the relocation and occupancy of NSF's employees will be completed by May 2015," p. AOAM-9, http://www.nsf.gov/about/budget/fy2012/pdf/30_fy2012.pdf.

million and $.46 million, respectively, for NSF's Office of the Inspector General and the National Science Board.

The Administration's FY2012 budget request proposes increases for certain NSF-wide investments funding from more than one Foundation account, including the interagency Networking and Information Technology Research and Development (NITRD) and National Nanotechnology Initiative (NNI) efforts, and NSF's Science, Engineering, and Education for Sustainability (SEES) portfolio and Major Multi-User Research Facilities funding.

For FY2012 the Administration proposes a $152.1 million (12.1%) increase for NITRD and a $27.3 million (6.0%) increase for the NNI. Total funds for these accounts in FY2012 under the President's plan would be $1.258 billion and $456.0 million, respectively. The NITRD program is a collaborative effort in which 13 agencies coordinate and cooperate to help increase the overall effectiveness and productivity of federal IT R&D.[62] Similarly, the NNI is a multiagency effort to advance nanoscale science, engineering, and technologies through the coordination of federal R&D.[63] NSF is a principle funding agency for both of these efforts.

The Administration has asked for approximately a $272.6 million (39.1%) increase for NSF's SEES portfolio[64] and a $31.5 million (2.7%) increase for Major Multi-User Research Facilities funding in FY2012. Total funds for these accounts in FY2012 under the President's plan would be $998.2 million and $1.185 billion, respectively. The SEES portfolio focuses on sustainability, including fundamental climate and energy science research. Major Multi-User Research Facilities supports R&D centers such as the National Radio Astronomy Observatory and the Large Hadron Collider.

The Administration's FY2012 request would also eliminate six NSF programs: Deep Underground Science and Engineering Laboratory, Graduate STEM Fellow in K-12 Education, National STEM Distributed Learning Program, Research Initiation Grants to Broaden Participation in Biology, Science Learning Centers, and the Synchrotron Radiation Center. Funds from these activities would be redirected to other Foundation accounts.

[62] For more information, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Background, Funding, and Activities*, by Patricia Moloney Figliola

[63] For more information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent Jr.

[64] The FY2012 budget justification does not include FY2010 actual amounts for all accounts in the SEES portfolio. Therefore, growth calculations for the portfolio were made without contributions from EHR or the Office of International Science and Engineering. The FY2012 SEES portfolio request for these accounts is $12.0 million and $17.0 million, respectively. Data available upon request.

Table 10. National Science Foundation

(in millions of dollars)

	FY 2010 Actual	FY2011	FY2012 Request
Biological Sciences	714.8		794.5
Computer & Information Sci. & Eng.	618.7		728.4
Engineering	775.9		908.3
Geosciences	891.9		979.2
Math and Physical Sciences	1,368.0		1,432.7
Social, Behavioral, & Economic Sciences	255.3		301.1
Office of Cyberinfrastructure	214.7		236.0
Office of International Sci. & Eng.	47.4		58.0
U.S. Polar Programs	451.7		477.4
Integrative Activities	274.9		336.3
U.S. Arctic Research Comm.	1.6		1.6
Subtotal Research & Related Activities	**5,615.3**		**6,253.5**
Education & Human Resources	872.8		911.2
Major Research Equipment & Facilities Construction	165.9		224.7
Agency Ops. & Award Mgmt.	299.9		357.7
National Science Board	4.4		4.8
Office of Inspector General	14.0		15.0
Total NSF	**6,972.2**		**7,767.0**

Source: National Science Foundation, *FY2012 Budget Request to Congress,* Arlington, VA, February 14, 2011. Summary Tables.

Notes: The totals do not include carryovers or retirement accruals. Totals may differ from the sum of the components due to rounding.

Department of Commerce

National Institute of Standards and Technology[65]

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.

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

The Administration's FY2012 budget proposes $1.001 billion in funding for NIST, a 16.9% increase over the FY2010 appropriation of $856.6 million. Support for research and development under the Scientific and Technical Research and Services (STRS) account would increase 34.3% from $505.4 million to $678.9 million (excluding the Baldrige National Quality Program which has been transferred out of STRS). Under the Industrial Technology Services (ITS) account, the Manufacturing Extension Partnership (MEP) program would receive $142.6 million, 14.4% more than the $124.7 million appropriated in FY2010, while funding for the Technology Innovation Program (TIP) would increase to $75.0 million, 7.3% over the FY2010 figure of $69.9 million. Now budgeted under ITS, support for the Baldrige National Quality Program would decrease 19.8% from $9.6 million to $7.7 million. A new program, the Advanced Manufacturing Technology Consortia (AMTech) would be created and funded at $12.3 million. The construction budget would decline 42.4% from $147.0 million in FY2010 to $84.6 million in FY2012. (See **Table 11**.)

NIST's extramural programs (currently the Manufacturing Extension Partnership and the Technology Innovation Program), which are directed toward increased private sector commercialization, have been a source of contention. The Administration's FY2012 budget would establish and provide support for an additional extramural program, AMTech. Some members of Congress have expressed skepticism over a "technology policy" based on providing federal funds to industry for the development of "pre-competitive generic" technologies. This approach, coupled with pressures to balance the federal budget, has 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.[66]

Increases in spending for 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 Administration stated its intention to double funding over 10 years for "innovation-enabling research" done, in part, at NIST through its "core" programs (defined as the STRS account and the construction budget). In April 2009, President Obama indicated his decision to double the budget of key science agencies, including NIST, over the next 10 years. While Congress has provided additional funding, 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.[67]

[66] 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.

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

Table 11. NIST

(in millions of dollars)

NIST Program	FY2010 Enacted	FY2011	FY2012 Request
STRS[a]	505.4		678.9
ITS			
TIP	69.9		75.0
MEP	124.7		142.6
Baldrige Program	9.6		7.7
AMTech			12.3
Construction	147.0		84.6
NIST Total[b]	**856.6**		**1001.1**

Sources: NIST website (available at http://www.nist.gov/public_affairs/budget.htm), P.L. 111-117 and Administration's FY2012 Budget Request.

a. Excludes FY2010 funding for the Baldrige National Quality Program; funding for this program is included in the FY2010 Enacted column under ITS for comparison purposes.

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

National Oceanic and Atmospheric Administration[68]

The Commerce Department's 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 manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[69] The reorganization was intended to unify certain of 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 FY2012, President Obama has requested $737.0 million in R&D funding for NOAA, a 7.6% increase in funding from the FY2010 level of $684.7 million. R&D accounts for 13.4% of NOAA's total FY2012 discretionary budget request of $5.503 billion. The R&D request consists of $490 million for research (66.5%), $85 million for development (11.5%), and $162 million for R&D equipment (22.0%). Excluding equipment, about $412 million (71.6%) of the R&D request would fund intramural programs and $163 million (28.3%) would fund extramural programs.[70]

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

[69] "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.

[70] National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2012 Budget Summary*, National Oceanic and Atmospheric Administration, Washington, DC, February 2011, http://www.corporateservices.noaa.gov/nbo/fy12_bluebook/chapter7_Research_Development.pdf.

NOAA's administrative structure has evolved into five line offices that reflect its diverse mission, including the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite, Data, and Information Service (NESDIS); National Weather Service (NWS); and Office of Oceanic and Atmospheric Research (OAR). In addition to NOAA's five line offices, Program Support (PS), a cross-cutting budget activity, includes the Office of Marine and Aviation Operations (OMAO). NOAA's FY2012 budget request proposes a budget neutral reorganization of its administrative structure by establishing a Climate Service (CS) line office. The reorganization would bring together existing climate related capabilities from NWS, NESDIS, and OAR. The main goal of establishing CS is to strengthen and expand NOAA's contributions to climate science by creating a more efficient and effective management structure. NESDIS would be renamed as the National Environmental Satellite Service (NESS) while NOS and NMFS would remain unchanged.

CS would receive $246.6 million for R&D, 33.5% of the total NOAA FY2012 R&D request and 71.2% of the total request for the CS line office. The OAR R&D funding level would decrease relative to FY2010 by $230.4 million to $175.1 million because of the transfer of OAR R&D climate related activities to CS. NWS R&D funding would decrease by $7.1 million (-17.2%) to $34.1 million. The President's budget would increase NOS R&D by $19.1 million (26.6%) to $91.0 million and NMFS R&D funding by $29.4 million (53.8%) to $84.0 million. NESS R&D funding would increase by $2.7 million (10.5%) to $28.4 million. OMAO R&D equipment would be funded at $77.8 million, a decrease of $8.0 million (-9.3%) from FY2010 (see **Table 12**).[71]

The NOAA Research Council, an internal body composed of scientific personnel, developed the current NOAA 5-Year Research Plan for 2008-2012. The plan identified the most pressing research challenges as a set of six overarching questions. NOAA's research and development portfolio is structured around finding answers to these questions:[72]

> What factors, human and otherwise, influence ecosystem processes and impact our ability to manage marine ecosystems and forecast their future state?
>
> What is the current state of biodiversity in the oceans, and what impacts will external forces have on this diversity and how we use our oceans and coasts?
>
> What are the causes and consequences of climate variability and change?
>
> What improvements to observing systems, analysis approaches, and models will allow us to better analyze and predict the atmosphere, ocean, and hydrological land processes?
>
> How can the accuracy and warning times for severe weather and other high-impact environmental events be increased significantly?
>
> How are uncertainties in our analysis and predictions best estimated and communicated?

[71] Emily Larkin, NOAA Budget Office, email, March 7, 2011.

[72] National Oceanic and Atmospheric Administration, *National Oceanic and Atmospheric Administration FY 2012 Budget Summary*, National Oceanic and Atmospheric Administration, Washington, DC, February 2011, http://www.corporateservices.noaa.gov/nbo/fy12_bluebook/chapter7_Research_Development.pdf.

Table 12. NOAA R&D

(in millions of dollars)

NOAA Line Office	FY2010 Actual	FY2011	FY2012 Request
NOS	$71.9		$91.0
NMFS	54.6		84.0
OAR	405.5		175.1
CS	N/A		246.6
NWS	41.2		34.1
NESS (formerly NESDIS)	25.7		28.4
OMAO[a]	85.8		77.8
Total R&D[b]	**684.7**		**737.0**

Sources: Emily Larkin, NOAA Budget Office, Email, March 7, 2011.

a. All OMAO R&D funding is for equipment.

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

National Aeronautics and Space Administration[73]

The Administration has requested $16.637 billion for NASA R&D in FY2012. This amount would be an increase of 20.9% over FY2010, in a total NASA budget that would remain unchanged at $18.724 billion. For a breakdown of these amounts, as well as the amounts authorized for NASA in FY2012 by the NASA Authorization Act of 2010 (P.L. 111-267), see **Table 13**.

The proposed increase in R&D funding, despite flat funding for the agency as a whole, is made possible by the planned retirement of the space shuttle. The space shuttle program is classified as an operational expense, not R&D. The last shuttle flight is scheduled to be completed during FY2011. Funding for the shuttle program would decrease from $3.101 billion in FY2010 to $665 million in the FY2012 request. Most of the FY2012 request for this program would be used to cover a funding shortfall in the defined benefit pension plan of the contractor that manages space shuttle operations.

The Administration's $5.017 billion request for NASA Science in FY2012 would be an 11.5% increase from FY2010. The largest increase would be for Earth Science, which would continue the global climate research initiative proposed in FY2011 and support the development and launch of several missions recommended by the 2007 decadal survey of the National Academies.[74] An independent review of the James Webb Space Telescope (JWST) in October

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

[74] 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.

2010 estimated that the project was 15 months behind schedule and $1.4 billion over budget.[75] NASA is developing a revised JWST program with a new schedule and cost estimate.

The request for Aeronautics is $569 million, an increase of 14.6% from FY2010. Selected research topics (e.g., the effects of high altitude ice crystals on aircraft) in categories identified by the 2010 authorization act (P.L. 111-267, Sec. 902) would receive increases, while funding for hypersonics would be reduced and focused on foundational research.

Space Technology would receive $1.024 billion under the request. About half of this total ($497 million) would be for Crosscutting Space Technology Development, a mostly new activity. The request for this activity is comparable to the amount authorized for Space Technology by the 2010 authorization act ($486 million). Most of the remainder of the request for Space Technology would be for two activities transferred from other accounts: Exploration Technology Development from the Exploration account and Small Business Innovation Research from the Cross-Agency Support account. The request would roughly double the funding for both these transferred activities.

The Administration's request for Exploration in FY2012 is $3.949 billion, an 8.9% increase over FY2010 but about 25% less than the authorized amount. In FY2010, the bulk of this account funded the Constellation program, including the Orion crew vehicle and the Ares I rocket for carrying humans into low Earth orbit, as well as the heavy-lift Ares V cargo rocket and other systems needed for a Moon mission. Under the FY2012 request, the account would instead fund development of the Multipurpose Crew Vehicle (MPCV) and heavy-lift Space Launch System (SLS) mandated by the 2010 authorization act. Although this would be a substantial change, many elements of Orion and Ares would also be included in the MPCV and SLS. The request for Exploration also includes $850 million to help companies develop commercial crew transport services to low-Earth orbit; the FY2010 appropriation included $39 million for development of commercial cargo capabilities, but none for commercial crew.

The request for the International Space Station (ISS) is $2.842 billion, a 22.9% increase over FY2010. Although the request includes an additional $60 million for ISS research, most of the requested increase would fund crew and cargo transportation to and from orbit. Because of the end of the space shuttle program in FY2011, transportation services in FY2012 will be obtained under contract with international partners and commercial providers.

[75] Final report of the JWST Independent Comprehensive Review Panel, October 29, 2010, http://www.nasa.gov/pdf/499224main_JWST-ICRP_Report-FINAL.pdf; and GAO, *NASA: Assessments of Selected Large-Scale Projects*, GAO-11- 239SP, March 2011, http://www.gao.gov/new.items/d11239sp.pdf.

Table 13. NASA R&D

(in millions of dollars)

	FY2010 As Enacted	FY2010 Op. Plan	FY2011 Enacted	FY2012 Authorized	FY2012 Request
Science	$4,469.0	$4,497.6		$5,248.6	$5,016.8
Earth Science	*1,450.3*	*1,439.3*		*1,944.5*	*1,797.4*
Planetary Science	*1,359.5*	*1,364.4*		*1,547.2*	*1,540.7*
Astrophysics	*1,119.8*	*647.3*		*1,109.3*	*682.7*
James Webb Space Telescope[a]	—	*438.7*		—	*373.7*
Heliophysics	*636.6*	*608.0*		*647.6*	*622.3*
Adjustments	*(97.2)*	—		—	—
Aeronautics	501.0	497.0		584.7	569.4
Space Technology	—	275.2		486.0	1,024.2
Exploration	3,746.3	3,625.8		5,252.3	3,948.7
Human Exploration Capabilities[b]	*n/a*	*3,287.5*		*n/a*	*2,810.2*
Commercial Spaceflight[b]	*n/a*	*39.1*		*n/a*	*850.0*
Exploration R&D[b]	*n/a*	*299.2*		*n/a*	*288.5*
International Space Station	2,317.0	2,312.7		2,952.2	2,841.5
Subtotal R&D	**11,033.3**	**11,208.3**		**14,523.8**	**13,400.6**
Other NASA Programs[c]	4,048.7	4,045.6		1,372.8	1,681.4
Cross-Agency Support[d]	3,194.0	3,017.6		3,189.6	3,192.0
Associated with R&D	*2,336.6*	*2,217.3*		*2,914.2*	*2,836.1*
Associated with Other	*857.4*	*800.3*		*275.4*	*355.9*
Construction & Env. C&R[d]	448.3	452.8		363.8	450.4
Associated with R&D	*328.0*	*332.7*		*332.4*	*400.2*
Associated with Other	*120.3*	*120.1*		*31.4*	*50.2*
Total R&D	**13,697.8**	**13,758.3**		**17,770.3**	**16,636.9**
Total NASA	**18,724.3**	**18,724.3**		**19,450.0**	**18,724.3**

Source: FY2010 as enacted from P.L. 111-117 and H.Rept. 111-366. FY2010 operating plan and FY2012 request from NASA's FY2012 congressional budget justification, http://www.nasa.gov/news/budget/. FY2012 authorized from P.L. 111-267.

Notes: FY2010 operating plan amounts reflect NASA's operating plan dated July 21, 2010; they differ from the enacted amounts because of reprogramming, the creation of a separate line item for the James Webb Space Telescope, and the transfer of certain activities from Exploration and Cross-Agency Support to Space Technology. Totals and subtotals may differ from the sum of the components due to rounding.

a. Included in Astrophysics in FY2010 enacted and FY2012 authorized amounts.

b. The items within the Exploration account are new in the FY2012 budget documents. The FY2010 enacted and FY2012 authorized amounts for these items are not available.

c. Space Shuttle, Space and Flight Support, Education, and Inspector General.

d. 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 Agriculture[76]

The FY2012 request for research and education activities in the U.S. Department of Agriculture (USDA) is $2.773 billion, a decrease of $222.0 million (approximately 7.4%) from the FY2010 level of $2.995 billion. (See **Table 14**.)

The Agricultural Research Service (ARS) is USDA's in-house basic and applied research agency, and operates approximately 100 laboratories nationwide. The ARS also includes the National Agricultural Library, the primary information resource on food, agriculture, and natural resource sciences. 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. The President has requested $1.156 billion for ARS for FY2012, $109.0 million below the FY2010 enacted level, including a $101.0 million reduction in funding for FY2010 add-ons designated by Congress for research at specific locations.

The amounts from the discontinued projects are to be redirected to the Administration's research priorities including research on the conversion of agricultural products into biobased products and biofuels; development of production systems that will provide a sustainable balance of crop production, carbon soil sequestration, and net greenhouse gas emissions; development of new measures to control bovine tuberculosis and bovine respiratory diseases; domestic and global market opportunities; new varieties and hybrids of feedstocks; and new healthier foods with decreased caloric density. The FY2012 budget request includes an increase of $6.0 million for research at Regional Biofuels Feedstocks Research and Demonstration Centers and a $4.0 million increase for research to develop integrated, sustainable management systems to improve food production and security. Other proposed increases include $7.0 million for research on non-traditional agents and their possible use in food and $1.3 million for epidemiological and ecologic studies. The Administration does not propose any funding for buildings and facilities in FY2012 for ARS, but does propose $3.0 million for high priority needs of existing facilities.

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 its FY2012 request, NIFA would support larger and longer-term research efforts on issues related to the viability of agriculture. NIFA is responsible for developing partnerships between the federal and state components of agricultural research, extension, and institutions of higher education. 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 FY2012 request proposes

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

$1.366 billion for NIFA, a decrease of $120.0 million from the FY2010 level. The NIFA FY2012 budget proposes the elimination of $141.0 million in congressional add-ons and reductions in ongoing program initiatives. Funding for formula distribution in the FY2012 request to the state Agricultural Experiment Stations is $605.0 million, $31.0 million below the FY2010 enacted level.

One of the stated primary goals of the President's FY2012 NIFA request is to emphasize and prioritize competitive, peer-reviewed allocation of research funding. Because of the increased emphasis on competitive grants, the Administration has requested funding for the development of new grant management tools. For FY2012, the Administration seeks funding for programs 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 contribute to agricultural productivity and sustainability. Another focus in the FY2012 request is 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 FY2012 request proposes $325.0 million for AFRI, a $63.0 million increase (24.0%) over the FY2010 level. In addition to supporting fundamental and applied science in agriculture, USDA maintains 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 is to provide increased opportunities for minority and under-served communities in agricultural science. AFRI funding would provide $8.2 million for alternative and renewable energy research to develop cost-effective feedstocks for biofuel production; $4.7 million for global climate change research to develop mitigation capabilities for agricultural production; $11.8 million for international food security; $8.2 million for an integrated food safety research program that has the potential for improving the understanding of disease-causing microorganisms; and $8.2 million in nutrition and obesity prevention research. The Administration also proposes support for initiatives in agricultural genomics, emerging issues in food and agricultural security, the ecology and economics of biological invasions, and plant biotechnology. The Administration has proposed research efforts that would go beyond water quality to include water availability, reuse, and conservation.

The FY2012 request for USDA provides $86.0 million for the Economic Research Service (ERS), $4.0 million above the FY2010 enacted level. 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. FY2012 funding for the ERS includes support for an administrative data pilot project. Funding for the National Agricultural Statistics Service (NASS) is proposed at $165.0 million in the FY2012 request, $3.0 million above the FY2010 level. The FY2012 budget request includes approximately $12.0 million in initiatives which have been offset by the termination of $8.3 million in low-priority programs. The FY2012 budget request includes a recommendation to improve research efforts in analyzing the impacts of bioenergy production, and to examine concerns pertaining to feedstock storage, transportation networks, and 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. Proposed FY2012 funding for NASS provides for 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 is provided to support the third year of the 2012 Census of Agriculture's five year cycle.

Data from the Census of Agriculture is to be used to measure trends and new developments in the agricultural community.

Table 14. U.S. Department of Agriculture R&D

(in millions of dollars)

	FY2010 Actual[a]	FY2011 Estimate	FY2012 Request
Agricultural Research Service			
Product Quality/Value Added	$105.0		107.0
Livestock Production	81.0		75.0
Crop Production	234.0		236.0
Food Safety	108.0		114.0
Livestock Protection	79.0		80.0
Crop Protection	203.0		197.0
Human Nutrition	86.0		89.0
Environmental Stewardship	202.0		196.0
National Agricultural Library	22.0		23.0
Repair, Maintenance, Trust Funds, and Other Programs	74.0		39.0
Subtotal	**1,194.0**		**1,156.0**
Buildings and Facilities	71.0		0.0
Total, ARS	**1,265.0**		**1,156.0**
National Institute of Food and Agriculture (NIFA)[a]			
Hatch Act Formula	215.0		204.0
Cooperative Forestry Research	29.0		27.0
Earmarked Projects and Grants	141.0		0.0
Agriculture and Food Research Initiative	262.0		325.0
Federal Administration	18.0		18.0
Higher Education Programs[b]	48.0		43.0
Other Programs	79.0		91.0
Subtotal, Research and Education Activities	**792.0**		**708.0**
Extension Activities			
Smith-Lever Sections 3b&c	298.0		283.0
Extension and Integrated Programs	49.0		10.0
1890 Colleges, Tuskegee, & West Virginia State University Colleges	91.0		91.0
Other Extension Programs	57.0		83.0
Subtotal, Extension Activities	**495.0**		**467.0**

	FY2010 Actual[a]	FY2011 Estimate	FY2012 Request
Integrated Activities	60.0		30.0
Mandatory and Other Programs	139.0		161.0
Total, NIFA[c]	**1,486.0**		**1,366.0**
Economic Research Service	82.0		86.0
National Agricultural Statistics Service	162.0		165.0
Total, Research, Education, and Economics	**2,995.0**		**2,773.0**

Sources: U.S. Department of Agriculture, *FY2012 Budget Summary and Annual Performance Plan*.

Note: Totals and subtotals may differ from the sum of the components due to rounding.

a. Funding levels are contained in the U.S. Department of Agriculture FY2012 Budget Summary and Annual Performance Plan, February 2011. Formerly CSREES. NIFA was established in Title VII of the 2008 Farm Bill.

b. 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.

c. Program totals may or may not include set-asides (non-add) or contingencies.

Department of the Interior[77]

President Obama has proposed $727 million in R&D funding for the Department of the Interior (DOI), a decrease of $49 million (-6.3%) from the FY2010 actual funding of $776 million. (See **Table 15**.) The U.S. Geological Survey (USGS) would remain the primary supporter of R&D within DOI, accounting for more than 83% of the department's total FY2012 R&D request.[78]

President Obama has proposed $607.2 million for USGS R&D in FY2012, a decrease of $53.8 million (-8.1%) from the FY2010 actual level. USGS R&D is conducted under several activity/program areas that have been realigned for FY2012. Seven of these areas constitute DOI's Surveys, Investigations, and Research (SIR) portfolio: Ecosystems; Climate and Land Use Change; Energy, Minerals, and Environmental Health; Natural Hazards; Water Resources, Core Science Systems; and Administration and Enterprise Information. In total, the SIR R&D funding would fall by $58.8 million (-8.9%) in FY2012 over FY2010 actual, with the largest reductions being made to the Water Resources (-$18.1 million, -15.5%), Core Science Systems (-$13.9 million, -24.1%), and Energy, Minerals, and Environmental Health (-$13.4 million, -13.2%) accounts.

Under the President's FY2012 budget request, an eighth account, National Land Imaging, is recommended for funding existing and future Landsat missions. Landsat provides sensing data for space policy and land use and climate change research. This account would be funded at $5.0 million in FY2012.

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

[78] Data on the Department of the Interior's R&D funding for FY2012 was provided by the Office of Management and Budget and the DOI's Office of Budget in private communications with CRS.

The National Park Service would receive $38 million in R&D funding for FY2012, $4 million (11.8%) above its FY2010 R&D funding level. DOI's other agencies would see flat R&D funding for FY2012.

Table 15. Department of the Interior R&D

(in millions of dollars)

	FY2010 Enacted	FY2011	FY2012 Request
U.S. Geological Survey	661		607
Bureau of Land Management	12		12
Bureau of Reclamation	13		12
National Park Service	34		38
Fish and Wildlife Service	11		11
Bureau of Ocean Energy Management, Regulation, and Enforcement	45		47
Total, DOI R&D[a]	**776**		**727**

Source: CRS analysis of unpublished data provided to CRS by the Office of Management and Budget, The White House, and agency budget justifications for FY2012.

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

Environmental Protection Agency[79]

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 through 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.

As indicated earlier in this report, action has not been completed on any of the 12 regular appropriations bills for FY2011, including the Interior, Environment, and Related Agencies appropriations bill that provides funding for the Environmental Protection Agency (EPA). Since the beginning of FY2011, EPA and other federal departments and agencies have been funded under a series of interim continuing resolutions (CRs).[80] Most recently, the Additional Continuing Appropriations Amendments, 2011 (P.L. 112-6), extended funding generally at FY2010 levels

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

[80] For more detailed discussion of recent continuing resolutions as well as information on the history, nature, scope, and duration of continuing resolutions, see CRS Report RL30343, *Continuing Resolutions: Latest Action and Brief Overview of Recent Practices*, by Sandy Streeter.

through April 8, 2011, for most federal departments and agencies. Congress is considering additional full-year options for FY2011 appropriations, therefore the following discussion presents the President's FY2012 budget request as compared to the FY2010 enacted appropriations.

The President's FY2012 budget request of $848.6 million for the EPA S&T account, including transfers from the Superfund account, is $26.3 million (3.0%) below the $874.9 million included in the FY2010 regular and supplemental appropriations (P.L. 111-88 and P.L. 111-212).[81] The amount included in the FY2012 budget request for the EPA's S&T account (including transfers) represents 9.1% of the agency's total $8.97 billion request for FY2012. As indicated in **Table 16** below, the base requested funding for the S&T account is a decrease below the FY2010 enacted level. The $23.0 million proposed transfer from the Superfund account for FY2012 is $3.8 million less than the $26.8 million transferred in FY2010. As indicated in EPA's FY2012 budget justification,[82] the requested base amount for the S&T account includes both increases and decreases of varying levels for the individual EPA research program and activity line items identified within the account when compared with the enacted FY2010 appropriations. For some activities, the amount of the request for FY2012 remained relatively flat compared to the prior year appropriation.

The President's FY2012 budget includes reductions in some programmatic areas within EPA's S&T appropriations account, including $16.3 million for the Climate Protection Program, $3.5 million (-17.4%) less than FY2010; $108.0 million for Air, Climate, and Energy research, $3.4 million (-3.1%) less than FY2010; and $171.0 million for Sustainable Communities (human health and ecosystem) Research, $17.1 million (9.1%) less than FY2010. The largest requested dollar decrease for FY2012 within the S&T account was for EPA's Homeland Security research activities.[83] The $42.0 million requested for FY2010 is nearly $24.3 million (-36.7%) below the FY2010 appropriation of $66.3 million.

The largest quantitative increase for FY2012 above FY2010 levels within the S&T account was $138.1 million for Chemical Safety and Sustainability research activities, including funding for human health risk assessments, endocrine disruptors, and computations toxicology. The requested amount is $17.3 million (14.3%) more than the $120.7 million appropriated in FY2010. The FY2012 request also included $118.8 million for Safe and Sustainable Water Research, a $7.7 million (6.9%) increase above FY2010. FY2012 requested funding for other areas, such as Pesticide Licensing, Drinking Water Programs, Indoor Air and Radiation, and Clean Air Quality

[81] Title II of P.L. 111-88, the Interior, Environment, and Related Agencies appropriations for FY2010 included $872.9 million for EPA's S&T account. Title II of P.L. 111-212 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 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. For information on FY2010 funding for all EPA appropriations accounts see CRS Report R40685, *Interior, Environment, and Related Agencies: FY2010 Appropriations*; for discussion of the FY2010 EPA S&T supplemental funding see CRS Report R41098, *Federal Research and Development Funding: FY2011*, coordinated by John F. Sargent Jr.

[82] U.S. EPA, *Fiscal year FY2012 Justification of Appropriation estimates for the Committee on Appropriations: Science and Technology*, http://www.epa.gov/planandbudget/FY_2012_CJ_VV_rev.pdf, PDF pp. 74-248..

[83] 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.

research activities reflected both increases and decreases when compared to FY2010 appropriations.

The activities 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.[84] 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) reports[85] 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 16** below for purpose of comparison.) This is an indication that not all of the EPA S&T account funding is allocated to R&D.

Some Members of Congress and other stakeholders have consistently 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 congressional policymakers, scientists, and environmental organizations have expressed concern about the downward trend in federal resources for scientific research over 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. Additionally, several recent and pending EPA regulatory actions have been the focus of considerable debate during first session of the 112th Congress,[86] including EPA scientific research in support of these actions. Actions under the Clean Air Act, in particular EPA

[84] In recent years, EPA's annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts established by Congress during the FY1996 appropriations process.

[85] 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 $590 million for FY2010, $651 million proposed for FY2011, and $579 proposed for FY2012. 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,*and *Fiscal Year 2012 Budget of the United States: Analytical Perspectives – Special Topics/Research and Development pgs. 366-368* http://www.gpoaccess.gov/usbudget/browse.html.

[86] For a discussion of EPA regulatory actions see CRS Report R41561, *EPA Regulations: Too Much, Too Little, or On Track?*, by James E. McCarthy and Claudia Copeland.

controls on emissions of greenhouse gases, as well as efforts to address conventional pollutants from a number of industries, have received much of the attention. Several actions under the Clean Water Act, Safe Drinking Water Act, Resource Conservation and Recovery Act (RCRA), have also received some attention. Congressional concern regarding these issues are likely to be prominent areas of debate during oversight and deliberation of EPA's S&T funding levels.

Table 16. Environmental Protection Agency S&T Account

(in millions of dollars)

Environmental Protection Agency	FY2010 Enacted (P.L. 111-88)	FY2010 Supplemental (P.L. 111-212)	FY2011	FY2012 Request
Science and Technology Appropriations Account				
—Base Appropriations	*$848.1*	*$2.0*		*$825.6*
—Transfer in from Superfund Account	*26.8*	*N/A*		*23.0*
Total Science and Technology	**$874.9**	**$2.0**		**$848.6**
R&D Budget Authority Report by OMB	*$590.0.*	*N/A*		*$579.0 est.*

Source: Prepared by CRS. FY2010 appropriation amounts are from the Conference Report (H.Rept. 111-316), accompanying the FY2010 Interior, Environment and related Agencies appropriations (P.L. 111-88); the FY2010 base amount includes $2.0 million in supplemental appropriations 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 mitigation measures under P.L. 111-212, Title II. FY2012 requested amounts are from EPA's FY 2012 *Justification of Appropriation Estimates for Committee on Appropriations*, http://www.epa.gov/planandbudget/annualplan/fy2012.html; OMB amounts are as reported in Office of Management and Budget (OMB) *Fiscal Year 2012 Budget of the United States: Analytical Perspectives – Special Topics/Research and Development pgs. 366-368* http://www.gpoaccess.gov/usbudget/browse.html. Totals may differ from the sum of the components due to rounding.

Department of Transportation[87]

President Obama has requested $1.215 billion for Department of Transportation (DOT) R&D in FY2012, an increase of $146 million (13.7%) from the FY2010 enacted level. (See **Table 17**.) Two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for most of the department's R&D funding (79.4% in the FY2012 request).

The President has requested $417 million for FAA R&D and R&D facilities, an increase of $5 million (1.2%) from the FY2010 enacted level. The $190 million requested for Research, Engineering, and Development (RE&D) is essentially unchanged from the FY 2010 enacted level. Of these funds, $77 million ($5 million above the FY2010 level) is for the RE&D NextGen R&D portfolio which is focused on the use of alternative and renewable fuels for general aviation aircraft to reduce aviation's effects on the environment. The Environmental and Energy program, including some NextGen research, would be funded at $35.8 million, with R&D focused on

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

applications such as modeling environmental impacts of aviation and further advancing technologies that reduce aircraft noise and emissions. [88]

The FHWA would receive $548 million in R&D funding in FY2012 under the President's request, an increase of $94.8 million (20.9%). Highway Research and Development funding would increase to $200.0 million, up $33.7 million (20.3%) from FY2010 funding of $166.3 million. Funding for Intelligent Transportation Systems R&D would increase to $96.1 million in FY2012, up $14.8 (18.1%) from its FY2010 funding level. The ITS Multi-modal Research Program and the Competitive University Transportation Center (UTC) Consortia would each receive $20 million in FY2012. In addition, R&D funding for the State Planning and Research program would grow to $206.4 million in FY2012, up $23.4 million (12.8%) over FY2010.

Table 17. Department of Transportation R&D

(in millions of dollars)

	FY2010 Actual	FY2011	FY2012 Request
Federal Highway Administration	453		548
Federal Aviation Administration	412		417
Other agencies	204		250
Total, DOT R&D	**1,069**		**1,215**

Source: DOT FY2011 agency budget justifications; unpublished tables provided by OMB to CRS in February 2010; private communications between OMB and CRS.

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

[88] Federal Highway Administration, U.S. Department of Transportation, *Budget Estimates Fiscal Year2012*, February 2011.

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