Federal Research and Development Funding: FY2016

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February 11, 2016

Congressional Research Service
7-5700
www.crs.gov
R43944

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

President Obama's budget request for FY2016 included $145.694 billion for research and development (R&D), an increase of $7.625 billion (5.5%) over the estimated FY2015 R&D funding level of $138.069 billion. The request represented the President's R&D priorities.

Funding for R&D is concentrated in a few departments and agencies. Under President Obama's FY2016 budget request, seven federal agencies would have received 95.6% of total federal R&D funding, with the Department of Defense (DOD, 49.5%) and the Department of Health and Human Services (HHS, 21.3%) accounting for more than 70% of all federal R&D funding. The largest increases in agency R&D funding in the President's request would have gone to the Department of Defense (DOD, up $4.670 billion, 6.9%), Department of Energy (DOE, up $861 million, 7.3%), and the Department of Commerce (DOC, up $601 million, 39.4%).

Legislation targeted the R&D budgets of the National Institute of Standards and Technology, National Science Foundation, and DOE Office of Science seeking to double them from their FY2006 levels. The America COMPETES Act aimed to double funding over 7 years, and the America COMPETES Reauthorization Act of 2010 over 11 years. The President's FY2016 budget requested increases for these accounts, as it did in the President's FY2015 and FY2014 requests. It departs from earlier Obama and Bush Administration budgets that explicitly stated the doubling goal. Enacted funding for FY2015 for these accounts represents a compound annual growth rate of 3.25% since FY2006, a rate that would result in doubling in 22 years.

The President's FY2016 request continued support for three multi-agency R&D initiatives—the National Nanotechnology Initiative (NNI), the Networking and Information Technology Research and Development (NITRD) program, and the U.S. Global Change Research Program (USGCRP). The request also continued support for the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative, the Materials Genome Initiative, and the National Robotics Initiative. The President proposed FY2016 discretionary funding for seven new manufacturing institutes as part of his proposed National Network for Manufacturing Innovation (NNMI), in addition to the nine that have already been planned, competed, or awarded. The President also proposed $1.9 billion in mandatory funding for the establishment of 29 additional institutes between FY2017 and FY2024. In addition, the FY2016 budget proposed a new multiagency R&D initiative, the Precision Medicine Initiative which seeks to build on research and discoveries that allow medical treatments to be tailored to an individual's unique characteristics (e.g., a patient's genes) or the genetic profile of an individual's tumor.

In December 2015, Congress passed, and the President signed, the Consolidated Appropriations Act, 2016 (P.L. 114-113) providing discretionary appropriations for all federal agencies for FY2016. For some federal agencies it is possible to discern R&D funding levels directly from this act and its accompanying explanatory statement. In these cases, this report reflects the results of P.L. 114-113. For other federal agencies, R&D is included in appropriations accounts with non-R&D activities and it is not possible to determine specific R&D funding levels until reported by these agencies.

As in recent years, the annual appropriations process was completed after the start of the fiscal year. This can affect agencies' execution of their R&D budgets, including the delay or cancellation of planned R&D activities and acquisition of R&D-related equipment.

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Overview

The 114th 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. 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, shale gas extraction, and defenses against disease. However, widespread concerns about the federal debt and recent and projected federal budget deficits are driving difficult decisions about the prioritization of R&D, both in the context of the entire federal budget and among competing needs within the federal R&D portfolio.

The U.S. government supports a broad range of scientific and engineering R&D. Its purposes include specific concerns such as addressing 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 individual funding agencies.

The federal R&D budget is an aggregation of the R&D components of each federal agency. There is no single, centralized source of funds that is allocated to individual agencies. Agency R&D budgets are developed internally as part of each agency's overall budget development process and may be included either in accounts that are entirely devoted to R&D or in accounts that include funding for non-R&D activities. These budgets are subjected to review, revision, and approval by the Office of Management and Budget (OMB) and become part of the President's annual budget submission to Congress. The federal R&D budget is then calculated by aggregating the R&D components of each federal agency.

Congress plays a central role in defining the nation's R&D priorities as it makes decisions about the level and allocation of R&D funding—overall, within agencies, and for specific programs. Some Members of Congress have expressed concerns about the level of federal spending (for R&D as for other purposes) in light of the current federal deficit and debt. As Congress acts to complete the FY2016 appropriations process, it faces two overarching issues: the extent to which federal R&D investments can grow in the face of increased pressure on discretionary spending and the prioritization and allocation of the available funding. Budget caps may limit overall R&D funding and may require movement of resources across disciplines, programs, or agencies to address priorities. Moving funding between programs/accounts/agencies can become more complex and difficult because the funding for different programs/accounts/agencies is often provided through different appropriations bills.

Structurally, this report begins with a discussion of the overall level of the President's FY2016 R&D request, followed by analyses of the R&D funding request from a variety of perspectives and for selected multiagency R&D initiatives. The report concludes with discussion and analysis of the R&D budget requests of selected federal departments and agencies that, collectively, account for more than 98% of total federal R&D funding. Selected terms associated with federal R&D funding are defined in the text box on the next page. **Appendix** provides a list of acronyms and abbreviations.

Definitions Associated with Federal Research and Development Funding

Two key sources of definitions associated with federal research and development funding are the White House Office of Management and Budget (OMB) and the National Science Foundation.

Office of Management and Budget. The Office of Management and Budget provides the following definitions of R&D-related terms in OMB Circular No. A-11, "Preparation, Submission, and Execution of the Budget" (July 2013). This document provides guidance to agencies in the preparation of the President's annual budget and instructions on budget execution.

Conduct of Research. Research and development activities comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture, and society, and the use of this stock of knowledge to devise new applications. Includes administrative expenses for R&D, including the operating costs of research facilities and equipment; does not include physical assets for R&D such as R&D equipment and facilities or routine product testing, quality control, mapping, collection of general-purpose statistics, experimental production, routine monitoring and evaluation of an operational program, and the training of scientific and technical personnel.

Basic Research. Basic research is defined as systematic study directed toward fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications towards processes or products in mind. Basic research, however, may include activities with broad applications in mind.

Applied Research. Applied research is defined as systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

Development. Development is defined as systematic application of knowledge or understanding, directed toward the production of useful materials, devices, and systems or methods, including design, development, and improvement of prototypes and new processes to meet specific requirements.

R&D Equipment. Amounts for major equipment for research and development. Includes acquisition or design and production of movable equipment, such as spectrometers, research satellites, detectors, and other instruments. At a minimum, this line should include programs devoted to the purchase or construction of R&D equipment.

R&D Facilities. Amounts for the construction and rehabilitation of research and development facilities. Includes the acquisition, design, and construction of, or major repairs or alterations to, all physical facilities for use in R&D activities. Facilities include land, buildings, and fixed capital equipment, regardless of whether the facilities are to be used by the government or by a private organization, and regardless of where title to the property may rest. Includes fixed facilities such as reactors, wind tunnels, and particle accelerators.

National Science Foundation. The National Science Foundation provides the following definitions of R&D-related terms in its *Science and Engineering Indicators: 2014* report.

Research and Development. Research and development, also called research and experimental development; comprises creative work undertaken on a systematic basis to increase the stock of knowledge—including knowledge of man, culture, and society—and its use to devise new applications.

R&D Plant. In general, R&D plant refers to the acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities.

Basic Research. The objective of basic research is to gain more comprehensive knowledge or understanding of the subject under study without specific applications in mind. Although basic research may not have specific applications as its goal, it can be directed in fields of present or potential interest. This is often the case with basic research performed by industry or mission-driven federal agencies.

Applied Research. The objective of applied research is to gain knowledge or understanding to meet a specific, recognized need. In industry, applied research includes investigations to discover new scientific knowledge that has specific commercial objectives with respect to products, processes, or services.

Development. Development is the systematic use of the knowledge or understanding gained from research directed toward the production of useful materials, devices, systems, or methods, including the design and development of prototypes and processes.

The President's FY2016 Budget Request

On February 2, 2015, President Obama released his proposed FY2016 budget. This report provides government-wide, multi-agency, and individual agency analyses of the President's FY2016 request as it relates to R&D and related activities. The President's budget proposes $145.694 billion for R&D in FY2016, an increase of $7.625 billion (5.5%) over the estimated FY2015 R&D funding level of $138.069 billion.[1] Adjusted for anticipated inflation of approximately 1.6%, the President's FY2016 R&D request represents a real increase of 3.9% from the FY2015 estimated level.[2]

Increasing federal funding for physical science and engineering research was a primary science and technology policy effort pursued by Congress, President George W. Bush, and President Obama in his first four years in office. Referred to frequently as the "doubling effort," Congress and Presidents Obama and Bush sought to increase support for the physical sciences and engineering by doubling funding for accounts at three federal agencies with a strong R&D emphasis in these disciplines: the Department of Energy (DOE) Office of Science, the National Science Foundation (NSF), and the Department of Commerce (DOC) National Institute of Standards and Technology (NIST) core laboratory research and construction of research facilities (collectively referred to as the "targeted accounts"). The doubling goal was expressed in President Bush's American Competitiveness Initiative, in budget requests from President Obama before FY2014, and implicitly in the America COMPETES Act (P.L. 110-69) and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). The America COMPETES Act and the reauthorization act set appropriations authorization levels consistent with a doubling pace of 7 years and 11 years, respectively.[3] In aggregate, appropriations provided to these accounts fell short of the levels authorized in P.L. 110-69 and P.L. 111-358.

In his FY2015 budget, the President requested a 1.2% increase in aggregate funding for the targeted accounts, a pace that would require more than 58 years to double. Though not explicitly mentioning the doubling goal or timeframe, in his FY2016 budget, the President is requesting a 5.7% increase in aggregate funding for the targeted accounts over the FY2015 level, a pace that would result in doubling in about 12 years. See "Efforts to Double Certain R&D Accounts" below for more details.

More broadly, in a 2009 speech before members of the National Academy of Sciences, President Obama put forth a goal of increasing the national (public and private) investment in R&D to more than 3% of the U.S. gross domestic product (GDP). President Obama did not provide details on

[1] Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that falls short of the inflation rate may reduce real purchasing power. Final FY2015 funding for the Department of Homeland Security had not been enacted at the time of the President's proposed FY2016 budget. Therefore, the Office of Management and Budget used the President's FY2015 budget request for DHS in estimates of FY2015 funding.

[2] As calculated by CRS using the GDP (chained) price index for FY2015 and FY2016 in Table 10.1, Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2020, *Budget of the United States Government, Fiscal Year 2016*, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/hist10z1.xls.

[3] As used in this report, the term "doubling pace" means the number of years required for funding for the targeted accounts to double, relative to the FY2006 baseline year, if the compound annual growth rate (CAGR) were to continue. For example, the doubling pace of the America COMPETES Act is based on the 10.3% CAGR from FY2006 to FY2010, the last year of authorizations under the act. At 10.3% annual growth, funding for the targeted accounts would double in approximately 7 years. Similarly, the CAGR for the America COMPETES Reauthorization Act of 2010, which authorized appropriations through FY2013, was 6.3%, a rate that would take approximately 11 years to double.

how this goal might be achieved (e.g., through increases in direct federal R&D funding or through indirect mechanisms such as the research and experimentation (R&E) tax credit).[4] When President Obama set forth the goal in 2009, total U.S. R&D expenditures were approximately 2.90% of GDP. In 2012, R&D as a percentage of GDP was 2.89%, with the federal government contributing 0.86% (down from 0.91% in 2009) and non-federal sources contributing 2.02% (up from 1.98% in 2009).[5] Achieving the 3% goal would likely require a substantial increase in government and corporate R&D spending. In 2012, achieving the 3% goal would have required approximately $18 billion in additional R&D funding above the actual U.S. R&D funding level of $452.6 billion.

Analysis of federal R&D funding is complicated by several factors, such as inconsistency among agencies in the reporting of R&D and the inclusion of R&D activities in accounts with non-R&D activities. As a result, figures reported by OMB and the White House Office of Science and Technology Policy (OSTP), including those shown in **Table 1**, may differ from the agency budget analyses that appear later in this report.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide different insights. The following sections examine the data by agency, by the character of the work supported, by a combination of these two perspectives, and by whether R&D is defense-related or not.

Federal R&D by Agency

Congress makes decisions about federal R&D funding through the authorization and appropriations process primarily from the perspective of individual agencies and programs. **Table 1** provides data on R&D by agency for FY2014 (actual), FY2015 (estimate), and FY2016 (request).[6]

Under President Obama's FY2016 budget request, seven federal agencies would receive more than 95% of total federal R&D funding: the Department of Defense (DOD), 49.5%; Department of Health and Human Services (HHS) (primarily the National Institutes of Health (NIH)), 21.3%; Department of Energy (DOE), 8.6%; National Aeronautics and Space Administration (NASA), 8.4%; National Science Foundation (NSF), 4.3%; Department of Agriculture (USDA), 2.0%; and Department of Commerce (DOC), 1.5%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Department of Homeland Security (DHS), Department of the Interior (DOI), Department of Transportation (DOT), Department of Veterans Affairs (VA), and Environmental Protection Agency (EPA). In total, these 12 agencies accounted for more than 98% of current and requested federal R&D funding.

[4] 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 Tax Credit: Current Law and Policy Issues for the 114th Congress*, by Gary Guenther.

[5] National Science Foundation, National Center for Science and Engineering Statistics, *National Patterns of R&D Resources* (annual series).

[6] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2016*, February 2015, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/ap_19_research.pdf.

The largest agency R&D increases in the President's FY2016 request (as measured in dollars), compared with FY2015, are for DOD, $4.670 billion (6.9%); DOE, $861 million (7.3%); DOC, $601 million (39.4%); HHS, $565 million (1.9%); USDA, $438 million (17.9%); and NSF, $310 million (5.2%). DHS would see a decrease of $463 million (44.9%).

Table 1. Federal Research and Development Funding by Agency, FY2014-FY2016

(budget authority, dollar amounts in millions)

				Change, FY2015-FY2016	
Department/Agency	**FY2014 Actual**	**FY2015 Estimate**	**FY2016 Request**	**Dollar**	**Percent**
Department of Defense	$66,018	$67,451	$72,121	$4,670	6.9%
Department of Health and Human Services	30,685	30,475	31,040	565	1.9%
Department of Energy	11,996	11,736	12,597	861	7.3%
National Aeronautics and Space Administration	11,906	12,145	12,238	93	0.8%
National Science Foundation	5,827	5,999	6,309	310	5.2%
Department of Agriculture	2,380	2,446	2,884	438	17.9%
Department of Commerce	1,556	1,526	2,127	601	39.4%
Department of Veterans Affairs	1,101	1,090	1,147	57	5.2%
Department of Transportation	853	900	1,115	215	23.9%
Department of the Interior	840	904	985	81	9.0%
Department of Homeland Security	1,032	1,032[a]	569	-463	-44.9%
Environmental Protection Agency	539	523	559	36	6.9%
Other	1,602	1,842	2,003	161	8.7%
Total	**136,335**	**138,069**	**145,694**	**7,625**	**5.5%**

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2016,* February 2015, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/ap_19_research.pdf.

Note: Totals may differ from the sum of the components due to rounding. Amounts in this table may differ from amounts reported in the agency chapters of this report due to a variety of factors, including R&D funding in accounts that also include funding for non-R&D activities.

a. Because DHS appropriations had not been enacted at the time the President's FY2016 budget request was released, the Administration's figure for FY2015 DHS R&D funding was based on the FY2014 appropriations not the FY2015 appropriation that was subsequently enacted.

Federal R&D by Character of Work, Facilities, and Equipment

Federal R&D funding can also be examined by the character of work it supports—basic research, applied research, or development—and by funding provided for construction of R&D facilities and acquisition of major R&D equipment. (See **Table 2**.) President Obama's FY2016 request includes $32.728 billion for basic research, up $831 million (2.6%) from FY2015; $34.146 billion for applied research, up $1.235 million (3.8%); $75.976 billion for development, up $5.294 million (7.5%); and $2.844 billion for facilities and equipment, up $265 million (10.3%).

Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2014-FY2016

(budget authority, dollar amounts in millions)

				Change, FY2015-FY2016	
	FY2014 Actual	FY2015 Estimate	FY2016 Request	Dollar	Percent
Basic research	$32,187	$31,897	$32,728	$ 831	2.6%
Applied research	32,546	32,911	34,146	1,235	3.8%
Development	68,985	70,682	75,976	5,294	7.5%
Facilities and Equipment	2,617	2,579	2,844	265	10.3%
Total	**136,335**	**138,069**	**145,694**	**7,625**	**5.5%**

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2016,* February 2015, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/ap_19_research.pdf.

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

Federal Role in U.S. R&D by Character of Work

A primary policy foundation for public investments in basic research and for incentives (e.g., tax credits) for the private sector to conduct research is the view, widely held by economists, that the private sector will, left on its own, underinvest in basic research from a societal perspective. The usual argument for this view is that the social returns (i.e., the benefits to society at large) exceed the private returns (i.e., the benefits accruing to the private investor, such as increased revenues or higher stock value). Other factors that may inhibit corporate investment in basic research include long time horizons for commercial applications (diminishing the potential returns due to the time value of money), high levels of technical risk/uncertainty, shareholder demands for shorter-term returns, and asymmetric and imperfect information.

The federal government is the nation's largest supporter of basic research, funding 52.6% of U.S. basic research in 2012.[7] Industry funded 21.3% of U.S. basic research in 2012, with state governments, universities, and other non-profit organizations funding the remaining 26.0%.[8]

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 54.0% in 2012, while the federal government accounted for an estimated 36.2%.[9]

Industry also provides the vast majority of funding for development. Industry accounted for 76.4% of development in 2012, while the federal government provided 22.1%.[10]

[7] National Science Foundation, National Center for Science and Engineering Statistics, 2013, *National Patterns of R&D Resources: 2011–12 Data Update*, NSF 14-304, http://www.nsf.gov/statistics/nsf14304/. More recent data are not yet available.

[8] Ibid.

[9] Ibid.

[10] Ibid.

Federal R&D by Agency and Character of Work Combined

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 overall federal R&D budget reflects a wide range of national priorities, including supporting advances in spaceflight, developing new and affordable sources of energy, and understanding and deterring terrorist groups. These priorities and the mission of each individual agency contribute to the composition of that agency's R&D spending (i.e., the allocation among basic research, applied research, development, and facilities and equipment). In the President's FY2016 budget request, the Department of Health and Human Services, primarily NIH, would account for nearly half (48.8%) of all federal funding for basic research. HHS would also be the largest federal funder of applied research, accounting for about 43.5% of all federally funded applied research in the President's FY2016 budget request. DOD is the primary federal funder of development, accounting for 85.6% of total federal development funding in the President's FY2016 budget request.[11]

Table 3. Top R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2014-FY2016

(budget authority, dollar amounts in millions)

	FY2014 Actual	FY2015 Enacted	FY2016 Request	Change, FY2015-FY2016	
				Dollar	Percent
Basic Research					
Dept. of Health and Human Services	15,862	15,482	15,966	484	3.1%
National Science Foundation	4,752	4,834	5,062	228	4.7%
Dept. of Energy	4,095	4,120	4,245	125	3.0%
Applied Research					
Dept. of Health and Human Services	14,621	14,791	14,864	73	0.5%
Dept. of Defense	4,664	4,775	4,819	44	0.9%
Dept. of Energy	4,550	4,363	4,683	320	7.3%
Development					
Dept. of Defense	58,986	60,366	65,036	4,670	7.7%
NASA	6,004	6,481	6,423	-58	-0.9%
Dept. of Energy	2,559	2,322	2,621	299	12.9%
Facilities and Equipment					
Dept. of Energy	792	931	1,048	117	12.6%
National Science Foundation	397	437	445	8	1.8%
Dept. of Commerce	213	233	402	169	72.5%

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2016,* February 2015, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/ap_19_research.pdf.

Note: The top three funding agencies in each category, based on the FY2016 request, are listed.

[11] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2015,* Table 21-1.

Defense-Related and Nondefense-Related R&D

Federal R&D funding can also be characterized as defense-related or nondefense-related. Defense-related R&D is provided for primarily by the Department of Defense, but also includes some activities at the Department of Energy and the Federal Bureau of Investigation. Defense-related R&D has fluctuated between 50% and 70% of total federal R&D funding for more than three decades. Defense-related R&D grew from 52.7% of total federal R&D funding in FY2001 to 60.5% in FY2008, then declined over several years to 56.8% in 2012.[12] The President's FY2016 budget includes $76.9 billion in defense-related R&D funding (about 52.8% of the total R&D request) and $68.8 billion for non-defense R&D (about 47.2% of the total R&D request).[13]

Multiagency R&D Initiatives

Although this report focuses primarily on the R&D activities of individual agencies, President Obama's FY2016 budget request supports several multiagency R&D initiatives.

Efforts to Double Certain R&D Accounts[14]

In 2006, President Bush announced the American Competitiveness Initiative (ACI) which, in part, sought to increase federal funding for physical sciences and engineering research by doubling funding over 10 years (by FY2016 from their FY2006 levels) for targeted accounts at NSF, DOE, and DOC. The targeted accounts include all NSF accounts, the DOE Office of Science, and the NIST Scientific and Technical Research and Services (STRS) and construction of research facilities (CRF) accounts.

In 2007, Congress authorized substantial increases for these targeted accounts under the America COMPETES Act (P.L. 110-69), which set the combined authorization levels for these accounts for FY2008 to FY2010 at a seven-year doubling pace from the FY2006 baseline. 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.[15] (See **Table 4**.)

[12] CRS analysis of National Science Board, *Science and Engineering Indicators 2014*, NSB 14-01, 2014, Appendix table 4-33, http://www.nsf.gov/statistics/seind14/.

[13] John P. Holdren, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy, "The 2016 Budget: Investing in America's Future," presentation at the American Association for the Advancement of Science, Washington, DC, February 2015.

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

[15] In 2009, the American Recovery and Reinvestment Act of 2009 (P.L. 111-5) provided $5.202 billion in supplemental funding for several of the targeted accounts. This increased aggregate funding for the accounts above the target levels in that year.

Table 4. Funding for Accounts Targeted for Doubling, FY2006-FY2016

(budget authority, in millions of current dollars)

	FY2006 Actual	FY2007 Actual	FY2008 Actual	FY2009 Actual[a]	FY2009 ARRA	FY2010 Actual
NSF	$5,589	$5,890	$6,125	$6,494	$3,002	$6,873
DOE/Office of Science	3,602	3,813	4,089	4,773	1,596	4,829
NIST/STRS	395	434	441	472	220	515
NIST/CRF	174	59	161	172	360	147
Total	**9,760**	**10,196**	**10,815**	**11,910**	**5,178**	**12,364**

	FY2011 Actual	FY2012 Actual	FY2013 Actual	FY2014 Actual	FY2015 Actual	FY2016 Request
NSF	$6,806[b]	$7,033	$6,884	$7,172	$7,344	$7,724
DOE/Office of Science	4,858	4,874	4,621	5,070	5,071	5,340
NIST/STRS	497	567	580	651	675	755
NIST/CRF	70	55	56	56	50	59
Total	**12,231**	**12,529**	**12,141**	**12,949**	**13,141**	**13,877**

Sources: NIST budget requests, FY2008-FY2016, available at http://www.nist.gov/public_affairs/budget/index.cfm; DOE budget requests, FY2008-FY2016, available at http://www.cfo.doe.gov/crorgcf30.htm; NSF, Budget Internet Information System, "NSF Requests and Appropriations History," NSF.gov, February 25, 2015, http://dellweb.bfa.nsf.gov/NSFRqstApproHist/NSFRequestsandAppropriationsHistory.pdf; and the President's FY2016 budget, available at http://www.whitehouse.gov/omb/budget/Appendix.

Notes: Totals may differ from the sum of the components due to rounding. Figures in this table have been revised since the original date of publication in this report due to methodological changes.

a. The FY2009 agency funding levels do not include funding provided by the American Recovery and Reinvestment Act of 2009 (ARRA, P.L. 111-5).

b. Includes $54 million transferred to the U.S. Coast Guard for icebreaking services (per P.L. 112-10).

In 2010, Congress passed the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) which, among other things, authorized appropriations for the targeted accounts for FY2011 to FY2013.[16] The aggregate authorization levels for the targeted accounts in this act were consistent with an 11-year doubling path. Congress has not authorized appropriations for the targeted accounts beyond FY2013.[17]

Aggregate FY2013 funding subsequently appropriated for the targeted accounts was approximately $12.141 billion, $2.964 billion less than authorized in the act. This funding level set a pace to double over more than 22 years from the FY2006 level—more than triple the length of time originally envisioned in the 2007 America COMPETES Act and about twice as long as the doubling period established by the America COMPETES Reauthorization Act of 2010. Using the FY2006 as the base year funding level, FY2014 appropriations set a 20-year doubling pace while FY2015 appropriations set a 21-year pace.

[16] For more information, see America COMPETES Act (P.L. 110-69): Selected Policy Issues, coordinated by Heather B. Gonzalez.

[17] For additional information on reauthorization efforts, see CRS Report R43880, *The America COMPETES Acts: An Overview*, by Heather B. Gonzalez.

Budget constraints appear to have put the future of the doubling path in question. 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) in the targeted accounts.[18] In his FY2011 budget documents, President Obama extended the period over which he intended to double funding for the targeted accounts to 11 years (FY2006 to FY2017).[19] The FY2013 budget request reiterated President Obama's intention to double funding for the targeted accounts from their FY2006 levels but did not specify the length of time over which the doubling was to take place. President Obama's FY2014 budget expressed a commitment to increasing funding for the targeted accounts, but did not commit to doubling. The President's FY2015 budget contained no explicit statement of commitment to increasing funding for the targeted accounts. For FY2016, President Obama is requesting $13.877 billion in aggregate funding for the targeted accounts, an increase of $752 million (5.7%) above the estimated FY2015 aggregate funding level of $13.125 billion. If enacted, this funding level would set a doubling pace of about 20 years over the FY2006 level.

Figure 1 shows total funding for the targeted accounts as a percentage of their FY2006 funding level, and illustrates how actual (FY2006-FY2015), requested (FY2007-FY2016), and authorized appropriations (FY2008-FY2013) compare to different doubling rates using FY2006 as the base year. The thick black line at the top of the chart is at 200%, the doubling level. The data used in **Figure 1** are in current dollars, not constant dollars; the effect of inflation on the purchasing power of these funds is not taken into consideration.

Some analysts have raised questions about the efficacy and unintended consequences of the doubling policy. Among the questions: What is the basis for asserting that a doubling of funding is the correct target for increases (as opposed to, say, an increase of 30%, 80%, or 120%)? What is the basis for setting the time period for doubling (e.g., 7 years, 11 years)? Is the optimal approach to double funding for specific agencies? If so, should the doubling for the selected agencies be done in aggregate or individually? Are the chosen agencies the right agencies? Should specific programs or appropriations accounts be targeted rather than entire agencies? What are the adjustment costs of a post-doubling slowdown in funding increases?

In an effort to understand the potential consequence of the doubling effort, a 2009 National Bureau of Economic Research paper analyzed the effects of the NIH doubling (which took place from 1988 to 2003) and subsequent funding slowdown on the U.S. biomedical research enterprise. Among its conclusions, the authors found that "future increases in research spending should be seen in terms of increasing the stock of sustainable activity rather than in attaining some arbitrary target (i.e., doubling) in a short period."[20] Similar views were expressed by participants at a roundtable held by the House Committee on Energy and Commerce in 2014.[21]

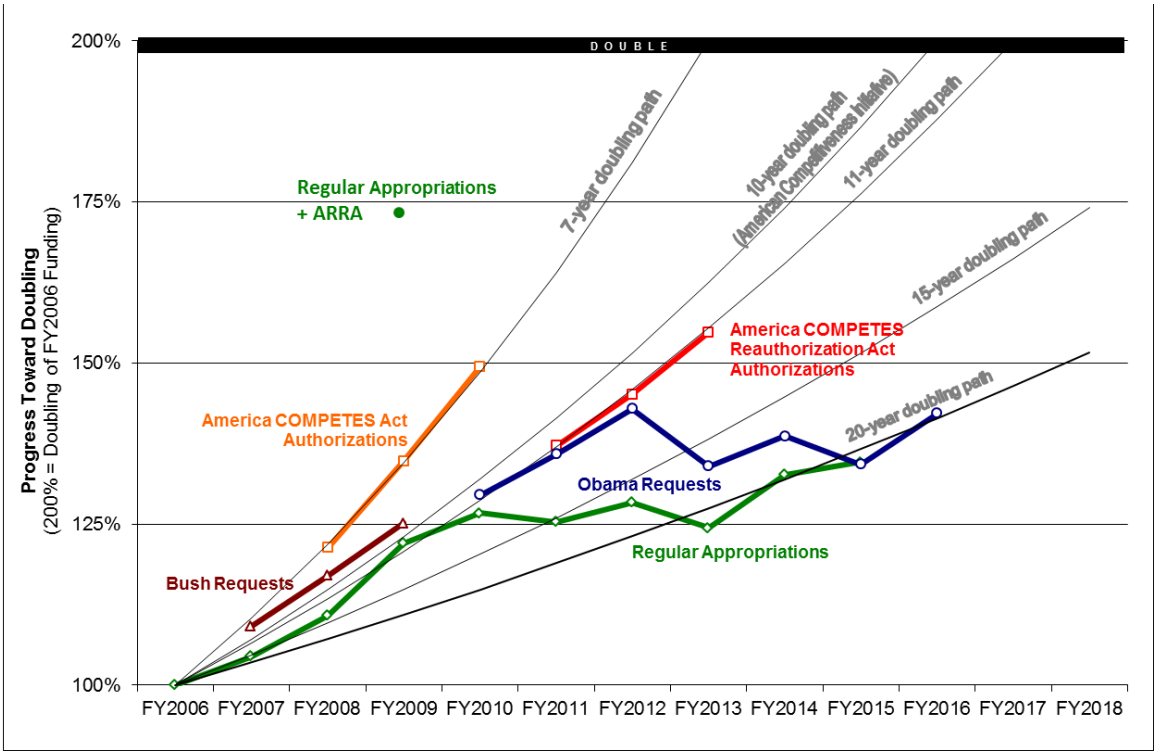
[18] EOP, OSTP, *The President's Plan for Science and Innovation: Doubling Funding for Key Basic Research Agencies in the 2010 Budget*, May 7, 2009, http://www.whitehouse.gov/files/documents/ostp/budget/doubling.pdf.

[19] EOP, OSTP, *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] Richard Freeman and John Van Reenen, "What if Congress Doubled R&D Spending on the Physical," *Innovation Policy and the Economy*, vol. 9 (February 2009), p. 28.

[21] A video of the "21st Century Cures Roundtable," held on May 6, 2014, is available at http://energycommerce.house.gov/event/21st-century-cures-roundtable.

Figure 1. Funding for Accounts Targeted for Doubling: Appropriations, Authorizations, and Requests versus Selected Doubling Rates



Sources: Prepared by CRS based on data from the Office of Management and Budget and agency budget justifications for FY2008 to FY2016, the NSF Budget Internet Information System, and agency authorization levels from the America COMPETES Act (P.L. 110-69) and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

Notes: The 7-year doubling pace represents annual increases of 10.4%, the 10-year doubling pace represents annual increases of 7.2%, the 11-year doubling pace represents annual increases of 6.5%, the 15-year doubling pace represents annual increases of 4.7%, and the 20-year doubling pace represents annual increases of 3.3%. Through compounding, these rates would achieve the doubling of funding in the specified time period. The lines connecting aggregate appropriations, authorizations, and requests for the targeted accounts are for clarification purposes only.

National Nanotechnology Initiative[22]

Launched by President Clinton in his FY2001 budget request, the National Nanotechnology Initiative (NNI) is a multiagency R&D initiative to advance understanding and control of matter at the nanoscale, where the physical, chemical, and biological properties of materials differ in fundamental and useful ways from the properties of individual atoms or bulk matter.[23] Federal nanotechnology efforts are coordinated by the National Science and Technology Council (NSTC) Subcommittee on Nanoscale Science, Engineering, and Technology (NSET).

The President's request for NNI R&D funding for FY2016 is $1.495 billion. This is $7.5 million (0.5%) above the FY2015 funding level of $1.495 billion. (See **Table 5**.)

Table 5. National Nanotechnology Initiative Funding, FY2014-FY2016

(budget authority, in millions of current dollars)

FY2014 Actual	FY2015 Estimate	FY2016 Request	Change, FY2015-FY2016	
			Dollar	Percent
$1,574.3	$1,487.8	$1,495.3	$7.5	0.5%

Source: Nanoscale Science, Engineering, and Technology Committee, National Science and Technology Council, The White House, *Supplement to the President's Budget for Fiscal Year 2016, The National Nanotechnology Initiative: Research and Development Leading to a Revolution in Technology and Industry*, March 11, 2015.

Networking and Information Technology Research and Development Program[24]

Established by the High-Performance Computing Act of 1991 (P.L. 102-194), the Networking and Information Technology Research and Development (NITRD) program is the primary mechanism by which the federal government coordinates its unclassified networking and information technology R&D investments in areas such as supercomputing, high-speed networking, cybersecurity, software engineering, and information management.

President Obama is requesting $4.091 billion in FY2016 for the NITRD program. (See **Table 6**.) This is $123.5 million (3.1%) above the FY2015 funding level. The largest agency increases in NITRD funding under the Administration's FY2016 request are for the DOE ($65.1 million, 10.3%) and NSF ($31.0 million, 2.6%). The President's budget would reduce NITRD funding at DOD by $10.0 million (1.4%), DHS by $6.1 million (7.7%), and the Agency for Healthcare Research and Quality (part of HHS) by $5.3 million (18.8%).[25]

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

[23] In the context of the NNI and nanotechnology, the nanoscale refers to lengths of 1 to 100 nanometers. A nanometer is one-billionth of a meter, or about the width of 10 hydrogen atoms arranged side by side in a line.

[24] For additional information on the NITRD program, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Background, Funding, and Activities*, by Patricia Moloney Figliola.

[25] EOP, NSTC, Committee on Technology, Subcommittee on Networking and Information Technology Research and Development, *Supplement to the President's FY2016 Budget for Fiscal Year 2016, The Networking and Information Technology Research and Development Program*, pp. 6-7, February 2015, https://www.nitrd.gov/pubs/2016supplement/FY2016NITRDSupplement.pdf.

Table 6. Networking and Information Technology Research and Development Program Funding, FY2014-FY2016

(budget authority, in millions of current dollars)

FY2014 Actual	FY2015 Estimate	FY2016 Request	Change, FY2015-FY2016	
			Dollar	Percent
$3,885.6	$3,967.1	$4,090.6	$123.5	3.1%

Source: EOP, NSTC, Committee on Technology, Subcommittee on Networking and Information Technology Research and Development, *Supplement to the President's FY2016 Budget for Fiscal Year 2016, The Networking and Information Technology Research and Development Program*, pp. 6-7, February 2015, https://www.nitrd.gov/pubs/2016supplement/FY2016NITRDSupplement.pdf.

U.S. Global Change Research Program[26]

The U.S. Global Change Research Program (USGCRP) coordinates and integrates federal research and applications to understand, assess, predict, and respond to human-induced and natural processes of global change. The program seeks to advance global climate change science and to "build a knowledge base that informs human responses to climate and global change through coordinated and integrated Federal programs of research, education, communication, and decision support."[27] Thirteen departments and agencies participate in the USGCRP.

The President's request for USGCRP funding for FY2016 and USGCRP funding data for FY2014 (actual) and FY2015 (estimate) were not available at the time of publication of this report.

BRAIN Initiative

In April 2013, President Obama launched the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative, asserting that

> There is this enormous mystery waiting to be unlocked, and the BRAIN Initiative will change that by giving scientists the tools they need to get a dynamic picture of the brain in action and better understand how we think and how we learn and how we remember. And that knowledge could be—will be—transformative.[28]

Among the agencies participating in the BRAIN Initiative are the Defense Advanced Research Projects Agency (DARPA), NIH, NSF, and the Food and Drug Administration (FDA). The research supported under this initiative seeks to facilitate a better understanding of "how the brain records, processes, uses, stores, and retrieves vast quantities of information, and shed light on the complex links between brain function and behavior,"[29] and to help improve the prevention, diagnosis, and treatment of brain diseases such as Parkinson's and Alzheimer's.

[26] For additional information on the USGCRP, see CRS Report R43227, *Federal Climate Change Funding from FY2008 to FY2014*, by Jane A. Leggett, Richard K. Lattanzio, and Emily Bruner.

[27] U.S. Global Change Research Program website, http://www.globalchange.gov/about/mission-vision-strategic-plan.

[28] The White House, "Remarks by the President on the BRAIN Initiative and American Innovation," speech transcript, April 2013, http://www.whitehouse.gov/photos-and-video/video/2013/04/02/president-obama-speaks-brain-initiative-and-american-innovation#transcript.

[29] The White House, "Fact Sheet: BRAIN Initiative," press release, April 2, 2013, http://www.whitehouse.gov/the-press-office/2013/04/02/fact-sheet-brain-initiative.

According to OSTP, federal investments in the BRAIN initiative totaled approximately $100 million in FY2014 and $200 million in FY2015. The President's FY2016 budget request includes more than $300 million for the effort, including $135 million in funding for NIH, $95 million from DARPA, and $72 million from NSF.[30] In addition, the Intelligence Advanced Research Projects Activity (IARPA) and the FDA are expected to make contributions to the BRAIN Initiative in FY2016.[31]

Precision Medicine Initiative

In his January 2015 State of the Union address, President Obama announced the Precision Medicine Initiative (PMI), a new undertaking among HHS agencies, proposing $215 million in FY2016 funding. The PMI seeks to build on research and discoveries that allow medical treatments to be tailored to an individual's unique characteristics (e.g., a patient's genes) or the genetic profile of an individual's tumor.

The President's FY2016 request for the PMI includes $130 million for NIH, $70 million for the National Cancer Institute (NCI), $10 million for FDA, and $5 million for the Office of the National Coordinator for Health Information Technology (ONC). NIH funding would support the development of a voluntary national research cohort of a million or more people to provide insights into health and disease. NCI funding would support the identification of genetic drivers in cancer and the application of that knowledge in the development of cancer treatments. FDA funding would support the development of databases to support the regulatory structure needed to advance innovation in precision medicine. ONC funding would support the development of interoperability standards and requirements to address privacy and enable secure exchange of data across systems. [32]

Materials Genome Initiative

Announced in June 2011 by President Obama, the Materials Genome Initiative (MGI) is a multi-agency initiative

> to create new knowledge, tools, and infrastructure with a goal of enabling U.S. industries to discover, manufacture, and deploy advanced materials twice as fast than is possible today. Agencies are currently developing implementation strategies for the Materials Genome Initiative with a focus on: (1) the creation of a materials innovation infrastructure, (2) achieving national goals with advanced materials, and (3) equipping the next generation materials workforce.[33]

In congressional testimony, OSTP Director John Holdren stated that the purpose of the Materials Genome Initiative is to "speed our understanding of the fundamentals of materials science, providing a wealth of practical information that American entrepreneurs and innovators will be able to use to develop new products and processes" in much the same way that the Human Genome Project accelerated a range of biological sciences by identifying and deciphering the

[30] EOP, OSTP, "Obama Administration Proposes Doubling Support for The Brain Initiative," press release, March 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/FY%202015%20BRAIN.pdf.

[31] EOP, OSTP, "Obama Administration Proposes Over $300 Million in Funding for The BRAIN Initiative," fact sheet, February 2015, http://www.whitehouse.gov/sites/default/files/microsites/ostp/brain_initiative_fy16_fact_sheet_ostp.pdf.

[32] The White House, "Fact Sheet: President Obama's Precision Medicine Initiative," press release, January 30, 2015, http://www.whitehouse.gov/the-press-office/2015/01/30/fact-sheet-president-obama-s-precision-medicine-initiative.

[33] Email correspondence between OSTP and CRS, March 14, 2012.

human genetic code.[34] Such research may contribute to the identification of substitutes for critical minerals that are in short supply or have at-risk supply chains; the design, development, and use of materials that could reduce the number and severity of traumatic brain injuries resulting from blasts, impacts, and collisions incurred in military engagements, motor vehicle accidents, and athletics; and the development of new lightweight materials for vehicles that could enable new energy storage and propulsion systems and improve fuel efficiency.[35] The White House asserts that

> Since the launch of MGI in 2011, the Federal government has invested over $250 million in new R&D and innovation infrastructure to anchor the use of advanced materials in existing and emerging industrial sectors in the United States.[36]

Neither the President's FY2015 budget nor his FY2016 budget included a table of agency funding for the MGI. The NSTC Subcommittee on the Materials Genome Initiative (SMGI) coordinates the initiative's activities. Among the agencies participating in MGI R&D are DOE, DOD, U.S. Geological Survey, NSF, NIST, NASA, NIH, and NSF. MGI also coordinates its efforts with two other multiagency initiatives, the NNI and NITRD. [37]

Advanced Manufacturing Partnership

In June 2011, President Obama launched the Advanced Manufacturing Partnership (AMP), an effort to bring together "industry, universities, and the Federal government to invest in emerging technologies that will create high-quality manufacturing jobs and enhance our global competitiveness."[38] Two R&D-focused components of the AMP are the National Robotics Initiative (NRI) and the National Network for Manufacturing Innovation (NNMI).

National Robotics Initiative

The National Robotics Initiative seeks to "develop robots that work with or beside people to extend or augment human capabilities."[39] Among the goals of the program are increasing labor productivity in the manufacturing sector, assisting with dangerous and expensive missions in space, accelerating the discovery of new drugs, and improving food safety by rapidly sensing microbial contamination.[40]

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[34] John P. Holdren, Director, OSTP, EOP, testimony before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Science and Space, hearing on "Keeping America Competitive Through Investments in R&D," March 6, 2012, http://commerce.senate.gov/public/?a=Files.Serve&File_id=fed566eb-e2c8-49da-aec5-f84e4045890b.

[35] The White House, Materials Genome Initiative, "Examples of Materials Applications," accessed May 2014, http://www.whitehouse.gov/mgi/examples.

[36] The White House, Materials Genome Initiative, accessed February 27, 2015, http://www.whitehouse.gov/mgi.

[37] NSTC, Committee on Technology, SMGI, "Materials Genome Initiative Strategic Plan," December 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/NSTC/mgi_strategic_plan_-_dec_2014.pdf.

[38] John P. Holdren, Director, OSTP, EOP, testimony before the Senate Committee on Commerce, Science, and Transportation, Subcommittee on Science and Space, hearing on "Keeping America Competitive Through Investments in R&D," March 6, 2012, http://commerce.senate.gov/public/?a=Files.Serve&File_id=fed566eb-e2c8-49da-aec5-f84e4045890b.

[39] Ibid.

[40] EOP, OSTP, website, August 3, 2011, http://www.whitehouse.gov/blog/2011/08/03/supporting-president-s-national-robotics-initiative.

In January 2015, several agencies—NSF, NIH, NASA, USDA, and DOD—announced a new round of funding for NRI efforts.[41] Neither the President's FY2015 nor his FY2016 budget included a table of agency funding for the NRI, but the *Analytical Perspectives* supplement to the President's FY2016 budget indicates support for initiative funding.[42]

National Network for Manufacturing Innovation[43]

President Obama first proposed the establishment of a National Network for Manufacturing Innovation in his FY2013 budget, which requested $1 billion to support the establishment of up to 15 institutes. The President also included proposals for establishing the NNMI in his FY2014, FY2015 and FY2016 budgets.

As originally conceived, the NNMI would consist of

> a network of institutes where researchers, companies, and entrepreneurs can come together to develop new manufacturing technologies with broad applications. Each institute would have a unique technology focus. These institutes will help support an ecosystem of manufacturing activity in local areas. The Manufacturing Innovation Institutes would support manufacturing technology commercialization by helping to bridge the gap from the laboratory to the market and address core gaps in scaling manufacturing process technologies.[44]

In the absence of explicit congressional authorization and appropriations for the NNMI, the Obama Administration competed and/or awarded eight institutes for manufacturing innovation using the broad agency authorities and appropriations of the DOD and DOE. The Administration has committed to establishing a ninth institute, but the focus area has not been identified.

In December 2014, Congress passed the Revitalize American Manufacturing and Innovation Act of 2014 (RAMIA), as Title VII of Division B of the Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235). President Obama signed the bill into law on December 16, 2014. RAMIA directs the Secretary of Commerce to establish a Network for Manufacturing Innovation (NMI) program within the Commerce Department's NIST.

The President's FY2016 budget proposes discretionary funding for seven additional centers—two each to be supported by USDA, DOE, and NIST, and one to be supported by DOD. In addition, the President's FY2016 budget includes a request for $1.9 billion in mandatory funding for NIST for the establishment of 29 additional centers between FY2017 and FY2024, which would bring the total number of centers to 45.

[41] National Science Foundation, "National Robotics Initiative (NRI): The realization of co-robots acting in direct support of individuals and groups," Program Solicitation NSF 15-505, January 2, 2015, http://www.nsf.gov/pubs/2015/nsf15505/nsf15505.htm.

[42] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2016*, pp. 293-294.

[43] For additional information on the NNMI, see CRS Report R42625, *The Obama Administration's Proposal to Establish a National Network for Manufacturing Innovation*, by John F. Sargent Jr., and CRS Report R43857, *The Network for Manufacturing Innovation*, by John F. Sargent Jr.

[44] DOC, *FY2014 Budget in Brief*, February 2012, p. 123, http://www.osec.doc.gov/bmi/budget/FY13BIB/fy2013bib_final.pdf.

Reorganization of STEM Education Programs[45]

In FY2014, the Obama Administration proposed a major overhaul of the federal science, technology, engineering, and mathematics (STEM) education portfolio. That plan would have affected about 50% of the federal STEM education effort and involved the transfer of STEM education budget authority between federal agencies.

Although many legislators expressed conceptual support for reorganization as a means to improve the portfolio, the joint explanatory statement that accompanied the Consolidated Appropriations Act, 2014 (P.L. 113-76) rejected the proposal overall. It stated that the proposal "contained no clearly defined implementation plan, had no buy-in from the education community, and failed to sufficiently recognize or support a number of proven, successful programs." Some FY2014 House and Senate appropriations reports accepted some changes on a case-by-case basis. In a March 2014 progress report the Administration stated that the number of federal STEM education programs had been reduced by 40% between FY2012 (228 programs) and FY2014 (138 programs).

For FY2015, the Obama Administration proposed what it described as a "fresh" reorganization of the federal STEM education portfolio. Unlike the FY2014 proposal, which sought to transfer funding between agencies, the FY2015 proposal sought to consolidate funding within agencies. According to the Office of Management and Budget, the FY2015 reorganization would have consolidated or eliminated 31 programs at 9 agencies, affecting $145 million in FY2014 budget authority. The FY2015 budget request aimed to further reduce STEM education programs to 111 from their FY2014 level of 138.

The OSTP asserts that the President's FY2016 budget continues to reduce fragmentation.[46] Further government-wide details were not available at the time of publication of this report.

[45] For additional information on the reorganization of federal STEM education programs, see CRS Report R43880, *The America COMPETES Acts: An Overview*, by Heather B. Gonzalez; CRS In Focus IF00013, *The President's FY2015 Budget and STEM Education (In Focus)*, by Heather B. Gonzalez; and CRS Report R42642, *Science, Technology, Engineering, and Mathematics (STEM) Education: A Primer*, by Heather B. Gonzalez and Jeffrey J. Kuenzi.

[46] EOP, OMB, *Budget of the United States Government, Fiscal Year 2016,* "Cuts Consolidations, and Savings," p. 87, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2016/assets/ccs.pdf.

FY2016 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 total federal R&D funding. Annual appropriations for these agencies are provided through 9 of the 12 regular appropriations bills. For each agency covered in this report, **Table 7** shows the corresponding regular appropriations bill that provides primary funding for the agency, including its R&D activities.

In December 2015, Congress passed, and the President signed, the Consolidated Appropriations Act, 2016 (P.L. 114-113) providing discretionary appropriations for all federal agencies for FY2016. For some federal agencies it is possible to discern R&D funding levels directly from this act and its accompanying explanatory statement. In these cases, this report reflects the results of P.L. 114-113. However, for some agencies, funding for R&D is included in appropriations line items that also include non-R&D activities; therefore, in such cases, it is not possible to identify precisely how much of the funding provided in appropriations laws is allocated to R&D specifically. In general, R&D funding levels are known only after departments and agencies allocate their appropriations to specific activities and report those figures.

As of the start of fiscal year 2016, Congress had not completed action on any of the 12 regular appropriations bills for FY2015. The House Committee on Appropriations had reported all 9 of the regular appropriations bills that provide R&D funding and the House had passed 5 of them. The Senate Committee on Appropriations had reported all 9 of the regular appropriations bills that provide R&D funding and the Senate had not passed any of them.

On September 30, 2015, President Obama signed into law the Continuing Appropriations Act, 2016 (P.L. 114-53), a continuing resolution (CR) that provided funding for the agencies through December 11, 2015, until the enactment into law of an appropriation for any project or activity provided for in this act, or until the enactment into law of the applicable appropriations act for FY2016 without any provision for such project or activity. The CR generally provided FY2016 budget authority for FY2015 projects and activities at the rate they were funded during that fiscal year. Most projects and activities funded in the CR were subject to an across-the-board decrease of 0.2108%.

In addition to the general provisions that establish the coverage, duration, and rate, CRs usually include provisions that are specific to certain agencies, accounts, or programs. These include provisions that designate exceptions to the formula and purpose for which any referenced funding is extended (referred to as “anomalies”) and provisions that have the effect of creating new law or changing existing law (often used to renew expiring provisions of law). The CR includes a number of such provisions, each of which is briefly summarized in CRS Report R44214, *Overview of the FY2016 Continuing Resolution (H.R. 719)*, by Jessica Tollestrup.

Because of the way that agencies report budget data to Congress, it can be difficult to identify the portion that is R&D. Consequently, R&D data presented in the agency analyses in this report may differ from R&D data provided by OMB.

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://www.crs.gov/cli/Clis?cliId=73. Also, the status of each appropriations bill is available on the CRS webpage, *Status Table of Appropriations*, available at http://crs.gov/Pages/AppropriationsStatusTable.aspx.

Table 7. 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
Department of Health and Human Services - 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
Department of Veterans Affairs	Military Construction and Veterans Affairs, and Related Agencies Appropriations Act

Source: CRS website, FY2016 Status Table of Appropriations, available at http://crs.gov/Pages/AppropriationsStatusTable.aspx.

Department of Defense[47]

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 8**.) 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, Chemical Agents and Munitions Destruction Program, and the National Defense Sealift Fund. The Defense Health Program (DHP) supports the delivery of health care to DOD personnel and their families. DHP funds (including the RDT&E funds) are requested through the Defensewide Operations and Maintenance appropriations request. 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. 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 are requested through the Defensewide Procurement appropriations request. 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. The RDT&E funding for this effort is requested in the Navy's Procurement request and appropriated in Title V, Revolving and Management Funds, of the appropriation 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 programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which 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 has asked for additional OCO funds in supplemental requests, if the initial OCO funding is not enough to get through the fiscal year. The OCO budget has been declining as operations in Iraq and Afghanistan are reduced. As the United States steps up its battle with the Islamic State of Iraq and Syria (ISIS), OCO funding will continue.

In addition, GWOT/OCO-related requests/appropriations often include money for a number of transfer funds. These have included in the past the Iraqi Freedom Fund (IFF), the Iraqi Security

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

Forces Fund, the Afghanistan Security Forces Fund, and the Pakistan Counterinsurgency Capability Fund. Another transfer fund is the Mine Resistant and Ambush Protected Vehicle Fund (MRAPVF). 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. These transfers are eventually reflected in Title IV prior year funding figures.

For FY2016, the Obama Administration requested $69.785 billion for DOD's baseline Title IV RDT&E. This is $6.101 billion above what was enacted for FY2015. It should be noted that the overall President's budget request did not stay within the caps of the Budget Control Act of 2011 (P.L. 112-25) as modified by the American Taxpayer Relief Act of 2012 (P.L. 112-240) and the Bipartisan Budget Act of 2012 (P.L. 113-67). Whether to continue abiding by these caps was a matter of a larger budget debate between the Administration and Congress. This debate was reflected somewhat in the amount of funding allocated to OCO-related RDT&E, since OCO funding is considered emergency funding and not counted toward the caps.

In addition to the baseline Title IV RDT&E request, the Administration requested $980 million in RDT&E through the Defense Health Program and $579 million in RDT&E through the Chemical Agents and Munitions Destruction program for FY2016. The Administration requested $25 million in RDT&E funding through the National Defense Sealift Fund for FY2016.

The House approved $66.151 billion for DOD's baseline RDT&E program, $3.634 billion below the Administration's request. Most of this decrease can be attributed to reductions made to the Air Force's request. For example, the Long Range Strike program request was reduced by $460 million to reflect a rescheduling of the program. The Next Generation Refueling K-46 Aircraft program request was reduced by $275 million because the House determined that the request of $602 million exceeded needed funding. The House also expressed concern that the Air Force was using funds authorized for the Space Modernization Initiative to start new programs rather than to advance more evolutionary improvements in existing programs. As a result the House reduced the request for the Advanced Extremely High Frequency Military Satellite Communication program by $140 million and the Space Based Infrared Satellite (SBIRS) program request by $51 million, while transferring the balance of the request for this latter program ($241 million) to the Air Force's Title IX OCO appropriation. This transfer of $241 million to the Air Force OCO RDT&E appropriation accounts for just a portion of the $1.349 billion increase the House approved in Air Force OCO RDT&E. The increase in Air Force OCO RDT&E also included an increase of $915 million for classified Air Force programs. In total, the House increased the request for OCO RDT&E by $1.594 billion.

The House also reduced the Navy's request by $648 million, with the biggest decrease made to the Marine Assault Vehicle program (-$68 million). The Army's request was increased by $447 million with the largest increase going to the Combat Vehicle Improvement program (+$98 million) to upgrade the lethality of the Stryker combat vehicle. The House reduced the Defensewide account by a net $123 million. This included a $100 million general reduction of request for the Defense Advanced Research Projects Agency (DARPA), a $250 million increase to continue support for the Defense Rapid Innovation Fund, and an increase of $165 million for the U.S.-Israeli Cooperative program, primarily directed at ballistic missile defense technologies.

In addition to the Title IV appropriation recommendations, the House also recommended the requested amounts for the National Defense Sealift Fund and the Chemical Agents and Munitions Destruction program, $2 million for RDT&E for the Office of the Inspector General, and $1.640 billion for Defense Health Program RDT&E. The latter includes an additional $63 million added by amendment on the House floor.

The Senate Appropriations Committee recommended $70.325 billion for Title IV RDT&E, $540 million more than that requested by the Administration. Some notable recommended changes to the Administration's requests were: an increase of $350 million for the Navy's Unmanned Carrier Launched Airborne Surveillance and Strike System; an increase of $144 million for the Air Force's Expendable Launch Vehicle, an increase of $400 million to continue the Defense Rapid Innovation Program in the Defensewide account; an increase of $165 million for the U.S.-Israeli Cooperative program in the Defensewide account; and an increase of $203 million for the Defense Technology Analysis program in the Defensewide account. The latter was directed toward assessing the cyber vulnerability of major weapons systems.

In addition to the Title IV appropriation recommendations, the Senate Committee also recommended the requested RDT&E funds for the National Defense Sealift Fund and the Chemical Agents and Munitions Destruction program. The committee recommended $2 million in RDT&E for the Office of the Inspector General. The committee also recommended increasing RDT&E funding in the Defense Health Program by $819 million. The committee recommended funding for OCO RDT&E at the requested levels.

Division C of the Consolidated Appropriations Act, 2016 (P.L. 114-113) provides FY2016 appropriations for DOD. President Obama signed the act on December 18, 2015. The act provides $69.785 billion for Title IV RDT&E, $6 million (9.6%) more than for FY2015 and equal to the request in aggregate. The aggregate Title IV DOD RDT&E funding level includes:

- Army: $7.565 billion for FY2016, $892 million (13.4%) more than for FY2015 and $640 million (9.2%) more than the request;
- Navy: $18.118 billion for FY2016, $2.163 billion (13.6%) more than for FY2015 and $232 million (1.3%) more than the request.
- Air Force: $25.217 billion for FY2016, $1.587 billion (6.7%) more than for FY2015 and $1.257 (4.7%) billion less than the request.
- Defensewide: $18.696 billion for FY2016, $1.479 billion (8.6%) more than for FY2015 and $266 million (2.0%) more than the request.

In addition, the act fully funds the Chemical Agents and Munitions Destruction RDT&E at $579 million, $17 million (2.8%) below the FY2015 level, and provides $2.122 billion for Defense Health Program RDT&E, $1.142 billion(116.5%) more than the request and $391 million (22.6%) above the FY2015 level. The act also provides $25 million for RDT&E in the National Defense Sealift Fund, an amount equal to the request and $1 million (3.2%) more than in FY2015, and $2 million in RDT&E for the Office of the Inspector General, $1 million (50.0%) more than in FY2015 and $2.6 million (55.3%) less than the request. P.L. 114-113 also fully funded the OCO request and added an additional $40 million to support the Israel Technical Working Group.

RDT&E funding can be analyzed 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 the development of system improvements in existing operational systems.

Many congressional policymakers are particularly interested in S&T funding since these funds support the development of new technologies and the underlying science. Some in the defense community see ensuring adequate support for S&T activities as imperative to maintaining U.S. military superiority into the future. The knowledge generated at this stage of development can also contribute to advances in commercial technologies.

The FY2016 Title IV baseline S&T funding request was $12.266 billion, $81 million more than what was enacted in FY2015. The House voted to appropriate $12.573 billion for Title IV S&T. This includes the $100 million general reduction to DARPA's request. The Senate Appropriation Committee recommended $12.822 billion for Title IV S&T. P.L. 114-113 provides $13.250 billion for Title IV S&T for FY2016, $984 million (8.0%) more than the request and $1.065 billion (8.7%) above the FY2015 level.

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 Administration requested $2.089 billion for basic research for FY2016. This is $189 million less than what was enacted for FY2015. The House approved $2.100 billion for basic research (not counting the DARPA general reduction). The Senate Appropriation Committee recommended $2.317 billion in basic research. Much of the Senate Committee's recommended increase would go toward in-house basic research and toward increases in the Navy's University Research Initiatives. P.L. 114-113 provides $2.309 billion for basic research, $32 million (1.4%) more than in FY2015 and $221 million (10.6%) more than the request.

Table 8. Department of Defense RDT&E

(in millions of dollars)

	FY2015 Enacted		FY2016 Request		FY2016 House		FY2016 S. Cmte.		FY2016 Enacted	
Budget Account	**Base**	**OCO**	**Base**	**OCO**	**Base**	**OCO**	**Base**	**OCO**	**Base**	**OCO**
Army	6,673	2	6,925	2	7,372	2	7,097	2	7,565	2
Navy	15,955	36	17,886	36	17,238	218	18,237	36	18,118	36
Air Force	23,630	15	26,474	17	23,163	1,366	25,874	17	25,217	17
Defensewide	17,217	270[a]	18,330	137	18,207[b]	199	18,926	137	18,696	177
Dir., Test & Evaluation	209		171		171		191		189	
Total Title IV—By Account[c]	**63,684**	**322**	**69,785**	**191**	**66,151[b]**	**1,785**	**70,325**	**191**	**69,785**	**231**
Budget Activity										
6.1 Basic Research	2,278		2,089		2,100[d]		2,317		2,309	

Budget Account	FY2015 Enacted		FY2016 Request		FY2016 House		FY2016 S. Cmte.		FY2016 Enacted	
	Base	OCO	Base	OCO	Base	OCO	Base	OCO	Base	OCO
6.2 Applied Research	4,603	45	4,713		4,838[d]		4,928		5,004	
6.3 Advanced Tech. Dev.	5,304	23	5,464		5,735[d]	40	5,577		5,937	
6.4 Advanced Component Dev. and Prototypes	12,472	19	14,402	2	13,621	57	14,936	2	14,083	42
6.5 Systems Dev. And Demo	11,101	10	12,771		11,704	241	12,839		12,795	
6.6 Management Support[e]	4,396		4,185		4,321		4,496		4,424	
6.7 Op. Systems Dev.[f]	23,530	225	26,161	190	23,931	1,447	25,231	190	25,253	190
Total Title IV—by Budget Activity[c]	**63,684**	**322**	**69,785**	**191**	**66,151[bg]**	**1,785**	**70,325**	**191**	**69,785[i]**	**231**
Title V—Revolving and Management Funds										
National Defense Sealift Fund	24		25		25		25		25	
Title VI—Other Defense Programs										
Defense Health Program	1,731		980		1,640[h]		1,799		2,122	
Chemical Agents and Munitions Destruction	596		579		579		579		579	
Inspector General	1		5		2		2		2	
Grand Total[c]	**66,036**	**322**	**71,374**	**191**	**68,397**	**1,785**	**72,730**	**191**	**72,513**	**231**

Source: CRS, adapted from the Department of Defense Budget, Fiscal Year 2016 RDT&E Programs (R-1), February 2015. H.Rept. 114-139. S.Rept. 114-63; Explanatory Statement, P.L. 114-113.

a. This figure includes $95 million for Ebola Response and Preparedness.

b. These figures include a $100 million general reduction to the recommended DARPA appropriation.

c. Numbers may not add due to rounding.
d. These figures do not include the $100 million general reduction to the recommended DARPA appropriation, since it is not possible to determine how this reduction will be allocated.
e. Includes funding for Director of Test and Evaluation.
f. Includes funding for Classified Programs.
g. This figure does not equal the sum of the column because the 6.1 through 6.3 funding does not reflect the $100 million DARPA general reduction.
h. This includes $63 million added to the Defense Health program RDT&E account on the House floor, which was offset by an equal reduction in the Defensewide Operations and Maintenance account.
i. This figure does not equal the sum of the column because the 6.1 to 6.7 components above do not reflect the $100 million DARPA general reduction

Department of Homeland Security[48]

The Department of Homeland Security (DHS) has identified five core missions: to prevent terrorism and enhance security, to secure and manage the borders, to enforce and administer immigration laws, to safeguard and secure cyberspace, and to ensure resilience to disasters. New technology resulting from research and development can contribute to all these goals. The Directorate of Science and Technology (S&T) has primary responsibility for establishing, administering, and coordinating DHS R&D activities. The Domestic Nuclear Detection Office (DNDO) is responsible for R&D relating to nuclear and radiological threats. Other components, such as the U.S. Coast Guard, conduct R&D relating to their specific missions.

The President requested $1.154 billion in FY2016 for R&D and related programs in DHS. This was a 19.2% decrease from $1.430 billion in FY2015. The total included $779 million for the S&T Directorate, $357 million for DNDO, and $18 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard. The House committee recommended a total of $1.162 billion, including $787 million for the S&T Directorate, $357 million for DNDO, and $18 million for Coast Guard RDT&E. The Senate committee recommended a total of $1.103 billion, including $765 million for the S&T Directorate, $320 million for DNDO, and $18 million for Coast Guard RDT&E. The final appropriation provided $1.152 billion, including $787 million for the S&T Directorate, $347 million for DNDO, and $18 million for Coast Guard RDT&E. (See **Table 9**.)

Directorate of Science and Technology

The S&T Directorate is the primary DHS R&D organization.[49] Led by a Senate-confirmed 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. It also conducts testing and other technology-related activities in support of acquisitions by other DHS components. The Administration's request of $779 million for the S&T Directorate in FY2016 was 29.4% less than the FY2015 appropriation of $1.104 billion. Most of the difference resulted from a lower request for Laboratory Facilities, which received $300 million in FY2015 for construction of the National Bio and Agro-Defense Facility (NBAF). No further funds for NBAF construction were requested in FY2016. Within the request for Research, Development, and

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

[49] For more information, see CRS Report R43064, *The DHS S&T Directorate: Selected Issues for Congress*, by Dana A. Shea.

Innovation (RD&I), support for Apex projects was to increase to $78 million in FY2016.[50] Apex projects are multidisciplinary projects agreed to between the S&T Directorate and the head of another DHS component. The FY2016 request proposed supporting six Apex projects in addition to the previous two. It also proposed a crosscutting "technology engines" activity within the Apex program. The request for University Programs, which funds S&T's university centers of excellence (together with some smaller programs), was $31 million, down from $40 million in FY2015.

The House committee's recommendation of $787 million for S&T was $8 million more than the request. In its report, the House committee recommended a $9 million increase (relative to the request) for University Programs, which it said would be sufficient to support all the existing centers of excellence. Other differences relative to the request were small. The committee expressed support for the Apex concept and recommended Apex funding at the requested level.

The Senate committee's recommendation of $765 million for S&T was $14 million less than the request. In its report, the Senate committee recommended an $8 million increase (relative to the request) for University Programs, offset by a $20 million decrease for RD&I. Other differences relative to the request were small. The committee stated that the University Programs increase would allow S&T to maintain at least 10 university centers of excellence (the current number). The committee did not specify how the decrease for RD&I should be allocated. It did state that "not less than prior year funding" should be allocated to the Apex program and directed S&T to "continue its focus" on three of the six new Apex projects.

The final appropriation of $787 million was $8 million more than the request. It included an increase of $9 million for University Programs, partially offset by decreases of less than $1 million for Laboratory Facilities and Management and Administration. The explanatory statement was silent regarding the Apex program.

Domestic Nuclear Detection Office

DNDO is the DHS organization responsible for nuclear detection research, development, testing, evaluation, acquisition, and operational support. It is led by a presidentially appointed Director. In addition to its responsibilities within DHS, it is charged with coordinating federal nuclear forensics programs and the U.S. portion of the global nuclear detection architecture. The Administration requested $357 million for DNDO in FY2016, an increase of 16.1% from the FY2015 appropriation of $308 million. In the Systems Acquisition account, the Administration proposed to merge the Radiation Portal Monitors program ($5 million in FY2015) and the Human Portable Radiation Detection Systems program ($49 million in FY2015) into a single, expanded Radiological and Nuclear Detection Equipment Acquisition program ($101 million requested for FY2016). The increase in funding for the merged program was to support recapitalization of DHS radiation detection equipment that is at or past its life expectancy.

The House committee's recommendation of $357 million for DNDO was the same as the Administration's request, except for a reduction of less than $1 million in the Management and Administration account. The committee concurred with the Administration's proposed consolidation and expansion of the Nuclear Detection Equipment Acquisition program.

[50] The FY2015 act and explanatory statement did not specify the allocation of funding to Apex projects within the total provided for RD&I. Apex funding was $15 million in FY2014 and in the FY2015 request.

The Senate committee's recommendation of $320 million for DNDO was $37 million less than the request. The reduction included $1 million from the Management and Administration account and $36 million from the new Nuclear Detection Equipment Acquisition program.

The final appropriation of $347 million for DNDO was $10 million less than the request. The reduction included less than $1 million from Management and Administration and $10 million from Nuclear Detection Equipment Acquisition.

Coordination of DHS R&D Activities

DHS-wide coordination of R&D activities has been an issue for several years. In September 2012, the Government Accountability Office (GAO) reported that although the S&T Directorate, DNDO, and the Coast Guard are the only DHS components that report R&D activities to the Office of Management and Budget, several other DHS components also fund R&D and activities related to R&D.[51] The GAO report found that DHS lacked department-wide policies to define R&D and guide reporting of R&D activities, and, as a result, DHS did not know the total amount its components invest in R&D. The report recommended that DHS develop policies and guidance for defining, reporting, and coordinating R&D activities across the department, and that DHS establish a mechanism to track R&D projects.

In the FY2013 and FY2014 appropriations cycles, Congress responded to GAO's findings by directing DHS to develop new policies and procedures. The explanatory statement for the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) directed the Secretary of Homeland Security, through the Under Secretary for Science and Technology, to establish a review process for all R&D and related work within DHS.[52] The joint explanatory statement for the Consolidated Appropriations Act, 2014 (P.L. 113-76) directed DHS to implement and report on new policies for R&D prioritization, and to review and, in accordance with GAO's recommendations, to implement policies and guidance for defining and overseeing R&D department-wide.[53]

Concerns remain, however. In September 2014, GAO testified that DHS had updated its guidance to include a definition of R&D, but that efforts to develop a process for coordinating R&D across the department were ongoing but not yet complete.[54] In April 2015, GAO's annual report on fragmented, overlapping, or duplicative federal programs stated that its concerns about DHS R&D had been only "partially addressed."[55]

In the FY2016 appropriations cycle, the House committee's report stated that "The Department needs a strategic planning process to focus research and development and future investments."[56] In December 2015, the final explanatory statement noted as follows:

> The Department lacks a mechanism for capturing and understanding research and development (R&D) activities conducted across DHS, as well as coordinating R&D to

[51] U.S. Government Accountability Office, *Department of Homeland Security: Oversight and Coordination of Research and Development Should Be Strengthened*, GAO-12-837, September 12, 2012.

[52] *Congressional Record*, March 11, 2013, p. S1547.

[53] *Congressional Record*, January 15, 2014, p. H927.

[54] U.S. Government Accountability Office, *Department of Homeland Security: Actions Needed to Strengthen Management of Research and Development*, GAO-14-865T, September 9, 2014.

[55] U.S. Government Accountability Office, *2015 Annual Report: Additional Opportunities to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits*, GAO-15-404SP, April 2015.

[56] H.Rept. 114-215, p. 4.

> reflect departmental priorities. As part of the Unity of Effort initiative and in order to address the above concerns, DHS is establishing Integrated Product Teams (IPTs) to assist the Science and Technology Directorate (S&T) with requirements gathering, validation, and alignment of budgetary resources. IPTs, comprised of personnel from across DHS, will be tasked with identifying and prioritizing technological capability gaps and coordinating departmental R&D to close those gaps. The overall IPT effort will be led by the Under Secretary for S&T, but individual IPTs will be led by senior representatives from the operational components, and will have representation from the JRC [Joint Requirements Council] Portfolio Teams and S&T.
>
> S&T will also play a critical role in helping DHS-wide acquisition programs by conducting independent technical assessments of acquisitions, including participation in developmental test and evaluation activities, to ensure DHS acquisitions effectively fill identified capability gaps. S&T is directed to brief the Committees not later than January 15, 2016, on the results of the first IPTs and technology assessments.[57]

Proposed Reorganization

In 2013, Congress directed DHS to review its programs relating to chemical, biological, radiological, and nuclear threats and to evaluate "potential improvements in performance and possible savings in costs that might be gained by consolidation of current organizations and missions, including the option of merging functions of the Domestic Nuclear Detection Office (DNDO) and the Office of Health Affairs (OHA)."[58] The report of this review was completed in June 2015. In July 2015, DHS officials testified that DHS planned to consolidate DNDO, OHA, and smaller elements of several other DHS programs into a new office, led by a new Assistant Secretary, with responsibility for DHS-wide coordination of chemical, biological, radiological, nuclear, and explosives (CBRNE) "strategy, policy, situational awareness, threat and risk assessments, contingency planning, operational requirements, acquisition formulation and oversight, and preparedness."[59] The House and Senate committee reports on FY2016 appropriations did not address the proposed consolidation. A provision in the final bill prohibited DHS from using FY2016 funds to establish an Office of CBRNE Defense "until such time as Congress has authorized such establishment."[60] The provision did, however, give DHS the authority to transfer funds for the establishment of such an office, if authorized.

[57] *Congressional Record*, December 17, 2015, p. H10162.

[58] Explanatory statement on the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6), *Congressional Record*, March 11, 2013, p. S1547.

[59] Joint prepared testimony of Reginald Brothers, Under Secretary for Science and Technology, Kathryn H. Brinsfield, Assistant Secretary for Health Affairs and Chief Medical Officer, and Huban A. Gowadia, Director of the Domestic Nuclear Detection Office, Department of Homeland Security, before the House Committee on Homeland Security, Subcommittees on Emergency Preparedness, Response, and Communications and Cybersecurity, Infrastructure Protection, and Security Technologies, July 14, 2015, http://homeland.house.gov/hearing/joint-subcommittee-hearing-weapons-mass-destruction-bolstering-dhs-combat-persistent-threats.

[60] P.L. 114-113, Div. F, Sec. 521.

Table 9. Department of Homeland Security R&D and Related Programs

(budget authority in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 H. Cmte.	FY2016 S. Cmte.	FY2016 Final
Directorate of Science and Technology	**$1,104**	**$779**	**$787**	**$765**	**$787**
Management and Administration	130[a]	132	132	130	132[b]
R&D, Acquisition, and Operations	974[c]	647	655[d]	634[d]	655[d]
Research, Development, and Innovation	457	435	435	415	435
Laboratory Facilities	435	134	134	134	134
Acquisition and Operations Support	42	47	47	47	47
University Programs	40	31	40	39	40
Domestic Nuclear Detection Office	**308**	**357**	**357**	**320**	**347**
Management and Administration	37	38	38	38	38
Research, Development, and Operations	198	196	196	196	196
Systems Architecture	17	17	17	17	17
Systems Development	21	22	22	22	22
Transformational R&D	70	68	68	68	68
Assessments	38	38	38	38	38
Operations Support	31	31	31	31	31
National Technical Nuclear Forensics Center	21	20	20	20	20
Systems Acquisition	73	123	123	87	113
Rad./Nuc. Detection Equipment Acquisition	—	101	101	65	91
Radiation Portal Monitors Program	5	—	—	—	—
Human Portable Radiation Detection Systems	49	—	—	—	—
Securing the Cities	19	22	22	22	22
U.S. Coast Guard RDT&E	**18**	**18**	**18**	**18**	**18**
DHS, Total R&D and Related Programs	**1,430**	**1,154**	**1,162**	**1,103**	**1,152**

Sources: FY2015 enacted from P.L. 114-4 and explanatory statement, *Congressional Record*, January 13, 2015. FY2016 request from DHS FY2016 congressional budget justification. FY2016 House Committee from H.R. 3128 as reported and H.Rept. 114-215. FY2016 Senate Committee from S. 1619 as reported and S.Rept. 114-68. FY2016 final from P.L. 114-113 and explanatory statement, *Congressional Record*, December 17, 2015.

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

a. Does not reflect a rescission of $0.5 million from unobligated prior-year balances.

b. Does not reflect a rescission of $0.3 million from unobligated prior-year balances.

c. Does not reflect a rescission of $16.6 million from unobligated prior-year balances.

d. Does not reflect rescissions totaling $10.0 million from unobligated prior-year balances.

Department of Health and Human Services

The Department of Health and Human Services (HHS) is the federal government's "principal agency for protecting the health of all Americans and providing essential human services, especially for those who are least able to help themselves."[61]

The President is requesting $31.0 billion in R&D funding for HHS, an increase of $565 million (1.9%) from its FY2015 level of $30.5 billion. Several components of HHS provide funding for R&D. This report focuses on HHS R&D funded through NIH, an HHS agency which provides more than 95% of total HHS R&D funding.[62]

The President's FY2016 request for R&D at other HHS agencies includes:

- Centers for Disease Control and Prevention: $398 million, equal to the amount it received in FY2015.
- Food and Drug Administration: $410 million, equal to the amount it received in FY2015.
- Agency for Healthcare Research and Quality: $385 million, an increase of $1 million (0.3%) from its FY2015 level.
- Health Resources and Services Administration: $22 million, equal to the amount it received in FY2015.
- Administration for Children and Families: $17 million, an increase of $6 million (54.5%) from its FY2015 level.[63]

In addition, the President's budget would eliminate R&D funding for the Centers for Medicare and Medicaid Services, which received $64 million in FY2015, and provide $163 million for departmental management related to R&D, an increase of $6 million (3.8%) above its FY2015 level.[64]

National Institutes of Health[65]

The National Institutes of Health (NIH) is the primary agency of the federal government charged with performing and supporting biomedical and behavioral research. It also has major roles in training biomedical researchers and disseminating health information. The NIH mission is "to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability."[66] The agency's organization consists of the Office of the NIH Director (OD) and 27 institutes and centers (ICs).

[61] HHS, "About," http://www.hhs.gov/about.

[62] Email correspondence between OMB and CRS, February 9, 2015.

[63] Ibid.

[64] Ibid.

[65] This section was written by Judith A. Johnson, Specialist in Biomedical Policy, CRS Domestic Social Policy Division. For background information on NIH, see CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*, by Judith A. Johnson, and CRS Report R43341, *NIH Funding: FY1994-FY2016*, by Judith A. Johnson.

[66] National Institutes of Health, "About the National Institutes of Health," http://www.nih.gov/about/mission.htm.

NIH supports and conducts a wide range of basic and clinical research, research training, and health information dissemination across all fields of biomedical and behavioral sciences. About 83% of NIH's budget goes out to the extramural research community in the form of grants, contracts, and other awards. This funding supports research performed by more than 300,000 non-federal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions.[67] OD sets overall policy and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The ICs focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with OD. As shown in **Table 10**, Congress provides separate appropriations to 24 of the 27 ICs, to OD, and to an intramural Buildings and Facilities account. The other three centers, which perform centralized support services, are funded through assessments on the IC appropriations.

Funding for NIH comes primarily from the Labor, HHS, and Education (Labor/HHS/ED) appropriations bill, with an additional amount for Superfund-related activities from the Interior/Environment appropriations bill. Those two bills provide NIH's discretionary budget authority. Each year NIH has also received $150 million in mandatory funding that is provided in the Public Health Service (PHS) Act for a special program on type 1 diabetes research. In addition, NIH has received funding via a PHS Act transfer. The total funding available for NIH activities, taking account of transfers, is known as the NIH program level.

For FY2016, the Obama Administration requested an NIH program level total of $31.311 billion, an increase of $1 billion (3.3%) over the FY2015 level of $30.311 billion (see **Table 10**). The FY2016 program level request for NIH included $150 million in mandatory funding for research on type 1 diabetes.[68] The FY2016 program level request also proposed $847 million in funding transferred to NIH by the PHS Program Evaluation Set-Aside, also called the evaluation tap. NIH and other HHS agencies and programs authorized under the PHS Act are subject to a budget assessment found in Section 241 of the PHS Act (42 U.S.C. §238j). It authorizes the Secretary to use a portion of eligible appropriations to study the effectiveness of federal health programs and to identify improvements. Although the PHS Act limits the evaluation tap to no more than 1% of eligible appropriations, in recent years the annual Labor/HHS/ED appropriations act has specified a higher amount (2.5% in FY2015 and in FY2016) and directed specific amounts of funding from the evaluation tap for transfer to a number of HHS programs. The set-aside has the effect of redistributing appropriated funds for specific purposes among PHS and other HHS agencies. NIH, with the largest budget among the PHS agencies, has traditionally been the largest "donor" of program evaluation funds and, until recently, a relatively minor recipient.[69]

[67] Department of Health and Human Services, *Fiscal Year 2016 Budget in Brief*, Washington, DC, February 2, 2015, p. 45, http://www.hhs.gov/budget/fy2016/fy-2016-budget-in-brief.pdf.

[68] Mandatory funds for type 1 diabetes research under PHS Act §330B were provided by the Protecting Access to Medicare Act of 2014 (P.L. 113-93) in FY2015 and by the Medicare Access and CHIP Reauthorization Act of 2015 (P.L. 114-10) for FY2016 and FY2017.

[69] For FY2015, although NIH contributed an estimated $700 million to the tap, it received $715 million under P.L. 113-235, an increase over the $8.2 million NIH received in FY2014 and prior years from the transfer. P.L. 113-235 allocated the entire $715 million to the National Institute of General Medical Sciences (NIGMS), offsetting the more than $700 million reduction in discretionary budget authority for NIGMS in the law compared with its FY2014 funding level. By convention, budget tables such as **Table 10** do not subtract the amount of the evaluation tap from the donor agencies' appropriations. For further information on the PHS Evaluation Set-Aside, see CRS Report R43304, *Public Health Service Agencies: Overview and Funding (FY2010-FY2016)*, coordinated by C. Stephen Redhead and Agata Dabrowska.

Under the President's FY2016 budget request, most ICs would have received a 2% to 4% increase compared to FY2015 with few exceptions, such as a $70 million (6%) increase for the National Institute on Aging and a $57 million (17%) increase for the National Library of Medicine (NLM). The increase for NLM was targeted for the National Center for Biotechnology Information to support PubMed Central in providing public access to papers emanating from NIH research. The increase was also for ClinicalTrials.gov to accommodate the increased volume of clinical trial reporting due to a proposed expansion of NIH trial reporting policy and implementation of regulations related to the Food and Drug Administration Amendments Act of 2007 (FDAAA).[70]

Except for the mandatory diabetes funding, Congress does not usually specify amounts for particular diseases or research areas. Congress generally appropriates specific amounts to each IC and leaves it to NIH and its scientific advisory panels to allocate funding to different research areas.[71] Some bills may propose authorizations for designated research purposes, but funding generally remains subject to discretionary appropriations and the NIH peer review process.

The House Appropriations Committee-reported version of the FY2016 Labor/HHS/ED appropriations bill (H.R. 3020) would have provided NIH with a total of $31.184 billion, including $1.01 billion provided by the evaluation tap.[72] Adding to this total the amount for Superfund-related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would bring the FY2016 NIH program level to $31.411 billion.

The Senate Appropriations Committee-reported version of the FY2016 Labor/HHS/ED appropriations bill (S. 1695) would have provided NIH with a total of $32.084 billion, including $940 million provided by the evaluation tap and an estimated $650 million in new funding from the HHS Non-recurring Expenses Fund (NEF).[73] Adding to this total the amount for Superfund-related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would bring the FY2016 NIH program level to $32.311 billion.

The Consolidated Appropriations Act, 2016 (H.R. 2029, P.L. 114-113) provides $32.084 billion for NIH in Division H (the Labor/HHS/Education appropriations act): $31.304 billion for the ICs plus $780 million in funding via the PHS Act transfer. With the addition of the $77 million for

[70] NIH, *FY2016 Justification of Estimates for Appropriation Committees, Vol. V, National Library of Medicine*, p. NLM-6, at http://www.nlm.nih.gov/about/2016CJ_NLM.pdf.

[71] See NIH website, "Estimates of Funding for Various Research, Condition, and Disease Categories (RCDC)," http://report.nih.gov/categorical_spending.aspx.

[72] The House passed version of H.R. 3020 would have set the PHS evaluation tap assessment at not more than 2.4% or $1.068 billion, whichever is less.

[73] S. 1695 would have set the PHS evaluation tap assessment at not more than 2.5%, and the final bill set the tap for FY2016 at not more than 2.5% (P.L. 114-113). The HHS Secretary is authorized to transfer to the NEF unobligated balances of certain expired discretionary funds. Under current law, NEF funds are available until expended for use by the HHS Secretary for capital acquisitions including facility and information technology infrastructure. Congressional appropriators must be notified in advance of any planned use of NEF funds. NEF funds have been used by HHS for expenses related to the Affordable Care Act, such as the federally facilitated exchanges. (See CRS Report R43066, *Federal Funding for Health Insurance Exchanges*, by Annie L. Mach and C. Stephen Redhead.) The Senate Appropriations Committee-reported FY2016 Labor/HHS/ED appropriations bill included language that would have repurposed the NEF for NIH biomedical research activities. S.Rept. 114-74 stated on p. 105 that the NEF "funding shall be transferred to and merged with the accounts for the various" ICs and the OD "in proportion to their shares of total NIH appropriations made by this act." Note that the House Appropriations Committee-reported FY2016 Labor/HHS/ED appropriations bill would have terminated the NEF and rescinded unobligated balances. However, the FY2016 Consolidated Appropriations Act (P.L. 114-113) did not enact either of these proposals.

Superfund-related research and the $150 million in diabetes funding, the NIH program level is $32.311 billion in FY2016, an increase of $2 billion (7%) over FY2015.[74]

The overview below outlines research priorities in the FY2016 NIH budget and selected responses from the House and Senate appropriation committee report language as well as the explanatory statement that accompanies the final bill, H.R. 2029 (P.L. 114-113).[75]

BRAIN. About 54% of the proposed NIH budget focuses on basic biomedical and behavioral research. The Brain Research through Application of Innovative Neurotechnologies (BRAIN) Initiative is a collaborative effort with the National Science Foundation and the Defense Advanced Research Projects Agency. It develops and applies new tools for the study of complex brain functions. The Administration requested a $70 million increase over FY2015 for the NIH portion of BRAIN, bringing the total to about $135 million in FY2016. The House report on H.R. 3020 stated that it would provide an $85 million increase for BRAIN in FY2016.[76] The Senate report on S. 1695 stated that it supported a $70 million increase.[77] P.L. 114-113 provides an $85 million increase for BRAIN.

Alzheimer's Disease. To continue implementing the research components of the National Plan to Address Alzheimer's Disease (AD), NIH estimated it would spend $638 million on AD research in FY2016, an increase of $51 million over FY2015. In a section on the National Institute on Aging (NIA), the House report on H.R. 3020 specified funding for Alzheimer's disease research at $886 million, an increase of $300 million over FY2015. In contrast, the Senate report on S. 1695 stated, "In keeping with long-standing tradition, the Committee has not earmarked funding for research on specific diseases. However, the Committee has included a $350,971,000 increase for NIA and expects that a significant portion will be dedicated to high quality research on Alzheimer's disease, subject to the scientific opportunity presented in the peer review process."[78] The explanatory statement on H.R. 2029 (P.L. 114-113) states that an increase of $350 million is provided for Alzheimer's disease research.

Antimicrobial Resistance. NIH would target $461 million in FY2016 to support the Administration's National Strategy to Combat Antibiotic-Resistant Bacteria, an increase of $100 million over FY2015. The increase is supported by both House and Senate appropriation committees as well as the explanatory statement on H.R. 2029 (P.L. 114-113).

Precision Medicine Initiative (PMI). The FY2016 budget request proposed a total of $215 million for a multi-agency precision medicine initiative: $10 million to FDA to support the development of the necessary regulatory approaches, $5 million to the Office of the National Coordinator for Health Information Technology for developing relevant data privacy and sharing requirements, and $200 million to support biomedical research at NIH. Of the amount for NIH, $130 million is for the development of a national research cohort composed of 1 million or more volunteers. The cohort's health, genetic, environmental and other data would be collected and used in research studies to identify novel therapeutics and prevention strategies. The proposal would use existing smaller research cohorts rather than recruiting 1 million new participants. The National Cancer Institute would use the remaining $70 million of NIH funds to explore the

[74] Superfund amount provided by Division G of P.L. 114-113, the Department of the Interior, Environment, and Related Agencies Appropriations Act, 2016.

[75] The amounts discussed in the text below regarding the Administration's FY2016 request are based on the NIH section in *Fiscal Year 2016 Budget in Brief*, pp. 44-49, http://www.hhs.gov/budget/fy2016/fy-2016-budget-in-brief.pdf.

[76] H.Rept. 114-195, p. 57.

[77] S.Rept. 114-74, p. 9.

[78] S.Rept. 114-74, p. 95.

genetics of tumor cells that are resistant to therapy, to determine the efficacy of combination therapies that target specific tumor mutations, and for research on non-invasive methods to track response to cancer treatment. Both House and Senate appropriation committees indicated support for PMI and the explanatory statement states that it includes $200 million for PMI in FY2016.

Biomedical Research Workforce. NIH estimated it would spend $785 million—$23 million more than in FY2015—to support 15,735 individuals, with a 2% stipend increase for predoctoral and postdoctoral trainees, in its major research training program, the Ruth L. Kirschstein National Research Service Awards. The explanatory statement accompanying H.R. 2029 (P.L. 114-113) states it "expects NIH to support the number of Ruth L. Kirschstein National Research Service Awards and other training grants in proportion to at least the general IC level funding increase. The agreement expects NIH to provide a stipend level and inflationary increases to grantees that is at least consistent with any fiscal year 2016 Federal employee pay raise."

National Center for Biotechnology Information (NCBI). The explanatory statement accompanying H.R. 2029 (P.L. 114-113) indicates that funding is provided directly to NLM for NCBI "to meet the challenge of collecting, organizing, analyzing, and disseminating the increasing amounts of data related to research in molecular biology and genomics and to support the deposit of manuscripts in PubMed Central under the NIH Public Access Policy."

Pediatric Research. NIH estimated it would spend over $3.6 billion on pediatric research in FY2016, an increase of $75 million over FY2015. The $13 million authorized for pediatric research by the Gabriella Miller Kids First Research Act of 2014 (P.L. 113-94) would continue in FY2016. The House and Senate appropriation committees allocated $12.6 million for pediatric research via the Gabriella Miller Kids First Research Act as did the explanatory statement accompanying H.R. 2029 (P.L. 114-113) which encouraged NIH to prioritize research on childhood cancer and provide an update in the FY2017 NIH budget request.

National Children's Study. Both committees commented on the cancellation of the National Children's Study (NCS) by NIH in December 2014.[79] The House Appropriations Committee "directs and provides funding for the continuation of the NCS in an alternative form" while the Senate Appropriations Committee "urges NIH to recalibrate and realign the investment already made in the NCS to initiate new and focus existing longitudinal studies to address the objectives identified for the NCS."[80] The explanatory statement accompanying H.R. 2029 (P.L. 114-113) provides funding to the NIH Office of the Director for the follow-on to the NCS and "expects NIH to continue to move forward based on the directions provided by the Committees on Appropriations of the House of Representatives and the Senate."

Research Project Grants. The main funding mechanism for supporting NIH extramural research is research project grants (RPGs), which are competitive, peer-reviewed, and largely investigator-initiated. The FY2016 budget requested total funding for RPGs of $17.2 billion, representing about 55% of NIH's proposed budget. The request would support an estimated 35,447 RPG awards. Within that total, 10,000 would be competing RPGs, an increase of over 1,200 grants compared with FY2015. (Competing awards are new grants plus competing renewals of existing grants.) NIH estimated the average amount of a competing RPG in FY2016 would be about $461,000, up from about $457,000 in FY2015.

[79] National Institutes of Health, "Statement on the National Children's Study," press release, December 12, 2014, http://nih.gov/about/director/12122014_statement_ACD.htm.

[80] H.Rept. 114-195, p. 78; and., S.Rept. 114-74, p. 104.

Table 10. National Institutes of Health Funding

(budget authority, in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 H. Cmte.	FY2016 S. Cmte.	FY2016 Final
National Cancer Institute (NCI)	$4,950	$5,098	$5,082	$5,204	$5,215
National Heart, Lung, & Blood Institute (NHLBI)	2,998	3,072	3,035	3,136	3,116
Dental/Craniofacial Research (NIDCR)	400	407	405	415	416
Diabetes/Digestive/Kidney (NIDDK)[a]	1,750	1,788	1,771	1,825	1,818
Neurological Disorders/Stroke (NINDS)	1,605	1,660	1,656	1,695	1,696
Allergy/Infectious Diseases (NIAID)	4,359	4,615	4,513	4,710	4,630
General Medical Sciences (NIGMS)	1,656	1,587	1,429	1,571	1,732
Child Health/Human Development (NICHD)	1,287	1,318	1,306	1,345	1,340
National Eye Institute (NEI)	684	695	698	710	716
Environmental Health Sciences (NIEHS)	668	682	676	696	694
National Institute on Aging (NIA)	1,199	1,267	1,518	1,548	1,600
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	522	533	528	544	542
Deafness/Communication Disorders (NIDCD)	405	416	412	425	423
National Institute of Mental Health (NIMH)	1,463	1,489	1,512	1,520	1,548
National Institute on Drug Abuse (NIDA)	1,029	1,047	1,051	1,069	1,077
Alcohol Abuse/Alcoholism (NIAAA)	447	460	456	469	468
National Institute of Nursing Research (NINR)	141	145	143	148	146
National Human Genome Research Institute (NHGRI)	499	515	506	526	519
Biomedical Imaging/Bioengineering (NIBIB)	330	337	338	344	347
Minority Health/Health Disparities (NIMHD)	269	282	272	287	280
Complementary/Integrative Health (NCCIH)[b]	125	128	128	130	131
Advancing Translational Sciences (NCATS)	635	660	643	699	685
Fogarty International Center (FIC)	68	70	69	71	70
National Library of Medicine (NLM)	337	394	341	402	395
Office of Director (OD)	1,414	1,443	1,552	874	1,571
Buildings & Facilities (B&F)	129	129	133	129	129
Subtotal, Labor/HHS Appropriation	**29,369**	**30,237**	**30,174**	**30,494**	**31,304**
PHS Evaluation Tap funding[c]	715	847	1,010	940	780
Non-recurring Expenses Fund (NEF)				650	
Subtotal, NIH	**30,084**	**31,084**	**31,184**	**32,084**	**32,084**
Superfund (Interior appropriation to NIEHS)[d]	77	77	77	77	77
Pre-appropriated type 1 diabetes funds[e]	150	150	150	150	150
Total, NIH program level	**30,311**	**31,311**	**31,411**	**32,311**	**32,311**

Sources: H.Rept. 114-195, pp. 232-234; S.Rept. 114-74, pp. 231-233; and detailed tables of the explanatory statement accompanying H.R. 2029 (P.L. 114-113).

Notes: Totals may differ from the sum of the components due to rounding. Amounts in table may differ from actuals in many cases. By convention, budget tables such as **Table 10** do not subtract the amount of transfers, such as the evaluation tap, from the agencies' appropriation. CRS estimated the NIH contribution to the evaluation tap to be over $700 million for FY2015. FY2015 amounts do not include $238,000,000 for NIAID for research on Ebola that was provided in P.L. 113-235 (Title VI of Division G).

a. Amounts for NIDDK do not include mandatory funding for type 1 diabetes research (see note h).

b. Reflects name change from National Center for Complementary and Alternative Medicine to National Center for Complementary and Integrative Health; provision included in P.L. 113-235.

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

d. This is a separate account in the Interior/Environment appropriations for NIEHS research activities related to Superfund; H.Rept. 114-170, p. 77, S.Rept. 114-70, p. 5.

e. Mandatory funds available to NIDDK for type 1 diabetes research under PHS Act §330B (provided by P.L. 113-93 in FY2015 and P.L. 114-10 in FY2016).

Department of Energy[81]

The Department of Energy (DOE) was established in 1977 by the Department of Energy Organization Act (P.L. 95-91), which combined energy-related programs from a variety of other agencies with defense-related nuclear programs that dated back to the Manhattan Project. Today, DOE conducts basic scientific research in areas ranging from nuclear physics to the biological and environmental sciences, basic and applied R&D relating to energy production and use, and R&D on nuclear weapons, nuclear nonproliferation, and defense nuclear reactors. The department has a system of 17 national laboratories around the country, mostly operated by contractors, that together account for about 40% of all DOE expenditures.

The Administration requested $14.178 billion in FY2016 for DOE R&D and related activities, including programs in three major categories: science, national security, and energy. This request was 12.2% more than the FY2015 appropriation of $12.640 billion. The House bill (H.R. 2028 as passed by the House) would have provided $12.813 billion. The Senate bill (H.R. 2028 as reported in the Senate) would have provided $13.154 billion. The enacted omnibus bill (P.L. 114-113) provided $13.680 billion. (See **Table 11** for details.)

The request for the DOE Office of Science was $5.340 billion, an increase of 5.4% from the FY2015 appropriation of $5.068 billion. There is no authorized funding level for the Office of Science for FY2016. The most recent authorization act (the America COMPETES Reauthorization Act of 2010, P.L. 111-358) authorized appropriations through FY2013. The FY2016 budget request did not mention the Obama Administration's previous goal of doubling the combined funding of the Office of Science and two other agencies. (For more information on the doubling goal and how it has evolved, see "Efforts to Double Certain R&D Accounts.") The original target, announced by the Bush Administration in 2006, was to achieve the doubling in the decade from FY2006 to FY2016. The FY2016 request for the Office of Science was 47% more than its FY2006 baseline. The House bill would have provided $5.100 billion, 40% above the baseline. The Senate bill would have provided $5.144 billion, 42% above the baseline. The final bill provided $5.350 billion, 47% above the baseline.

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

The Office of Science includes six major research programs. The request for the largest program, Basic Energy Sciences (BES), was $1.849 billion, an increase of 6.7%. Within BES, a proposed increase of $62 million for continued construction of the Linac Coherent Light Source II (LCLS-II) was slightly less than previously projected; however, the projected future cost of completing the project in FY2017 through FY2019 increased. A proposed increase of $35 million for Scientific User Facilities was to support increased operating hours at multiple BES research facilities. Energy Frontier Research Centers were to increase by $10 million to support up to 10 new centers. The House bill would have provided $79 million less than the request, including $8 million less for LCLS-II construction, $57 million less for Scientific User Facilities, and $12 million less for Energy Frontier Research Centers. The Senate bill would have provided the requested amount for LCLS-II construction, but $5 million less than the request for the remainder of the program. As requested, the final bill provided $1.849 billion for BES. This total included the requested amount for LCLS-II construction and $15 million more than the request for Scientific User Facilities. The explanatory statement was silent regarding Energy Frontier Research Centers.

The request for High Energy Physics was $788 million, an increase of 2.9%. Within this program, a proposed increase of $15 million for continued construction of the Muon to Electron Conversion Experiment (Mu2e) was slightly less than was previously projected; however, the projected future cost of completing the project in FY2017 through FY2019 increased. In the program's three major experimental research areas, proposed increases for cosmic frontier physics and energy frontier physics were approximately offset by a proposed decrease for physics at the intensity frontier. The House bill would have provided $12 million less than the request, including $9 million less for accelerator stewardship. The Senate bill would have provided approximately the requested amount overall, with $10 million more for construction of the Long Baseline Neutrino Facility offset by $10 million less for research. Both bills would have funded Mu2e construction at the requested level. The final bill provided $795 million, an increase of $7 million above the request. This total included the requested amount for Mu2e construction and $10 million more than the request for construction of the Long Baseline Neutrino Facility.

The request for Nuclear Physics was $625 million, an increase of 4.9%.The proposed increases were to be spread across most areas of research and operations. The House bill would have provided $8 million less than the request, including $6 million less for operations at the Relativistic Heavy Ion Collider and $2 million less for construction of the Facility for Rare Isotope Beams. The Senate bill would have provided $33 million less than the request, including the requested amount for the Relativistic Heavy Ion Collider, $5 million less for the Facility for Rare Isotope Beams, and unspecified other reductions. The final appropriation was $617 million, or $8 million less than the request. The total included the requested amount for the Facility for Rare Isotope Beams. The explanatory statement also "encouraged" DOE to fund "optimal operations" at the Relativistic Heavy Ion Collider.

The request for Biological and Environmental Research (BER) was $612 million, an increase of 3.4%. This program consists of two roughly equal parts: Biological Systems Science and Climate and Environmental Sciences. Within Climate and Environmental Sciences, the request included an increase of $31 million for climate and Earth system modeling. The House bill would have provided $74 million less than the request. The House committee report did not specify how its recommended funding for Biological and Environmental Research should be allocated. It expressed support for the Biological Systems Science program and for climate modeling in academia in collaboration with NASA, but it was silent regarding the remainder of the Climate and Environmental Sciences program. The Senate bill would have provided $2 million less than the request, with the entire reduction allocated to Climate and Environmental Sciences. The final bill provided $609 million, or $3 million less than the request. The explanatory statement stated

that this total included the requested funds for Bioenergy Research Centers within Biological Systems Science, and "urged" DOE to "give priority to optimizing the operation of BER user facilities," but explicitly declined to give any other direction regarding BER.

The request for Advanced Scientific Computing Research was $621 million, an increase of 14.8%. Essentially the entire increase was to be allocated to the Research and Evaluation Prototypes program. This activity supports R&D partnerships with vendors to influence and accelerate critical technologies for next-generation systems, system integration research, and development and engineering efforts. The Advanced Scientific Computing Research program is the focus of exascale computing activities in the Office of Science, accounting for $178 million of the $209 million requested for this crosscutting initiative. The House bill would have provided $83 million less than the request for Advanced Scientific Computing Research. Although the House committee report expressed support for the exascale initiative, it stated that its recommendation included only $99 million for this purpose within the Office of Science. The Senate bill would have provided the requested amount for Advanced Scientific Computing Research. The Senate committee report "strongly supported" the exascale initiative and stated that its total recommendation for that purpose in the Office of Science was $158 million. The final bill provided $621 million as requested, including $158 million for the exascale initiative.

The request for Fusion Energy Sciences was $420 million, a decrease of 10.2%. Construction funding for the International Thermonuclear Experimental Reactor (ITER) was to be $150 million, the same as in FY2015. In 2008, the cost for the U.S. share of ITER, a multi-year international construction project, was estimated to be between $1.45 billion and $2.2 billion. Schedule delays, design and scope changes, and other factors have delayed formal approval of a revised cost estimate. According to DOE, the current best estimate of the total U.S. cost for ITER construction (which is 9.09% of the total international cost) is between $4 billion and $6.5 billion. In June 2014, the Government Accountability Office found that the cost of ITER has increased, its schedule has slipped, the international project schedule is "not reliable," and DOE can "only partially" influence the international project's performance.[82] All other major program areas in Fusion Energy Sciences were to decrease under the Administration's request. The Alcator C-MOD facility was to cease operations at the end of FY2016. The House bill would have provided $48 million more than the request. This increase would have gone entirely to the domestic portion of the program, as House funding for ITER would have been the same as the request. The Senate bill would have provided no funding for ITER, but the requested amount for the domestic program. The Senate committee report directed the Secretary of Energy "to work with the Department of State to withdraw from the ITER project." The final bill provided $438 million, including $35 million less than requested for ITER and $53 million more than requested for the domestic program. The bill required that

> not later than May 2, 2016, the Secretary of Energy shall submit to the Committees on Appropriations of both Houses of Congress a report recommending either that the United States remain a partner in the ITER project after October 2017 or terminate participation, which shall include, as applicable, an estimate of either the full cost, by fiscal year, of all future Federal funding requirements for construction, operation, and maintenance of ITER or the cost of termination.

The request for DOE national security R&D was $4.488 billion, a 9.0% increase from $4.119 billion in FY2015. In the Weapons Activities account, Advanced Simulation and Computing was to increase by $25 million, and Advanced Manufacturing Development was to increase by $23

[82] U.S. Government Accountability Office, *Fusion Energy: Actions Needed to Finalize Cost and Schedule Estimates for U.S. Contributions to an International Experimental Reactor*, GAO-14-499, June 5, 2014.

million. Funding for the Naval Reactors program was to rise by 11.5%, including increases for technology development, systems development, and facility operations and maintenance. Defense Nuclear Nonproliferation R&D was to increase by $26 million, but this was to result largely from a transfer of funding for materials characterization research and diagnostic equipment development to this account from Weapons Activities. The House bill would have provided $109 million less than the request for R&D in Weapons Activities, including $18 million less for Advanced Simulation and Computing, $16 million less for Advanced Manufacturing Development, and a number of other changes. It would have provided $53 million less than the request for Naval Reactors, including $30 million less for Development and $21 million less for Operations and Infrastructure. The Senate bill would have provided $67 million less than the request for R&D in Weapons Activities, including the requested amount for Advanced Simulation and Computing, $19 million less for Advanced Manufacturing Development, and other changes. It would have provided $75 million less than the request for Naval Reactors, including $14 million less for Development and $59 million less for two construction projects. The final bill provided $4.451 billion, or $37 million less than the request. It provided the requested amount for Naval Reactors and Defense Nuclear Nonproliferation R&D. Within Weapons Activities, it provided the requested amounts for Advanced Simulation and Computing and for Advanced Manufacturing Development.

The FY2016 request for DOE energy R&D was $4.350 billion, up 26.0% from $3.453 billion in FY2015. The request proposed to increase funding for R&D in the Office of Energy Efficiency and Renewable Energy (EERE) by 43.9%, with increases requested for all major EERE programs. Within EERE, the largest proposed increases were for Advanced Manufacturing ($404 million, up from $200 million in FY2015), Vehicle Technologies ($444 million, up from $280 million), Solar Energy ($337 million, up from $233 million), and Building Technologies ($264 million, up from $172 million). The request for Advanced Manufacturing was to support the establishment of two additional Clean Energy Manufacturing Innovation Institutes (see "National Network for Manufacturing Innovation"). The proposed increase for Nuclear Energy reflected a rescission of unobligated prior-year balances in FY2015; without this rescission, the FY2016 request for Nuclear Energy would have been a $6 million decrease. The request for Electricity Delivery and Energy Reliability R&D included an increase of $15 million for smart grid R&D and $10 million to establish a new program of R&D on transformer resilience and advanced components. Support for the Advanced Research Projects Agency–Energy (ARPA-E) was to increase by 16.1%. The balance of ARPA-E project funding was to shift from an equal distribution between Stationary Power Systems and Transportation Systems to approximately a 60:40 split. The House and Senate bills would both have rejected the Administration's proposed large increases in EERE programs, although the Senate bill would have provided more than the FY2015 enacted amount for most major EERE programs (with the exception of Wind Energy). Both bills would have provided more than the request for Fossil Energy R&D, more for Nuclear Energy, and less for ARPA-E. The final bill provided a total of $3.879 billion. Within this total, it provided more than either the House or Senate bill for EERE, but still less than the request, and more than the House or Senate bill or the request for Fossil Energy R&D, Nuclear Energy and Electricity Delivery and Energy Reliability R&D. For ARPA-E, the final bill provided $291 million, the same as the Senate bill.

Table 11. Department of Energy R&D and Related Activities

(budget authority in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 House	FY2016 Sen. Cte.	FY2016 Final
Science	**$5,068**	**$5,340**	**$5,100**	**$5,144**	**$5,350**[a]
Basic Energy Sciences	1,733	1,849	1,770	1,844	1,849
High Energy Physics	766	788	776	788	795
Biological and Environmental Research	592	612	538	610	609
Nuclear Physics	596	625	616	592	617
Advanced Scientific Computing Research	541	621	538	621	621
Fusion Energy Sciences	468	420	468	270	438
Other	373	425	394	419	421
National Security	**4,119**	**4,488**	**4,326**	**4,346**	**4,451**
Weapons Activities[b]	2,478	2,676	2,567	2,609	2,633
Naval Reactors	1,234	1,375	1,323	1,300	1,375
Defense Nuclear Nonproliferation R&D	393	419	419	419	419
Defense Environmental Cleanup Tech. Dev.	14	17	17	17	23
Energy	**3,453**	**4,350**	**3,387**	**3,664**	**3,879**
Energy Efficiency and Renewable Energy[c]	1,671	2,404	1,425	1,700	1,808[d]
Fossil Energy R&D	561	560	605	610	632
Nuclear Energy	833	908	936	950	986
Electricity Delivery & Energy Reliability R&D	108	153	141	113	162
Advanced Research Projects Agency–Energy	280	325	280	291	291
DOE, Total	**12,640**	**14,178**	**12,813**	**13,154**	**13,680**

Source: FY2015 enacted from P.L. 113-235 and explanatory statement, *Congressional Record*, December 11, 2014. FY2016 request from DOE FY2016 congressional budget justification, http://energy.gov/cfo/downloads/fy-2016-budget-justification. FY2016 House from H.R. 2028 as passed by the House and H.Rept. 114-91. FY2016 Senate Committee from H.R. 2028 as reported in the Senate and S.Rept. 114-54. FY2016 final from P.L. 114-113 and explanatory statement, *Congressional Record*, December 17, 2015.

Notes: Totals may differ from the sum of the components due to rounding. Amounts include rescissions and use of prior-year unobligated balances.

a. Does not reflect a rescission of $3.2 million from unobligated prior-year balances.

b. Including Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Science, Engineering except Enhanced Surety and Enhanced Surveillance; Inertial Confinement Fusion Ignition and High Yield; Advanced Simulation and Computing; and a prorated share of Readiness in Technical Base and Facilities (called in Infrastructure and Operations in some bills) and Infrastructure and Safety. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems. This table does not include these funds because detailed funding schedules for those subprograms are classified.

c. Excluding Weatherization and Intergovernmental Activities.

d. Does not reflect rescissions totaling $3.8 million from unobligated prior-year balances.

National Science Foundation[83]

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."[84] The NSF is a primary source of federal support for U.S. university research, especially in mathematics and computer science. It is also responsible for significant shares of the federal science, technology, engineering, and mathematics education program portfolio and federal STEM student aid and support.[85]

NSF has six major appropriations accounts: Research and Related Activities (RRA, the main research account), Education and Human Resources (EHR, the main education account), Major Research Equipment and Facilities Construction (MREFC), Agency Operations and Award Management (AOAM), the National Science Board (NSB), and the Office of Inspector General (OIG). FY2016 funding for these accounts is tracked in **Table 12**.

Overall. Division B of the Consolidated Appropriations Act, 2016 (P.L. 114-113) provides NSF with a total of $7.463 billion for FY2016, $119 million (2%) more than for FY2015 and $260 million (3%) less than the request.

The Obama Administration had requested $7.724 billion for the NSF in FY2016, a $379 million (5%) increase over the FY2015 estimate of $7.344 billion. Under the request, RRA would have increased by $253 million or 4%. EHR would have grown by nearly $100 million (11%).

In its budget documents NSF indicated that its FY2016 priorities include four programs that have been foundation priorities since at least FY2013: Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS, $257 million requested, 11% increase); Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21, $143 million requested, 11% increase); Science, Engineering, and Education for Sustainability (SEES, $81 million requested, 42% reduction); and Secure and Trustworthy Cyberspace (SaTC, $124 million requested, 1% increase). New priorities in FY2016 included Clean Energy Technology ($377 million, 2% increase), Innovation Corps (I-Corps, $30 million, 14% increase), NSF Research Traineeships (NRT, $62 million, 1% increase), and Research at the Interface of Biological, Mathematical, and Physical Sciences (BioMaPS, $33 million, 12% increase). NSF added Cognitive Science and Neuroscience to its priority list in FY2015, but removed it in FY2016.[86]

As passed by the House, H.R. 2578 (Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016) would have provided a total of $7.394 billion to NSF in FY2016. This amount was $50 million (1%) more than the FY2015 estimated funding level and $329 million (4%) less than the Administration request. The House bill would have kept most NSF accounts at FY2015 levels. The $50 million increase in total NSF funding would have accrued to RRA. (A

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

[84] The National Science Foundation Act of 1950 (P.L. 81-507).

[85] For more information about the NSF, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by Heather B. Gonzalez; and CRS Report R44170, *The National Science Foundation: FY2016 Budget Request and Funding History*, by Heather B. Gonzalez.

[86] In FY2016, NSF identifies cognitive science and neuroscience as elements of a cross-foundation investment called Understanding the Brain (UtB). The FY2016 request for UtB is $144 million, $38 million (35%) more than the FY2015 estimate of $106 million.

small increase in funding for the OIG would have been offset by a similar reduction in MREFC.) When it was reported from the House Committee on Appropriations, H.R. 2578 was accompanied by H.Rept. 114-130 (referred to as the "House report" in this section). The House report directed NSF to comply with Section 106 of H.R. 1806 (America COMPETES Reauthorization Act of 2015) as reported, which requires NSF to publicly articulate (in the award abstract from NSF's public awards database) how each award serves the national interest. The Obama Administration threatened to veto H.R. 2578 when it was considered by the House (for a variety of reasons, only some of which related to the NSF—see text box titled, "Veto?").[87]

Veto?

On June 1, 2015, the Obama Administration issued a "Statement of Administration Policy" on H.R. 2578, as considered by the House. That statement indicated that the Administration strongly opposed House passage of H.R. 2578 and that senior advisors would recommend a veto. The statement described a number of concerning provisions from the bill, most of which were not related to NSF. However, the statement also cited perceived insufficiencies in the NSF top line, as well as the allocation of RRA funding by discipline.[88]

As amended and reported by the Senate Committee on Appropriations, H.R. 2578 would have provided close to the FY2015 estimated funding levels to all major NSF accounts in FY2016. RRA and MREFC would have received slightly less than their FY2015 funding levels; OIG would have received slightly more. When it was reported from the Senate Committee on Appropriations, H.R. 2578 was accompanied by S.Rept. 114-66 (referred to as the "Senate report" in this section).

Research. P.L. 114-113 provides $6.034 billion for RRA for FY2016, $100 million (2%) more than in FY2015 and $153 million (2%) less than requested by the President. RRA directorate funding levels are not specified in the act and an NSF spending plan had not been submitted to the Appropriations committees at the time of this report's publication. The explanatory statement accompanying P.L. 114-113 directs that "in lieu of House language regarding funding percentages for certain activities … funds for Social, Behavioral and Economic Sciences shall be up to the fiscal year 2015 level [$272.2 million]."[89]

The act provides no less than $160.0 million for the Experimental Program to Stimulate Competitive Research (EPSCoR) program, $10 million less than requested and essentially the same as for FY2015. In addition, the act provides $147 million for neuroscience and cognitive science research under the NSF's Understanding the Brain activity, a part of the multi-agency Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative, equal to the amount recommended in the House report.

The Obama Administration had requested a $253 million (4%) increase in year-over-year funding for RRA in FY2016, for a total of $6.186 billion. H.R. 2578, as passed by the House, would have provided $5.984 billion to this account in FY2016. As amended and reported by the Senate Committee on Appropriations, H.R. 2578 would have provided $5.934 billion.

FY2015 House report language (H.Rept. 113-448) directed NSF to apply any additional appropriations (over FY2015 RRA requested levels) to four major RRA subaccounts: BIO, CISE, ENG, and MPS. NSF received $126 million more than requested for RRA in FY2015. As

[87] Executive Office of the President, Office of Management and Budget, "Statement of Administration Policy: H.R. 2578—Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016," June 1, 2015, at https://www.whitehouse.gov/sites/default/files/omb/legislative/sap/114/saphr2578r_20150601.pdf.

[88] Executive Office of the President, Office of Management and Budget, "Statement of Administration Policy: H.R. 2578—Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016," June 1, 2015, at https://www.whitehouse.gov/sites/default/files/omb/legislative/sap/114/saphr2578r_20150601.pdf.

[89] Explanatory statement, P.L. 114-113.

directed, NSF applied the additional funding to the specified major RRA subaccounts, which each received 3% to 4% increases over FY2015 requested levels. Funding for GEO, SBE, IIA/OISE, and USARC was at FY2015 requested levels.

The FY2016 request sought increases ranging from 2% to 8% for all major RRA subaccounts. However, the request seeks slightly more (on average, as a percentage over the prior year) for accounts that did not receive extra funding over requested levels in FY2015 (i.e., GEO, SBE, IIA/OISE, and USARC).[90] Nevertheless, more than half of the total requested increase for RRA in FY2016 (54% of $253 million) would have gone to BIO, CISE, ENG, and MPS.

H.R. 2578, as passed by the House, would have provided a total of $5.984 billion to RRA in FY2016—about $50 million more than the FY2015 estimate. The House report further directed NSF to provide no less than 70% of total FY2016 RRA funding to BIO, CISE, ENG, and MPS. Under these provisions, BIO, CISE, ENG, and MPS would have split $4.189 billion in FY2016. This amount represents an 8% increase ($307 million) over the combined total that these four major subaccounts received in FY2015 ($3.882 billion).

The remaining major RRA subaccounts (GEO, SBE, OISE, IA, and USARC) would have split $1.795 billion. This amount was $257 million or -13% less than the combined total these accounts received in FY2015 ($2.052 billion). Other House report provisions further directed NSF to provide at least FY2015 levels to OISE, IA, and USARC. Therefore, of the $1.795 billion total provided for GEO, SBE, OISE, IA, and USARC in the House report, at least $475 million would have gone to OISE, IA, and USARC, while GEO and SBE would have split $1.320 billion. GEO and SBE received $1.577 billion (combined) in FY2015, which is $257 million (16%) more than they would have received in FY2016 under the House report. If NSF distributed these funds proportionally, which the House report did not require but has been past practice at NSF in some instances, the 16% decrease in funding would have reduced support for GEO by $212 million (from $1.304 billion in FY2015 to $1.092 billion in FY2015) and would have reduced support for SBE by $44 million (from $272 million in FY2015 to $228 million in FY2016).

Funding for Major RRA Subaccounts?

Policymakers actively debate congressional funding directives at the major subaccount level in RRA. Some analysts assert that legislators have a role in establishing funding priorities by scientific field within RRA, as part of the legislative oversight function and in order to assure accountability for taxpayer funds. Other analysts argue that the scientists who manage NSF ought to determine the distribution of funding by field, based on their deeper knowledge of research needs and scientific possibilities within each field, and of how these needs are best balanced across the NSF portfolio.[91]

Other RRA provisions in the House report would have provided $147 million for the BRAIN initiative; $177 million for Advanced Manufacturing; and $50 million for the International Ocean Drilling Program (IOPD).

As amended and reported by the Senate Committee on Appropriations, H.R. 2578 would have provided $5.934 billion to RRA in FY2016—the same amount as the FY2015 estimate, $253 million less than the request, and $50 million less than the House. The Senate report was silent on the question of the distribution of funding by major subaccount within RRA. Provisions in the Senate report included $15 million for research in biomanufacturing; $159 million for cybersecurity research; and $10 million for a pilot program to provide research funding to

[90] The average requested percentage increase for BIO (2%), CISE (4%), ENG (6%), and MPS (2%) is 4%. The average requested percentage increase for GEO (5%), SBE (7%), IIA/OISE (8%), and USARC (5%) is 6%.

[91] CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by Heather B. Gonzalez.

Historically Black Colleges and Universities (HBCUs) from within RRA. (HBCUs already receive targeted funding through EHR.)

The House report would have provided $160 million for the EPSCoR program; the Senate report would have provided just under this amount. The Administration requested $170 million for EPSCoR in FY2016, $10 million (6%) more than the FY2015 estimated funding level of just under $160 million.

Education. P.L. 114-113 provides $880 million for EHR, $14 million (1.6%) more than in FY2015 and $153 million (2.5%) less than the request. EHR FY2016 funding includes $35 million for the Historically Black Colleges and Universities Undergraduate Program (HBCU-UP), equal to the House recommended level, and $3 million more than the FY2015 level, the FY2016 request, and the Senate committee-recommended level. The act also provides $46 million for the Louis Stokes Alliance for Minority Participation (LSAMP) and $14 million for the Tribal Colleges and Universities Program (T-CUP), an amount equal to the FY2015 level, the FY 2016request, and the House, and Senate committee-recommended levels. The act also provides $63 million for the Advancing Informal STEM Learning (AISL) program for FY2016, $8 million (13.6) more than in FY2015 and $3 million (4.2%) more than the request. The act also includes $50 million for CyberCorps: Scholarships for Service, $5 million (11.1%) more than the FY2015 and request levels.

The FY2016 request for EHR was $963 million, or $97 million more than the FY2015 estimated level of $866 million. Most of the requested increase ($81 million or 83%) would have gone to activities classified as R&D. This additional investment in R&D would have further shifted the balance between R&D and education and training within EHR.[92] The President's FY2016 request for EHR allocated 49% to R&D activities. By comparison, in FY2008 (the earliest year for which comparable budget data are available), R&D activities constituted 11% of EHR funding. The character of EHR's R&D funding has also shifted, moving from about 91% basic research in FY2008 to about 34% basic research in the FY2016 request.[93] It is not entirely clear what has driven these changes or how these changes have affected program activities and constituencies.[94]

By program, the largest increase in the FY2016 EHR request was for Improving Undergraduate STEM Education (IUSE).[95] The Administration requested $121 million in EHR funding for IUSE in FY2016, a $36 million (43%) increase over the FY2015 estimated level of $84 million. In addition, IUSE would have received $15 million in FY2016 RRA co-funding (from GEO, ENG, and BIO). The second-largest increase in the FY2016 EHR request was for EHR Core Research (ECR): STEM Learning, within the Division of Research on Learning in Formal and Informal Settings.[96] The FY2016 request for ECR:STEM Learning was $49 million, or $24 million (92%) more than the FY2015 estimate of $26 million.

[92] According to Office of Management and Budget (OMB) character classification definitions, most EHR funding goes to R&D or to education and training. The education and training classification includes scholarships, as well as operating assistance for schools and colleges. For more information, see OMB Circular A-11, Section 84, "Character Classification (Schedule C)" at http://www.whitehouse.gov/sites/default/files/omb/assets/a11_current_year/s84.pdf.

[93] CRS analysis of NSF budget data from annual NSF congressional budget justifications and materials.

[94] The NSF asserts that some of this change may be attributable to OMB-driven reclassification of EHR activities. However, some stakeholders perceive an increase in research requirements under EHR solicitations.

[95] According to the July 23, 2014, IUSE program solicitation (NSF14-588), two goals guide the IUSE program, "1) to promote the development, use, and testing of instructional practices and curricular innovations that engage and improve student learning and retention in STEM, and 2) to promote community and institutional transformation that will increase opportunities for the application of highly effective STEM teaching methods."

[96] Each EHR division has an ECR program. ECR:STEM Learning is in the Division of Research on Learning in Formal (continued...)

EHR programs that are widely tracked by congressional policymakers include the Graduate Research Fellowship (GRF) and National Research Traineeship (NRT). The FY2016 request for GRF was $338 million, $4 million (1%) over the FY2015 estimated level of $333 million. GRF funding have been split equally between RRA and EHR, which would each have contribute $169 million. The FY2016 request for NRT was $62 million, which is essentially the same as the FY2015 estimate. Funding for the NRT would not have been evenly split between EHR and RRA. The RRA contribution would have been $27 million, $7 million below the FY2015 estimate of $33 million. The EHR contribution would have been $35 million, $7 million above the FY2015 estimate of $28 million. EHR would have provided the majority of NRT program funding for the first time in at least five fiscal years.[97]

The House-passed and Senate Committee on Appropriations-reported versions of H.R. 2578 agreed on topline funding for EHR in FY2016. Each would have provided $866 million. This amount was equal to the FY2015 estimate and $97 million below the request.

Provisions in the House report included $66 million for the Advanced Technological Education (ATE) program—an amount equal to the FY2015 funding level, FY2016 request, and Senate report recommendation. The House report also recommended $65 million for AISL, $10 million more than the FY2015 estimate and $5 million more than both the FY2016 request and Senate report recommendation.

The Senate report recommended $61 million for the Robert Noyce Teacher Scholarship Program, equal to the FY2015 level and the FY2016 request; $45 million for Cybercorps: Scholarships for Service, an amount equal to the FY2015 estimate and FY2016 request; and $52 million for STEM+C Partnerships, $5 million less than the FY2015 estimate and equal to the FY2016 request. The House report was silent on these programs.

Broadening participation provisions in the House report would have provided $35 million for HBCU-UP. This amount was $3 million more than the FY2015 estimated funding level, the FY2016 request, and the Senate report recommendation. The House report also recommended $46 million for LSAMP and $14 million for T-CUP. These amounts were equal to the FY2015 estimated funding levels, FY2016 requests, and Senate report recommendations for these two programs.

The Senate report recommended $8 million for Alliances for Graduate Education and the Professoriate (AGEP) and $24 million for Centers for Research Excellence in Science and Technology (CREST). These amounts were the same as both the FY2015 estimated funding levels and FY2016 requests for these programs. The House report did not specify funding for these programs.

(...continued)

and Informal Settings (DRL). According to the October 24, 2014, ECR: STEM Learning program solicitation (NSF15-509), DRL's "ECR projects are grounded in theory, ask well formulated research questions, employ relevant data and analytic techniques, and contribute to the growing body of literature on STEM education research."

[97] Section 510 of the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) directed NSF to (1) provide for "equal treatment" of the GRF and NRT (previously called the Integrative Graduate Education and Research Traineeship or IGERT) in funding change decisions—such that increases or decreases to these programs would purportedly happen at the same rate—and (2), to ensure that at least 50% of GRF and NRT program funds come from the RRA account. (The other 50% would come from EHR.) However, there may be some ambiguity in the equal treatment provisions (see author for details); and provisions requiring NSF to support the GRF and NRT programs with at least 50% RRA funding applied only to the period between FY2011 and FY2013.

With respect to Hispanic Serving Institutions (HSIs), the Senate report would have provided $5 million for NSF to implement an HSI program. The House report would have required NSF to report on targeted funding opportunities (of at least $30 million) for HSIs. The budget request pledged to emphasize Hispanic-serving two-year colleges through existing programs, including ATE, IUSE, and LSAMP.

Construction. Other accounts that fund R&D at the NSF include the MREFC account, which supports large construction projects and scientific instruments. P.L. 114-113 provides $200.3 million for MREFC, an amount approximately the same as the FY2015 and request levels.

The Administration requested $200.3 million for MREFC in FY2016, which is close to the FY2015 estimate of $201 million. In FY2016, MREFC funding would pay for the final year of National Ecological Observatory Network (NEON) construction, and would provide ongoing support for the Large Synoptic Survey Telescope (LSST) and Daniel K. Inouye Solar Telescope (DKIST).[98]

Both the House-passed and Senate Committee on Appropriations-reported versions of H.R. 2578 would have provided approximately $200 million to MREFC in FY2016.

Too Few MREFC Projects?

Historically, the MREFC account has typically supported between four and six projects at a time. The FY2015 and FY2016 requests for three projects was lower than the historical trend, which could indicate that some potentially scientifically valuable projects are being delayed or overlooked. On the other hand, when these large projects come online their operations costs must be shouldered by research accounts. This can be seen in the FY2016 BIO request, which states that "NEON operations will represent a major change to the BIO portfolio, with up to 5.9% of BIO's total funding dedicated to operations and maintenance of the facility."[99] In a constrained budget environment, this dynamic could precipitate difficult choices between funding for research and funding research facilities and equipment.

Other accounts. The Consolidated Appropriations Act, 2016 provides $330 million for AOAM, $5 million (2%) more than the FY2015 level and $25 million (7%) less than the request; $4 million for the NSB, equal to the FY2015 and request levels; and $15 million for the OIG, $1 million (6%) above the FY2015 level and equal to the request.

The Administration requested $355 million, $4 million, and $15 million for AOAM, NSB, and OIG (respectively). Funding for AOAM would have been $30 million or 9% greater in FY2016 than it was in FY2015 ($325 million, estimated). The increase for AOAM was part of a multi-year plan to relocate NSF headquarters. Previous disputes between NSF and its labor unions over headquarters interior space allocations have been resolved. Funding for NSB would not have changed significantly between FY2015 and FY2016 under the request; funding for OIG would increase by about three-quarters of a million (5%). The House-passed and Senate Committee on Appropriations-reported versions of H.R. 2578 agreed on funding for AOAM ($325 million) and the NSB ($4 million); they differed slightly on funding for OIG. The House would have provided $15 million to OIG in FY2016, about $700,000 more than the Senate committee.

The FY2016 NSF budget request included funding for three multi-agency initiatives: National Nanotechnology Initiative (NNI, $416 million), Networking and Information Technology Research and Development (NITRD, $1.217 billion), and U.S. Global Change Research Program (USGCRP, $341 million). The NSF request for NNI was about the same as the FY2015 estimate,

[98] The Advanced Technology Solar Telescope was renamed the Daniel K. Inouye Solar Telescope in December 2013.

[99] National Science Foundation, *FY2016 Budget Request to Congress*, February 2, 2015, p. BIO-2.

NITRD would have increased by $31 million, and USGCRP would have received an additional $10 million in FY2016.

Table 12. NSF Funding by Major Account

(budget authority in millions of dollars)

Account	FY2015 Estimate	FY2016 Request	FY2016 House	FY2016 S. Cmte.	FY2016 Enacted
Research and Related Activities (RRA)					
Biological Sciences (BIO)	731.0	747.9	see note a	n/s	n/s
Computer and Information Science and Engineering (CISE)	921.7	954.4	see note a	n/s	n/s
Engineering (ENG)	892.3	949.2	see note a	n/s	n/s
Geosciences (GEO)	1,304.4	1,365.4	see note a	n/s	n/s
Mathematical and Physical Sciences (MPS)	1,336.7	1,366.2	see note a	n/s	n/s
Social, Behavioral, and Economic Sciences (SBE)	272.2	291.5	see note a	n/s	n/s
Office of International Science and Engineering (OISE)	48.5	51.0	see note a	n/s	n/s
Integrative Activities (IA)	425.3	459.2	425.3	n/s	n/s
U.S. Arctic Research Commission (USARC)	1.4	1.5	1.4	n/s	n/s
RRA, Subtotal	**5,933.7**	**6,186.3**	**5,983.6**	**5,933.6**	**6,033.6**
Education and Human Resources (EHR)	**866.0**	**962.6**	**866.0**	**866.0**	**880.0**
Major Research Equipment and Facilities Construction (MREFC)	**200.8**	**200.3**	**200.0**	**200.3**	**200.3**
Agency Operations and Award Management (AOAM)	**325.0**	**354.8**	**325.0**	**325.0**	**330.0**
National Science Board (NSB)	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**
Office of the Inspector General (OIG)	**14.4**	**15.2**	**15.2**	**14.5**	**15.2**
NSF, Total	**7,344.2**	**7,723.6**	**7,394.2**	**7,343.8**	**7,463.5**

Source: FY2016 *NSF Budget Request to Congress*; H.R. 2578, as passed by the House, and H.Rept. 113-130; as well as H.R. 2578, as amended and reported in the Senate, and S.Rept. 114-54; P.L. 114-113 and explanatory statement, *Congressional Record*, December 17, 2015.

Notes: Totals may differ from the sum of the components due to rounding. The term "n/s" means "not specified." The account structure in **Table 12** reflects the realignment (in FY2015) of OISE and IA as separate budget activities.

a. H.Rept. 114-130 directs NSF to ensure that the BIO, CISE, ENG, and MPS directorates receive 70% of the committee recommendation for RRA, or $4.189 billion, in FY2016. The remaining $1.795 billion would be distributed to the other RRA accounts: GEO, SBE, OISE, IA, and USARC. Of the $1.795 billion provided for GEO, SBE, OISE, IA, and USARC, $475 million would go to OISE, IA, and USARC. (This is because the House report further directs NSF to provide no less than the FY2015 estimate for OISE, IA, and USARC in FY2016.) The remaining funds, $1.320 billion, would go to GEO and SBE.

National Aeronautics and Space Administration[100]

In 1958, the National Aeronautics and Space Act (P.L. 85-568) created the National Aeronautics and Space Administration to conduct civilian space and aeronautics activities. NASA has research programs in planetary science, Earth science, heliophysics, astrophysics, and aeronautics, as well as development programs for future human spacecraft and for multipurpose space technology such as advanced propulsion systems. In addition, NASA operates the International Space Station as a facility for R&D and other purposes.

The Administration requested $17.282 billion for NASA R&D in FY2016. This amount was 3.0% more than the $16.784 billion NASA received for R&D in FY2015.[101] The House bill (H.R. 2578 as passed by the House) would have provided $17.275 billion. The Senate bill (H.R. 2578 as reported in the Senate) would have provided $17.143 billion. The final appropriation included $18.094 billion. For a breakdown of these amounts, see **Table 13**. NASA R&D funding comes through five accounts: Science, Aeronautics, Space Technology, Exploration, and the International Space Station portion of Space Operations. There is no authorized level for NASA funding in FY2016. The most recent authorization act (the NASA Authorization Act of 2010, P.L. 111-267) authorized appropriations through FY2013.

The FY2016 request for Science was $5.289 billion, an increase of 0.8%. The House bill would have provided $5.238 billion. The Senate bill would have provided $5.295 billion. The final appropriation was $5.589 billion.

In Planetary Science, the request included $30 million for formulation and development of a potential future mission to Jupiter's moon Europa. Congress provided $69.7 million in FY2013, $80 million in FY2014, and $100 million in FY2015 for formulation of a Europa mission, which was a high priority of the 2011 National Research Council (NRC) decadal survey of planetary science.[102] The NRC expressed reservations, however, at the mission's estimated cost of $4.7 billion, and in April 2014, NASA issued a request for information seeking Europa mission concepts costing less than $1 billion.[103] NASA expects to formulate cost and schedule range estimates for a Europa mission during FY2016; it notes that the "mission concept may require significant modification."[104] The House bill would have provided $140 million for a Europa mission. Other Planetary Science increases in the House bill (relative to the request) included an additional $36 million for Mars Exploration, $20 million for production of plutonium-238 by the Department of Energy for use as an energy source in future NASA spacecraft, and $19 million for the Lunar Reconnaissance Orbiter. The Senate bill would have provided $40 million less than the request for Planetary Science. The Senate committee report was silent on funding for a Europa mission, but directed NASA to use the Space Launch System (see below) to launch the mission. The final bill included $175 million for a Europa mission; the explanatory statement "clarified that this mission shall include an orbiter with a lander that will include competitively selected instruments and that funds shall be used to finalize the mission design concept with a target

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

[101] Based on $2.974 billion for the International Space Station in FY2015. See notes to **Table 13**.

[102] National Research Council, *Vision and Voyages for Planetary Science in the Decade 2013-2022* (National Academies Press, 2011). Available online at http://www.nap.edu/catalog.php?record_id=13117.

[103] National Aeronautics and Space Administration, "Europa Mission Concepts Costing Less than $1 Billion," solicitation NNH14ZDA008L, April 28, 2014. Available at https://nspires.nasaprs.com/external/solicitations/.

[104] NASA FY2016 congressional budget justification, p. PS-47.

launch date of 2022." Overall, the final bill provided $270 million more than the Administration had requested for Planetary Science.

Also in the Science account, the Administration requested an increase of 9.9% for Earth Science to support, among other initiatives, an expansion of the Sustainable Land Imaging program. Over several years, this program is to develop and launch the Landsat 9 land imaging satellite for the U.S. Geological Survey as a duplicate of the currently operational Landsat 8. The budget request also proposed development of a lower-cost Thermal Infrared Free Flyer satellite to reduce the risk of a gap in data availability prior to the launch of Landsat 9, and initiation of a technology development program to inform the future design of Landsat 10. The House bill would have provided $264 million less than the request for Earth Science, with no funds for the Thermal Infrared Free Flyer and $33 million for Landsat 9. The Senate bill would have provided $16 million less than the request for Earth Science. Like the House bill, it would have provided no funds for the Thermal Infrared Free Flyer, but it included $100 million for Landsat 9. The final bill included $26 million less than the request for Earth Science overall, including no funds for the Thermal Infrared Free Flyer but $100 million for Landsat 9.

In Astrophysics, also funded in the Science account, the request included $85.2 million for the Stratospheric Observatory for Infrared Astronomy (SOFIA). In the FY2015 budget, NASA proposed placing the SOFIA aircraft in storage unless international partners could support the U.S. share of its operating costs. Rejecting this proposal, the 113th Congress provided $70 million for SOFIA in FY2015 and directed NASA to "continue to seek partners to restore SOFIA to its full operational level." The House and Senate bills would both have provided the requested amount for SOFIA. The House bill would have prohibited NASA from using FY2016 funds to shut down SOFIA or prepare to shut it down. The final bill also provided the requested amount; the explanatory statement noted (and supported) NASA's decision not to include SOFIA in its FY2016 senior review, the process by which NASA determines whether to extend or terminate long-standing programs.

The FY2016 request for Aeronautics was $571 million, a decrease of 12.3%. This request followed an increase in FY2015 of nearly $100 million above the FY2015 request. NASA reorganized its aeronautics research in FY2015 to align with a new strategic vision announced in August 2013.[105] The proposed FY2016 budget for Aeronautics was to support new activities aligned with the research thrust areas identified in the strategic vision. The House bill would have provided $600 million for Aeronautics. The Senate bill would have provided $525 million. The final appropriation was $640 million.

The FY2016 request for Space Technology was $725 million, an increase of 21.6%. The request included an increase of $44 million for in-space technology demonstrations and an increase of $48 million for maturation of early-stage transformational technologies. Space Technology was first established as a separate account in FY2011. Each year since then, the Administration has proposed to increase Space Technology funding. Congress has provided increases each year except FY2014, but always less than the Administration's request. This pattern was repeated for FY2016. The House bill would have provided $625 million, including $25 million for icy satellite surface technology and $20 million for nuclear propulsion. The Senate bill would have provided $600 million, including $150 million for on-orbit satellite servicing and $20 million for the Flight Opportunities program. The final bill provided $687 million, including up to $20 million for nuclear propulsion, $133 million for satellite servicing, and $15 million for Flight Opportunities.

[105] See National Aeronautics and Space Administration, "NASA Introduces New Blueprint for Transforming Global Aviation," August 14, 2013, http://www.nasa.gov/aero/strategic_vision/.

The explanatory statement noted that $25 million for icy satellite surface technology was included in its provision for Planetary Science.

The FY2016 request for Exploration was $4.506 billion, an increase of 3.4%. This account funds development of the Orion Multipurpose Crew Vehicle and the Space Launch System (SLS) heavy-lift rocket, which the 2010 authorization act mandated for human exploration beyond Earth orbit. The account also previously funded development of a commercial crew transportation capability for future U.S. astronaut access to the International Space Station. The House bill would have provided $4.759 billion. The Senate bill would have provided $3.831 billion (not counting $900 million for the commercial crew program, which the Senate and final bills included in another account, as part of their funding for the International Space Station). The final bill provided $4.030 billion (not counting up to $1.244 billion for commercial crew).

Within Exploration, the request of $2.863 billion for Orion, the SLS, and related ground systems (known collectively as Exploration Systems Development) was a decrease of 11.8%, while the request of $1.244 billion for commercial crew was an increase of 54.5%. Other recent Administration budgets similarly proposed to decrease Exploration Systems Development funding while increasing commercial crew funding. Many in Congress have seen these proposals as evidence of a difference in human spaceflight priorities between Congress and the Administration. Congress has generally appropriated less than the Administration's request for commercial crew and more for Exploration Systems Development. This pattern was again evident in the House and Senate bills for FY2016: the House bill would have provided $3.409 billion for Exploration Systems Development and $1.000 billion for commercial crew, while the Senate bill would have provided $3.510 billion for Exploration Systems Development and $900 million (in a different account, as noted above) for commercial crew. The pattern was less clear in the final bill, which provided $3.680 billion for Exploration Systems Development in the Exploration account and "up to" the requested amount for commercial crew in a different account. NASA argued that the requested amount for commercial crew was necessary to maintain the scheduled availability of commercial crew transportation to the International Space Station (ISS) starting in 2017. It noted that without a U.S. commercial capability, it will need to pay Russia for additional Soyuz flights to transport U.S. ISS crews (although it has also stated that it will likely purchase some additional Soyuz flights in any case). It asserted that the schedule for initial operation of Orion and the SLS (NASA plans a first crewed test flight for 2023) depends primarily on testing and development schedules and would be difficult to accelerate, even with additional funds. Some congressional supporters of Orion and the SLS argued that those programs have not received the funds they need to stay on schedule.

Lastly, the Administration's FY2016 request included $3.106 billion for the ISS.[106] Funding for the ISS includes the cost of commercial cargo flights for ISS resupply, as well as the cost of Russian Soyuz flights for U.S. ISS astronauts. The House bill would have provided $3.076 billion. The Senate bill would have provided $3.952 billion. As noted above, $900 million of the Senate provision for the ISS would have been for the commercial crew program, which was funded under Exploration in FY2015, the FY2016 request, and the FY2016 House bill. In the final bill, up to $1.244 billion of the ISS provision was for commercial crew, and the total amount for the ISS was not specified.

[106] Neither P.L. 113-235 nor the accompanying explanatory statement specified FY2015 funding for the ISS. They identified only the amount for Space Operations, which includes funding for other (non-R&D) activities in addition to the ISS. The total FY2016 request for Space Operations was a 4.6% increase. Relative to NASA's April 2015 operating plan for FY2015, the FY2016 request for the ISS was a 4.4% increase.

Table 13. NASA R&D

(budget authority in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 House	FY2016 S. Cmte.	FY2016 Final
Science	**$5,244.7**	**$5,288.6**	**$5,237.5**	**$5,295.0**	**$5,589.4**
Earth Science	1,772.5	1,947.3	1,682.9	1,931.6	1,921.0
Planetary Science	1,437.8	1,361.2	1,557.0	1,321.0	1,631.0
Astrophysics	684.8	709.1	735.6	730.6	730.6
James Webb Space Telescope	645.4	620.0	620.0	620.0	620.0
Heliophysics	662.2	651.0	642.0	649.8	649.8
Education	42.0	—[a]	—[a]	42.0	37.0
Aeronautics	**651.0**	**571.4**	**600.0**	**524.7**	**640.0**
Space Technology	**596.0**	**724.8**	**625.0**	**600.0**	**686.5**
Exploration	**4,356.7**	**4,505.9**	**4,759.3**	**3,831.2**	**4,030.0**
Exploration Systems Development	3,245.3	2,862.9	3,409.3	3,510.0	3,680.0
Commercial Spaceflight	805.0	1,243.8	1,000.0	—[b]	—[c]
Exploration R&D	306.4	399.2	350.0	321.2	350.0
International Space Station	**—[d]**	**3,105.6**	**3,075.6**	**3,951.6[e]**	—[f]
Subtotal R&D	**13,822.3**	**14,196.3**	**14,297.4**	**14,202.5**	**15,131.9**
Non-R&D Programs[g]	1009.9	1,024.4	1,038.1	950.2	995.7
Safety, Security, and Mission Services[h]	2,758.9	2,843.1	2,768.6	2,784.0	2,768.6
Associated with R&D[i]	*2,571.1*	*2,651.8*	*2,581.2*	*2,609.4*	*2,597.7*
Construction & Environmental C&R	419.1	465.3	425.0	352.8	388.9
Associated with R&D[i]	*390.6*	*434.0*	*396.2*	*330.7*	*364.9*
NASA, Total (R&D)	**16,783.9**	**17,282.0**	**17,274.8**	**17,142.6**	**18,094.4**
NASA, Total	**18,010.2**	**18,529.1**	**18,529.1**	**18,289.5**	**19,285.0**

Sources: FY2015 enacted from P.L. 113-235 and explanatory statement, *Congressional Record*, December 11, 2014, Book II, at pp. H9348-H9349. FY2016 request from NASA's FY2016 congressional budget justification, http://www.nasa.gov/news/budget/. FY2016 House from H.R. 2578 as passed by the House and H.Rept. 114-130. FY2016 Senate from H.R. 2578 as reported in the Senate and S.Rept. 114-66. FY2016 final from P.L. 114-113 and explanatory statement, *Congressional Record*, December 17, 2015, Book II, at pp. H9741-H9743.

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

a. Included in Astrophysics. This item is distinct from the Education account, which is included in Non-R&D Programs, lower in the table.

b. $900.0 million included in International Space Station.

c. Up to $1,243.8 million included in International Space Station.

d. Not specified in P.L. 113-235 or the explanatory statement. The R&D totals shown lower in the table are calculated using the $2,973.9 million amount given in NASA's April 2015 operating plan.

e. Includes $900.0 million for Commercial Crew.

f. Includes up to $1,243.8 million for Commercial Crew. Total not specified in P.L. 114-113 or the explanatory statement. The R&D totals shown lower in the table are calculated using an estimate of $4,186.0 million (based on assuming the average of the House and Senate amounts for the remainder of Space Operations).

g. Space Operations other than International Space Station, Education, and Inspector General.

h. Formerly known as Cross-Agency Support.

i. CRS estimates the allocation between R&D and non-R&D in proportion to the underlying program amounts in order to allow calculation of a total for R&D. The Safety, Security, and Mission Services account and the Construction and Environmental Compliance and Remediation account consist mostly of indirect costs for other programs, assessed in proportion to their direct costs.

Department of Commerce

The Department of Commerce is a multi-faceted organization that engages in diverse policy and programmatic activities, including trade, technology, telecommunications, data collection and analysis, and the environment. The department's R&D activities are found primarily in the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA). This chapter addresses only DOC R&D funding at those two organizations.

National Institute of Standards and Technology[107]

An agency of the Department of Commerce, NIST has 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 methods and techniques that underpin U.S. commerce, technological progress, product reliability, manufacturing processes, and public safety. NIST is also responsible for developing, maintaining, and retaining custody of the national standards of measurement; providing the means and methods for making measurements consistent with those standards; and ensuring the compatibility of U.S. national measurement standards with those of other nations.

Total Funding. Division B of the Consolidated Appropriations Act, 2016 (P.L. 114-113) funds NIST at $964 million for FY2016, $100.1 million (11.6%) more than for FY2015 and $155.7 million (13.9%) below the request.

The President's budget request would have provided $1.120 billion for NIST in FY2016, an increase of $255.8 million (29.6%) over the FY2015 enacted appropriation. (See **Table 14**.) On June 3, 2015, the House approved the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2016 (H.R. 2578). The bill would have provided a total of $855.0 million for NIST, $8.9 million (1.0%) less than in FY2015 and $264.7 million (23.6%) less than the request. On June 11, 2015, the Senate Committee on Appropriations reported an amended version of H.R. 2578 accompanied by S.Rept. 114-66. The Senate committee-recommended funding level for NIST was $893.0 million, $29.1 million (3.4%) less than for FY2015, $226.7 million (20.2%) less than the request, and $38.0 million (4.4%) more than the House-passed level.

NIST funding is provided through three accounts: Scientific and Technical Research and Services (STRS), Industrial Technology Services (ITS), and Construction of Research Facilities (CRF).

Scientific and Technical Research and Services. P.L. 114-113 funds STRS at $690.0 million for FY2016, $14.5 million (2.1%) more than it received for FY2015 and $64.7 million (8.6%) less than the request.

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

The President's request included $754.7 million for R&D in the STRS account for FY2016, $79.2 million (11.7%) above FY2015 funding. According to NIST, activities in this account for which increased funding is requested for FY2016 include: advanced manufacturing, up $24 million; ensuring a world-class neutron research facility, up $11 million; disaster resilient buildings and infrastructure, up $10 million; advanced communications, up $9 million; cybersecurity, up $7 million; Smart Cities/cyber-physical systems, up $5 million; quantum information science, up $5 million; and a lab-to-market/technology transfer initiative, up $4 million.[108] The proposed increase for advanced manufacturing included additional funding of $10 million for the Manufacturing Genome Initiative, $5 million for advanced sensing, $5 million for manufacturing entrepreneurship, and $4 million for biomanufacturing.

The House-passed bill would have provided $675.0 million for the STRS account, slightly below the $675.5 million provided for FY2015 and $79.7 million (10.6%) below the request. Of this amount, the House committee report (H.Rept. 114-130) recommended $603.5 million for laboratory programs, including $6.5 million for ongoing activities of the National Strategy for Trusted Identities in Cyberspace (NSTIC); $55.0 million for standards coordination and special programs, including $5.0 million for forensic research and standards work; and no funding for the lab-to-market program. The House committee encouraged NIST to continue existing work in retail cybersecurity and retail supply chain management and logistics, as well as its cybersecurity-related measurement science, particularly as it relates to implantable medical devices. The House committee also expresses its support for NIST's work in windstorm research and disaster resiliency, advanced textile and apparel research and manufacturing activities, and neuroscience, and encouraged NIST to examine technical and workforce barriers to high volume additive manufacturing of metals.

The Senate committee report (S.Rept. 114-66), recommended $684.7 million for the STRS account, $9.2 million (1.4%) more than for FY2015, $70.0 million less (9.3%) than the request, and $9.7 million more (1.4%) than the House-passed level. The Senate committee report expressed its support for the Administration's request for cybersecurity funding, including $15.0 million for the National Cybersecurity Center of Excellence, $16.5 million for the NSTIC, $4.4 million for the National Initiative for Cybersecurity Education, and $72.7 million for cybersecurity R&D. The Senate committee report recommended the requested level of funding for Disaster Resilient Buildings and Infrastructure, $2.0 million more than the FY2015 funding level for NIST's Urban Dome program focused on accurate measurement science for environmental monitoring and human health in urban areas. The Senate committee report also encouraged NIST to propose funding in future budgets for additional centers of excellence in fields such as regenerative medicine and advanced photonics, and to investigate the development of new and better standards for testing sports equipment.

Industrial Technology Services. P.L. 114-113 funds ITS at $155.0 million for FY2016, $16.9 million (12.2%) more than it received for FY2015 and $151.0 million (49.3%) less than the request. The appropriation includes $130 million for the Manufacturing Extension Partnership (MEP) program, equal to FY2015 funding and $11 million (7.8%) less than the request, and $25 million for the National Network for Manufacturing Innovation (NNMI) which did not receive funding in FY2015. The explanatory statement accompanying the act directs NIST to merge the activities of the Advanced Manufacturing Technology Consortia (AMTech) program into the NNMI.

[108] Department of Commerce, National Institute of Standards and Technology, *Fiscal Year 2016 Budget Submission to Congress*, February 2015, http://www.osec.doc.gov/bmi/budget/FY16CJ/NIST-NTIS_FY_2016_CJ_Final_508_Compliant.pdf.

The President requested $306.0 million for the ITS account for FY2016, up $167.9 million (121.6%) from FY2016. The President's ITS request included $141.0 million for the MEP program (up $11.0 million, 8.5%, from FY2015), $15.0 million for AMTech, up $6.9 million, 85.2%, from FY2015, and $150.0 million for the NNMI.[109] The Revitalize American Manufacturing and Innovation Act of 2014 (RAMIA, Title VII of Division B of the Consolidated and Further Continuing Appropriations Act, 2015, P.L. 113-235) authorized the NMI with provisions largely mirroring the National Network for Manufacturing Innovation (NNMI) first proposed by President Obama in his FY2013 budget request and renewed in his FY2014 and FY2015 requests. RAMIA authorizes NIST to carry out the NMI program using $5 million per year for FY2015-FY2024 from funds appropriated to the ITS account. The act also authorizes DOE to transfer to NIST up to $250 million over the FY2015-FY2024 period from funds appropriated for advanced manufacturing R&D in the DOE Energy Efficiency and Renewable Energy account. The President's FY2016 budget also included a request for $1.9 billion in mandatory funding for NIST for the establishment of 29 additional centers between FY2017 and FY2024, bringing the total number of centers to 45.

The House-passed bill would have provided $130.0 million for the ITS account for FY2016, $8.1 million (5.9%) below the FY2015 level and $176.0 million (57.5%) below the request. The House-passed bill would have provided $130.0 million for the MEP program, an amount equal to its FY2015 level and $11.0 million (7.8%) below the request, and would have provided no funding for the AmTech program ($8.1 million in FY2015, $15.0 million in the request) or the Network for Manufacturing Innovation (no funding in FY2015, $150.0 million in the request). The House committee report recognizes the authority given NIST under RAMI to use unobligated balances for the NMI, but stated its expectation that such funds only be used for coordination of interagency activities in support of the institutes and only for activities authorized by RAMI. The House committee report also noted that NIST was authorized under RAMI to seek the use of unobligated balances in the DOE Energy Efficiency and Renewable Energy account for manufacturing innovation institutes and stated that NIST may pursue the use of such funds to establish and operate such institutes.

The Senate committee-recommended funding level for ITS was $145.0 million for FY2016, $6.9 million (5.0%) more than for FY2015, $161.0 million (52.6%) less than the request, and $15.0 million (11.5%) more than the House-passed level. Senate committee-recommended funding for ITS included $130.0 million for the MEP program and $15.0 million for the AmTech program. Within the funds provided for AmTech, the Senate committee recommended $5.0 million for competitive external grants for R&D and workforce training related to high-volume additive manufacturing of metals, and $5.0 million for NIST's role in coordinating the existing NNMI institutes but would have provided no funds for the establishment of any NIST-led NNMIs in FY2016.

[109] The President's FY2015 budget proposed the establishment of the NNMI to promote the development of manufacturing technologies with broad applications. This request was not part of the President's FY2015 base budget request, but rather a part of the adjunct $56 billion Opportunity, Growth, and Security Initiative (OGSI) proposal. The OGSI included $2.4 billion to establish up to 45 NNMI institutes. The President's FY2013 and FY2014 budget requests sought mandatory appropriations to NIST of $1 billion in support of up to 15 NNMI manufacturing innovation institutes. No funding was provided for the NNMI in FY2013, FY2014, or FY2015. For more information, see "National Network for Manufacturing Innovation."

Construction of Research Facilities. P.L. 114-113 funds CRF at $119.0 million for FY2016, $68.7 million (136.6%) more than it received for FY2015 and $60.0 million (101.7%) more than the request. Of the appropriated amount, NIST is to use $60.0 million "to begin the design and renovation of its outdated and unsafe radiation physics infrastructure."[110]

The President requested $59.0 million for the NIST CRF account, up $8.7 million (17.3%) over FY2015.[111] The House-passed bill would have provided $50.0 million for the CRF account, slightly less than the $50.3 million provided for FY2015 and $9.0 million (15.3%) less than the request. Of these funds, the committee directed NIST to use no less than $13.0 million to begin design and renovation of its radiation physics research laboratory (Building 245) in FY2016.

The Senate committee-recommended funding level for the CRF account was $63.3 million, $13.0 million (25.8%) more than for FY2015, $4.3 million (7.3%) more than the request, and $13.3 million (26.6%) more than the House-passed level.

NIST's extramural programs (currently the MEP and AMTech), which are directed toward increased private-sector commercialization, have been a source of contention. Some Members of Congress have expressed skepticism providing federal funds to industry for the development of what are termed "pre-competitive generic technologies." This skepticism, coupled with pressures to balance the federal budget, previously led to proposals for the elimination of NIST extramural activities. In 2007, similar concerns led to the Advanced Technology Program being terminated and replaced by the Technology Innovation Program, which operated until Congress withdrew its funding in FY2012.

Some supporters assert that some technologies are too high-risk or too costly for a single company, or even a group of companies, to develop on their own, even though the anticipated widespread economic and societal benefits may be expected to greatly exceed the development costs. In such cases, some supporters assert that a market failure exists resulting in the private sector underinvesting in the technologies providing a rationale for federal financial and other assistance.

As part of the American Competitiveness Initiative, announced in 2006, the Bush 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 and CRF accounts). In April 2009, President Obama indicated his decision to double the budget of key science agencies, including the NIST STRS and CRF accounts, over the next 10 years. In President Obama's FY2011 budget the time frame for doubling slipped to 11 years; his FY2012 budget was silent on a time frame for doubling. There is no mention of doubling or a time frame in the FY2016 budget request. For more information on the doubling effort, see "Efforts to Double Certain R&D Accounts."

[110] Explanatory statement, P.L. 114-113.

[111] Department of Commerce, National Institute of Standards and Technology, *Fiscal Year 2016 Budget Submission to Congress*, February 2015, http://www.osec.doc.gov/bmi/budget/FY16CJ/NIST-NTIS_FY_2016_CJ_Final_508_Compliant.pdf.

Table 14. NIST Appropriations

(budget authority, in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 House	FY2016 S. Cmte.	FY2016 Enacted
Base Budget					
Scientific and Technical Research and Services (STRS)	**$675.5**	**$754.7**	**$675.0**	**$684.7**	**$690.0**
Industrial Technology Services (ITS) [a]	**138.1**	**306.0**	**130.0**	**145.0**	**155.0**
Manufacturing Extension Partnership (MEP)	130.0	141.0	130.0	130.0	130.0
Adv. Mfg. Technology Consortia (AmTech)	8.1	15.0	0.0	15.0	
National Network for Mfg. Innovation (NNMI)	0.0	150.0	0.0	0.0	25.0
Construction of Research Facilities (CRF)	**50.3**	**59.0**	**50.0**	**63.3**	**119.0**
NIST, Total (Base Budget)	**$863.9**	**$1,119.7**	**$855.0**	**$893.0**	**$964.0**
Mandatory Funding					
Wireless Innovation (WIN) Fund	**$300.0**[b]	—[b]	—[b]	—[b]	—[b]
National Network for Manufacturing Innovation (NNMI)	**0**	**1,930.0**	**0**	**0**	**0**

Source: U.S. Department of Commerce, *Department of Commerce, Budget in Brief, Fiscal Year 2016,* http://www.osec.doc.gov/bmi/budget/FY16BIB/EntireDocument-WebVersionWithCharts.pdf; FY2016 Congressional Budget Justification for the National Institute of Standards and Technology/National Technical Information Service, http://www.osec.doc.gov/bmi/budget/FY16CJ/NIST-NTIS_FY_2016_CJ_Final_508_Compliant.pdf; H.R. 2578; H.Rept. 114-130; S.Rept. 114-66; and P.L. 114-113 and explanatory statement, *Congressional Record*, December 17, 2015..

Notes:

a. The Revitalize American Manufacturing and Innovation Act of 2014 authorizes NIST to use $5 million per year for FY2015-FY2024 from funds appropriated to its Industrial Technology Services account to carry out the Network for Manufacturing Innovation program. The act also authorizes the Department of Energy to transfer to NIST up to $250 million over the FY2015-FY2024 period from funds appropriated for advanced manufacturing R&D.

b. The spectrum auction authorized by the Middle Class Tax Relief and Job Creation Act of 2012 (P.L. 112-96) provided $300.0 million for NIST; these funds will be used in FY2015 and future years.

National Oceanic and Atmospheric Administration[112]

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.[113] The reorganization was intended to unify elements of the nation's environmental activities and to provide a systematic approach for monitoring, analyzing, and protecting the environment. One of the agency's main challenges is related to its diverse mission of science, service, and stewardship. A review of research undertaken by NOAA found, "The major challenge for NOAA is connecting the pieces of its research program and ensuring research is linked to the broader science needs of the agency."[114]

NOAA's Research Council has developed a five-year plan (2013-2017) to guide the agency's R&D efforts.[115] R&D efforts support the long-term goals and enterprise objectives of NOAA's *Next Generation Strategic Plan*.[116] The strategic plan is organized into four categories of long-term goals including (1) climate adaptation and mitigation, (2) a weather-ready nation,[117] (3) healthy oceans, and (4) resilient coastal communities and economies; and three groups of enterprise objectives including (1) stakeholder engagement, (2) data and observations, and (3) integrated environmental modeling. To achieve the strategic plan's goals and objectives, NOAA has identified gaps in knowledge and capabilities. NOAA's R&D plan attempts to address these gaps by asking key questions. Key questions are used in the plan to frame and organize R&D objectives and to identify tasks associated with achieving these objectives.

The R&D plan notes that it "contains many elements to pursue and efforts must be prioritized as funding will likely not be available for all topics at all times." The plan also describes how priorities are set during the annual planning season. Although the plan identifies many different NOAA R&D efforts, it does not consider the relative importance of these efforts and related funding needs. Another challenge identified in the NOAA R&D plan is the need to integrate the diverse perspectives and professional expertise required by the agency's mission. The plan states that "holistically understanding the earth system is not only understanding its individual components, but understanding and interpreting the way each of the components interact and behave as an integrated composite that is more than the sum of its parts."

For FY2016, President Obama requested $911.7 million in R&D funding for NOAA, an increase of $219.8 million (31.8%) above the FY2015 enacted level of $691.9 million. P.L. 114-113 funds NOAA R&D at $806.4 million, $105.3 million (11.5%) less than the FY2016 request and $114.5

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

[113] "Reorganization Plan No. 4 of 1970," 35 *Federal Register* 15627-15630, October 6, 1970; see also http://www.lib.noaa.gov/noaainfo/heritage/ReorganizationPlan4.html.

[114] Dr. Kathryn Sullivan, Under Secretary of Commerce for Oceans and Atmosphere and NOAA Administrator, *NOAA Response to the NOAA Science Advisory Board's Portfolio Review Task Force Report*, NOAA, April 15, 2014, http://www.sab.noaa.gov/Reports/2014/NOAA.Response.to.PRTF.Report_2014.04.15.pdf.

[115] NOAA, *Research and Development at NOAA*, Five-Year Research and Development Plan 2013-2017, Washington, DC, 2014, http://nrc.noaa.gov/CouncilProducts/ResearchPlans/5YearRDPlan/NOAA5YRPHome/Preface/Purpose.aspx.

[116] NOAA, *NOAA's Next-Generation Strategic Plan*, Silver Spring, MD, December 2010, http://www.ppi.noaa.gov/wp-content/uploads/NOAA_NGSP.pdf.

[117] According to NOAA a weather-ready nation is envisioned as a society that is prepared for and responds to weather-related events.

million (16.5%) more than the FY2015 enacted funding level. In FY2016, R&D accounts for 14.0% of NOAA's total funding. R&D funding for FY2016 consists of $478.7 million for research (59.4% of total R&D funding), $81.3 million for development (10.1%), and $246.3 million for R&D equipment (30.5 %).[118] Most of the $98.0 million increase for R&D equipment will be used for NOAA vessel construction and fleet improvements.

NOAA's administrative structure is organized by five line offices that reflect its diverse mission: 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). **Table 15** provides R&D funding levels by line office for FY2015, the FY2016 request, and FY2016 enacted.[119]

The Office of Oceanic and Atmospheric Research is the primary center for R&D within NOAA. In FY2016, OAR accounts for 54.7% of NOAA's total R&D funding. P.L. 114-113 provides OAR with $441.4 million to fund R&D, an increase of $29.9 million (7.3%) above the FY2015 enacted funding level of $411.5 million.[120]

Funding for NOAA R&D is included in line items that also include non-R&D activities; therefore, it is not possible to identify precisely how much of the funding provided in appropriations laws is allocated to R&D. In general, R&D funding levels are known only after NOAA allocates its appropriations to specific activities and reports those figures.

OAR conducts research in three major areas which include weather and air chemistry; climate; and oceans, coasts, and the Great Lakes. A significant portion of these efforts is implemented through partnerships between NOAA and cooperative research institutes and the National Sea Grant College Program. NOAA supports 16 cooperative research institutes that work with seven NOAA laboratories in all three of the main OAR research areas. The President's FY2016 request would have funded the cooperative institutes with a total of $165.6 million, $8.6 million (5.5%) more than the FY2015 enacted funding level of $157.0 million. The House-passed bill would have funded the cooperative institutes with a total of $155.0 million, $10.6 million (6.4%) less than the FY2016 request and $2.0 million (1.3%) less than the FY2015 enacted funding level. The Senate committee-reported bill would have funded the cooperative institutes with a total of $162.0 million, $7.0 million (4.5%) more than the House-passed bill, $3.6 million (2.2%) less than the FY2016 request, and $5.0 million (3.2%) more than the FY2015 enacted funding level. P.L. 114-113 funds the cooperative institutes with a total of $168.0 million, $6.0 million (3.7%) more than the Senate committee-reported bill, $13.0 million (8.4%) more than the House-passed bill, $2.4 million (1.4%) more than the FY2016 request, and $11.0 million (7.0%) more than the FY2015 enacted funding level.

The National Sea Grant College Program is composed of 33 university-based state programs. Sea Grant programs support scientific research and engage constituents to identify and solve problems faced by coastal communities. The President's FY2016 request would have provided the National Sea Grant College Program with a total of $68.5 million, $1.2 million (1.8%) more than the FY2015 enacted funding level of $67.3 million. The House-passed bill would have funded Sea Grant with a total of $64.8 million, $3.7 million (5.3%) less than the FY2016 request, and $2.5

[118] Vicki Sschwantes, NOAA Budget Office, email to CRS, February 10, 2016.

[119] Ibid.

[120] Ibid.

million (3.7%) less than the FY2015 enacted funding level. The Senate committee-reported bill would have funded Sea Grant with a total of $72.8 million, $8.0 million (12.4%) more than the House-passed bill, $4.4 million (6.6%) more than the FY2016 request, and $5.5 million (8.2%) more than the FY2015 enacted funding level.[121] P.L. 114-113 funds Sea Grant with a total of $73.0 million, $0.2 million (0.3%) more than the Senate committee-reported bill, $8.2 million (12.7%) more than the House-passed bill, $4.5 million (6.6%) more than the FY2016 request, and $5.7 million (8.5%) more than the FY2015 enacted funding level.

Table 15. NOAA R&D

(budget authority, in millions of dollars)

	FY2015 Actuals	FY2016 Request	FY2016 House[a]	FY2016 S. Cmte.[a]	FY2016 Enacted
National Ocean Service (NOS)	$70.7	$77.9	n/a	n/a	$75.0
National Marine Fisheries Service (NMFS)	88.9	76.8	n/a	n/a	70.9
National Weather Service (NWS)	17.1	26.1	n/a	n/a	26.2
National Environmental Satellite, Data, and Information Service (NESDIS)	23.9	25.9	n/a	n/a	26.0
Office of Marine and Aviation Operations[b] (OMAO)	79.8	233.9	n/a	n/a	166.9
Office of Oceanic and Atmospheric Research (OAR)	411.5	471.1	n/a	n/a	441.4
Total, R&D	**691.9**	**911.7**	**n/a**	**n/a**	**806.4**
OAR Total, R&D and Non-R&D[c]	**446.3**	**507.0**	**430.7**	**456.1**	**482.0**
NOAA Total, R&D and Non-R&D	**5,441.0**	**5,974.7**	**5,169.3**	**5,381.6**	**5,765.6**

Source: Vicki Schwantes, NOAA Budget Office, email to CRS concerning NOAA R&D, February 10, 2016.

Notes:

a. House-passed and Senate committee-reported bills do not provide funding levels for R&D.

b. All Office of Marine and Aviation Operations funding is for equipment related to R&D.

c. OAR and NOAA funding totals are provided for context.

Department of Agriculture[122]

The U.S. Department of Agriculture (USDA) was created in 1862 in part to support agricultural research in an expanding, agriculturally dependent country. USDA conducts intramural research at federal facilities with government-employed scientists, and supports external research at universities and other facilities through competitive grants and formula-based funding. The breadth of contemporary USDA research spans traditional agricultural production techniques, organic and sustainable agriculture, bioenergy, nutrition needs and composition, food safety, animal and plant health, pest and disease management, economic decisionmaking, and other social sciences affecting consumers, farmers, and rural communities.

[121] The Sea Grant Program funding level includes Sea Grant base and aquaculture research funding.

[122] This section was written by Jim Monke, Specialist in Agricultural Policy, CRS Resources, Science, and Industry Division.

Four agencies carry out USDA's research and education activities, grouped together into the Research, Education, and Economics (REE) mission area. The agencies are the Agricultural Research Service (ARS), National Institute of Food and Agriculture (NIFA), National Agricultural Statistics Service (NASS), and Economic Research Service (ERS).[123]

For FY2016, the USDA research mission area receives $2.936 billion in the omnibus appropriation, an increase of $211 million over FY2015. Most of the increase is for ARS buildings and facilities ($167 million) and the flagship NIFA competitive grant program ($25 million), while most other accounts are held constant or nearly constant compared to FY2015. The enacted appropriation, like the House and Senate bills, does not follow most of the proposed changes in priorities in the Administration's request. (See **Table 16**.)

Agricultural Research Service

The Agricultural Research Service is USDA's in-house basic and applied research agency. It operates approximately 90 laboratories nationwide with about 7,400 employees. ARS also operates the National Agricultural Library, one of the Department's primary information repositories for food, agriculture, and natural resource sciences. ARS laboratories focus on efficient food and fiber production, development of new products and uses for agricultural commodities, development of effective controls for pest management, and support of USDA regulatory and technical assistance programs.

For FY2016, the enacted appropriation provides $1.144 billion for ARS salaries and expenses, an increase of $11 million over FY2015 (1%). The President had requested a 5% increase for salaries and expenses.

ARS had proposed increases across several programmatic areas for prioritized research projects, coupled with reductions in funding for several existing programs. Both the House and Senate committees expressly rejected many, if not most, of those specific reductions and reprogramming.

The explanatory statement for the omnibus and the individual committee reports address deficient animal welfare conditions that were uncovered at ARS research facilities, particularly at the ARS Meat Animal Research Center in Nebraska.[124] In the appropriations act and via report language, Congress instructs ARS to comply with Animal Welfare Act standards, allow animal welfare inspections by a USDA sister agency (Animal and Plant Health Inspection Service, APHIS), review and update its own animal care policies, and certify progress with the committees. Also, via explanatory statements for the Office of the Secretary, all House and Senate requirements on this issue are to be followed, thus including House report language that further withholds 5% of the ARS appropriation until USDA certifies that it has updated its policies and has functioning Institutional Animal Care and Use Committees.

For the ARS buildings and facilities account, the enacted appropriation provides $212 million, an increase of $167 million over FY2015 for an account which had received no appropriation for several years. As in FY2015, the funding is to be used for priorities that are identified in the "USDA ARS Capital Investment Strategy."[125] ARS' top facilities priorities are the construction of

[123] For background on agricultural research, see CRS Report R40819, *Agricultural Research: Background and Issues*, by Jim Monke. For background on FY2016 agricultural appropriations, see CRS Report R44240, *Agriculture and Related Agencies: FY2016 Appropriations*, coordinated by Jim Monke.

[124] See CRS Report R44091, *Meat Animal Research Center: The Animal Welfare Act and Farm Animal Research*, by Tadlock Cowan and Joel L. Greene.

[125] USDA-ARS, *The USDA Agricultural Research Service Capital Investment Strategy*, April 2012, at http://www.ars. (continued...)

a biocontainment laboratory at its poultry research facility in Athens, GA ($145 million); a foreign disease-weed science facility in Frederick, MD ($70 million); and an animal science, human nutrition and bee research center in Beltsville, MD ($33 million).

National Institute of Food and Agriculture

The National Institute of Food and Agriculture provides federal funding for research, education, and extension projects conducted in partnership with the State Agricultural Experiment Stations, the State Cooperative Extension System, land grant universities, colleges, and other research and education institutions, as well as individual researchers. These partnerships include the 1862 land-grant institutions, 1890 historically black colleges and universities (HBCUs), 1994 tribal land-grant colleges, and Hispanic-serving institutions.[126] Federal funds enhance capacity at universities and institutions by statutory formula funding, competitive awards, and grants.

For FY2016, the enacted appropriation provides $1.327 billion for NIFA, an increase of $37 million over FY2015 (2.9%). The President had requested $1.503 billion for NIFA.

USDA had proposed to merge NIFA's three primary accounts (Research and Education, Extension, and Integrated Activities) into a single NIFA-wide account. Congress effectively rejected that proposal by continuing to fund each of the accounts separately as in past years.

The Agriculture and Food Research Initiative (AFRI)—USDA's flagship competitive grants program with 25% of NIFA's total budget—receives $350 million, an increase of $25 million over FY2015 but less than the $125 million increase requested by the President.

Formula-funded programs are held constant, with the exception of Evans-Allen funding for historically black colleges and universities, which receive a $1.7 million increase (3%). The omnibus rejects an Administration's proposal that would have added a competitive portion to the normally formula-funded "capacity awards" programs such as the Hatch Act. The House report noted a lack of state matching funding for some historically black colleges and universities and directed USDA to develop a plan to work with the states to meet the matching requirements.[127]

The explanatory statement continues to direct that not less than 15% of NIFA's competitive research grant funds be used for the USDA agriculture research enhancement awards program, including USDA-EPSCoR.

The Administration had proposed $80 million to establish two new "Innovation Institutes" at USDA as part of its multiagency National Network for Manufacturing Innovation. (For additional information, see "National Network for Manufacturing Innovation.") These public-private institutes were to research challenges such as biomanufacturing and nanocellulosics. Like last year, the enacted appropriation ignores this proposal.

The President's request would have consolidated federal STEM education funding so that USDA would no longer provide Higher Education Challenge Grants, Graduate and Post-graduate Fellowship Grants, Higher Education Multicultural Scholars Program, Women and Minorities in

(...continued)

usda.gov/sp2UserFiles/Subsite/ARSLegisAffrs/USDA_ARS_Capital_Investment_Strategy_FINAL_eeo.pdf.

[126] The numbers 1862, 1890, and 1994 in this context refer to the years that laws were enacted creating these classifications of colleges and universities, not to the number of institutions.

[127] Association of Public and Land-Grant Universities, *Land-Grant but Unequal: State One-to-One Match Funding for 1890 Land-Grant Universities*, September 2013, at http://www.aplu.org/library/land-grant-but-unequal-state-one-to-one-match-funding-for-1890-land-grant-universities/file.

STEM Program, Agriculture in the Classroom, and Secondary/Postsecondary Challenge Grants. (See "Reorganization of STEM Education Programs.") The appropriation rejects that proposal and continues to fund the programs in USDA at FY2015 levels.

National Agricultural Statistics Service

The National Agricultural Statistics Service (NASS) conducts the Census of Agriculture and provides official statistics on agricultural production and indicators of the economic and environmental status of the farm sector. For FY2016, the appropriation provides NASS $168 million, a decrease of 4 million (2%) from FY2015. The President's request was $180 million, which would have been an increase of 5% over FY2015.

Economic Research Service

The Economic Research Service supports economic and social science information analysis on agriculture, rural development, food, commodity markets, and the environment. It collects and disseminates data concerning USDA programs and policies to various stakeholders. For FY2016, the appropriation provides ERS $85 million, which is the same as FY2015. USDA had requested $86 million.

Table 16. U.S. Department of Agriculture R&D

(budget authority in millions of dollars)

Agency or Major Program	FY2015 Enacted	FY2016 Request	FY2016 H. Cmte.	FY2016 S. Cmte.	FY2016 Final
Agricultural Research Service (ARS)	1,132.6	1,191.5	1,122.5	1,136.8	1,143.8
Buildings and Facilities	45.0	205.9	45.0	0.0	212.1
Subtotal, ARS	**1,177.6**	**1,397.4**	**1,167.5**	**1,136.8**	**1,355.9**
National Institute of Food and Agriculture (NIFA)					
Research and Education					
AFRI (competitive grants)	*325.0*	*450.0*	*335.0*	*325.0*	*350.0*
Hatch Act (1862 institutions)	*243.7*	*243.7*	*243.7*	*243.7*	*243.7*
Evans-Allen (1890s institutions)	*52.5*	*58.0*	*52.5*	*52.5*	*54.2*
McIntire-Stennis (forestry)	*34.0*	*34.0*	*34.0*	*34.0*	*34.0*
Innovation Institutes	—	*80.0*	—	—	—
Other	*131.7*	*132.9*	*116.4*	*135.9*	*137.8*
Subtotal	**786.9**	**998.6**	**781.5**	**791.1**	**819.7**
Extension					
Smith-Lever (b) & (c)	*300.0*	*300.0*	*300.0*	*300.0*	*300.0*
Smith-Lever (d)	*85.5*	*85.7*	*85.5*	*102.7*	*85.5*
Other	*86.2*	*89.8*	*86.5*	*86.2*	*90.4*
Subtotal	**471.7**	**475.6**	**472.1**	**488.9**	**475.9**
Integrated Activities	**30.9**	**28.9**	**30.9**	**13.7**	**30.9**
Subtotal, NIFA	**1,289.5**	**1,503.1**	**1,284.5**	**1,293.7**	**1,326.5**

Agency or Major Program	FY2015 Enacted	FY2016 Request	FY2016 H. Cmte.	FY2016 S. Cmte.	FY2016 Final
National Agricultural Statistics Service (NASS)	**172.4**	**180.3**	**161.2**	**168.1**	**168.4**
Economic Research Service (ERS)	**85.4**	**86.0**	**78.1**	**85.4**	**85.4**
Total, USDA Research Mission Area	**2,724.9**	**3,166.9**	**2,691.2**	**2,684.0**	**2,936.2**

Source: CRS, compiled from H.R. 3049 (H.Rept. 114-205), S. 1800 (S.Rept. 114-82), and tables in the joint explanatory statement for P.L. 113-235 and P.L. 114-113.

Notes: Components may not add to subtotals.

Department of the Interior[128]

The Department of the Interior (DOI) was created to protect and manage the nation's natural resources and cultural heritage and provides scientific and other information about those resources. DOI's responsibilities include, among other things, mapping; geological, hydrological, and biological science; migratory bird and wildlife conservation; endangered species preservation; surface-mined lands protection and restoration; and historic preservation.[129]

The Administration requested $1.075 billion in DOI R&D funding for FY2016, which was $140.2 million (15.0%) above its FY2015 enacted level of $934.6 million.[130]

According to DOI,

> Activities supported by this [R&D] funding range from scientific observations of the Earth and its systems—including water, wildlife, and plants—to applied field research to better address specific problems such as sea level rise, invasive species, and drought. This research reflects and informs the expertise of Interior's land managers who are on the front lines of a changing climate and confronting the unpredictable nature of its impacts.[131]

Of the R&D funding requested for FY2016, 5.6% was for basic research, 81.4% was for applied research, and 13.0% was for development. The U.S. Geological Survey (USGS) is the only DOI component that conducts basic research.[132]

Division G of the Consolidated Appropriations Act, 2016 (P.L. 114-113) provides DOI $963.5 million for FY2016, $26.7 million (2.9%) more than for FY2015 (actual) and $111.3 million (10.4%) below the request.[133]

Funding for DOI R&D is generally included in appropriations line items that also include non-R&D activities; therefore, it is not possible to identify precisely how much of the funding that

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

[129] Department of the Interior, *Strategic Plan for Fiscal Years 2014-2018*, http://www.doi.gov/pmb/ppp/upload/DOI-Strategic-Plan-for-FY-2014-2018-POSTED-ON-WEBSITE.pdf.

[130] Email correspondence between the DOI budget office and CRS.

[131] Department of the Interior, *Fiscal Year 2016: The Interior Budget in Brief*, February 2015, p. DH-50, http://www.doi.gov/budget/appropriations/2016/highlights/upload/2016_Highlights_Bookv3.pdfhttp://www.doi.gov/budget/appropriations/2015/highlights/upload/2015_Highlights_Book.pdf.

[132] Email correspondence between the DOI budget office and CRS.

[133] Email communications between DOI and CRS on February 9, 2016.

would be provided by appropriations bills is allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOI components allocate their final appropriations to specific activities and report those figures.

U.S. Geological Survey

The U.S. Geological Survey was established by Congress on March 3, 1879, to support the mission of the Department of the Interior and its science requirements. The USGS also works in collaboration with other federal, state, and tribal cooperators to conduct research and provide scientific data and information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

A single account, Surveys, Investigations, and Research (SIR), provides all USGS funding including R&D and non-R&D activities. USGS R&D is conducted under seven SIR activity/program areas: Ecosystems; Climate and Land Use Change; Energy, Minerals, and Environmental Health; Natural Hazards; Water Resources; Core Science Systems; and Science Support.

Division G of the Consolidated Appropriations Act, 2016 provides USGS $676.9 million for FY2016, $11.1 million (1.7%) more than in FY2015 (actual) and $84.2 million (11.1%) less than the request.

The President's total FY2016 budget request for USGS (i.e., SIR account) was $1.104 billion. Requested SIR funding included $761.1 million for R&D, an increase of $95.3 million (14.3%) over the FY2015 level of $665.8 million. This total included $176.3 million for Ecosystems, up $19.3 million (12.3%); $140.1 million for Climate and Land Use Change, up $40.1 million (40.1%); $103.3 million for Energy, Minerals, and Environmental Health, up $11.0 million (12.0%); $116.9 million for Natural Hazards, up $5.6 million (5.1%); $128.2 million for Water Resources, up $6.5 million (5.4%); $95.9 million for Core Science Systems, up $12.7 million (15.2%); and $0.4 million for Science Support, up $17,000 (4.0%).[134]

On June 16, 2015, the House Committee on Appropriations reported H.R. 3128 accompanied by H.Rept. 114-170. The House committee-recommended funding level for USGS (including both R&D and non-R&D activities) was $1.045 billion for FY2016, the same as for FY2015 and $149.8 million (12.5%) below request. On June 18, 2015, the Senate Committee on Appropriations reported S. 1645, accompanied by S.Rept. 114-70.The Senate Committee-recommended funding level for USGS was $1,058.5 billion, $13.5 million (1.3%) more than for FY2015, $136.3 million (11.4%) less than the request, and $13.5 million (1.3%) more than the House committee-recommended level.

Other DOI Components

In addition to the USGS, the Consolidated Appropriations Act, 2016 provided R&D funding for the following DOI components: [135]

[134] Ibid.

[135] Ibid.

- Bureau of Reclamation (BOR): $88.6 million in applied research and development funding for FY2016, $11.7 million (15.2%) more than in FY2015 (actual) and $2.7 million (3.1%) more than the FY2016 request.
- Bureau of Ocean Energy Management (BOEM): $72.8 million in applied research and development funding for FY2016, $1.2 million (1.7%) less than FY2015 (actual) and $3.5 million (5.1%) more than the FY2016 request.
- Fish and Wildlife Service (FWS): $32.5 million in applied research funding for FY2016, equal to the FY2015 (actual) level and $17.2 million (34.7%) less than the FY2016 request.
- Bureau of Land Management (BLM): $23.5 million in applied research and development funding for FY2016, $3.3 million (16.4%) more than in FY2015 (actual) and $7.5 million (24.1%) less than the FY2016 request.
- National Park Service (NPS): $27.0 million in applied research and development funding for FY2016, equal to the FY2015 (actual) level and $1.2 million (4.3%) less than the FY2016 request.
- Bureau of Safety and Environmental Enforcement (BSEE): $26.7 million in applied research funding for FY2016, $1.9 million (7.6%) more than in FY2015 (actual) and equal to the FY2016 request.
- Bureau of Indian Affairs (BIA): $9.5 million in applied research for FY2016, equal to the FY2015 (actual) level and $3.0 million (24.0%) less than the FY2016 request.
- Wildland Fire Management (WFM): $6.0 million in applied research for FY2016, equal to the FY2015 level and the request.
- Office of Surface Mining Reclamation and Enforcement (OSMRE): received no funding for R&D in FY2016 or in FY2015; President Obama had requested $4.4 million in applied research for FY2016.

Table 17 summarizes FY2015 R&D funding, the President's FY2016 R&D funding request, House and Senate Committee actions, and final FY2016 enacted appropriations for DOI components.

Table 17. Department of the Interior R&D

(budget authority, in millions of dollars)

	FY2015 Actual	FY2016 Request	FY2016 H. Cmte.	FY2016 S. Cmte.	FY2016 Enacted
U.S. Geological Survey (USGS)	$665.8	$761.1	___[a]	___[a]	$676.9
Bureau of Reclamation (BOR)	76.9	85.9	___[a]	___[a]	88.6
Bureau of Ocean Energy Management (BOEM)	74.1	69.3	___[a]	___[a]	72.8
Fish and Wildlife Service (FWS)	32.5	49.7	___[a]	___[a]	32.5
Bureau of Land Management (BLM)	20.2	31.0	___[a]	___[a]	23.5
National Park Service (NPS)	27.0	28.2	___[a]	___[a]	27.0
Bureau of Safety and Environmental Enforcement (BSEE)	24.8	26.7	___[a]	___[a]	26.7
Bureau of Indian Affairs (BIA)	9.5	12.5	___[a]	___[a]	9.5
Wildland Fire Management (WFM)	6.0	6.0	___[a]	___[a]	6.0
Office of Surface Mining Reclamation and Enforcement (OSMRE)	0.0	4.4	___[a]	___[a]	0.0
Department of the Interior, Total	**$936.8**	**$1,074.8**	___[a]	___[a]	**$963.5**

Source: FY2015 actual and FY2016 enacted figures from email communication from DOI to CRS on February 9, 2016. FY2016 request figures from Department of the Interior, *Fiscal Year 2016: The Interior Budget in Brief*, February 2015, p. DH-51, http://www.doi.gov/budget/appropriations/2016/highlights/upload/2016_Highlights_Bookv3.pdf.

Note: Totals may differ from the sum of the components due to rounding. TBD = To be determined. As noted in the main text, the allocation of R&D funds within these accounts is not generally specified in appropriations bills and is therefore not usually determined until after DOI appropriations are finalized.

a. Cannot be determined as R&D is included in accounts with non-R&D funding.

Environmental Protection Agency[136]

The U.S. Environmental Protection Agency (EPA), the federal regulatory agency responsible for implementing a number of environmental pollution control laws, funds a broad range of R&D activities to provide scientific tools and knowledge that support decisions relating to preventing, regulating, and abating environmental pollution. Beginning in FY2006, Congress has funded EPA through the Interior, Environment, and Related Agencies appropriations. Funding for EPA R&D is generally included in line items that also include non-R&D activities; therefore, it is not possible to identify precisely how much of the funding provided in appropriations laws is allocated to R&D specifically unless funding is provided at the precise level of the request (see discussion later in this section). In general, R&D funding levels are known only after EPA

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

allocates its appropriations to specific activities and reports those figures. The agency's Science and Technology (S&T) account funds much of EPA's scientific research activities. These activities include R&D conducted by the agency at its own laboratories and facilities, and R&D and other related scientific evaluations conducted by universities, foundations, and other non-federal entities that receive EPA grants. The S&T account receives a base appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account.[137] The transferred funds are for research on more effective methods to clean up contaminated sites.

Title II of Division G of the Consolidated Appropriations Act, 2016 (P.L. 114-113; H.R. 2029) provides $753.5 million for the EPA S&T account for FY2016 including transfers ($18.8 million) from the Superfund account, the same as enacted for the S&T account for FY2015.[138] Including transfers, the FY2016 total for the S&T account, which represents 9.3% of the $8.14 billion for the agency overall for FY2016 appropriations,[139] is $31.8 million (4.0%) less than the $785.3 million requested for FY2016.

No bill providing regular appropriations for FY2016 for Interior, Environment, and Related Agencies was passed in the House or Senate. On June 18, 2015, the House Appropriations Committee reported the Interior, Environment, and Related Agencies appropriations Act, 2016, H.R. 2822 (H.Rept. 114-170). The reported bill would have provided $721.1 million for FY2016 for EPA's S&T account, including transfers from the Superfund account ($16.2 million). The House suspended floor consideration of H.R. 2822 on July 8, 2015, and no final vote on its passage occurred. The Senate Committee on Appropriations' June 23, 2015, reported bill, S. 1645 (S.Rept. 114-70), would have provided $720.2 million for EPA's S&T account, including transfers from the Superfund account ($16.2 million). S. 1645 was placed on the Senate Legislative Calendar but was not considered on the floor.

Table 18 at the end of this section presents the FY2016 amounts for program activities within EPA's S&T account as enacted compared to H.R. 2822 and S. 1645 as reported by the House and the Senate Committees on Appropriations, the President's FY2016 budget request, and the FY2015 enacted level. As indicated in the explanatory statement and table in the December 17, 2015, *Congressional Record*[140] the enacted FY2016 base amount for the S&T account includes mostly decreases for individual EPA program and activity line items below the account level compared to the FY2016 request. The FY2016 requested base amount for the S&T account included mostly increases for programs and activities below the account level compared to the FY2015 enacted levels.[141] The FY2016 enacted amount for S&T account overall is identical to

[137] The EPA S&T account incorporates elements of the former EPA Research and Development account, as well as portions of the former Salaries and Expenses and Program Operations accounts, which were in place until FY1996. Since 1996, EPA's annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts established by Congress. A ninth account, Hazardous Waste Electronic Manifest System Fund, was added during the FY2014 budget process. Because of the differences in the scope of the activities included in these accounts, comparisons before and after FY1996 are not readily available.

[138] For an overview of the EPA FY2015 appropriations see CRS Report R43709, *Environmental Protection Agency (EPA): FY2015 Appropriations*, by Robert Esworthy.

[139] For and overview of EPA's FY2016 appropriations see CRS Report R44208, *Environmental Protection Agency (EPA): FY2016 Appropriations*, by Robert Esworthy and David M. Bearden.

[140] "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the House *Congressional Record*, vol. 161 No. 184-Book III (December 17, 2015), https://www.gpo.gov/fdsys/pkg/CREC-2015-12-17/pdf/CREC-2015-12-17-house-bk3.pdf. Under Division G, see discussion regarding EPA S&T account under "Title II—Environmental Protection Agency," p. H10219; and in the funding table, pp. H10256-H10263.

[141] For detailed discussion of the various EPA program areas and activities below the S&T account level see U.S. EPA, *Fiscal Year 2016 Justification of Appropriations Estimates for the Committee on Appropriations: Science and Technology*, February 2015, http://www2.epa.gov/sites/production/files/2015-02/documents/
(continued...)

the FY2015 enacted level. The only exception in program funding was a $10.0 million increase for "Research: National Priorities" for FY2016, offset by a reduction of $10.0 million for "Research: Sustainable and Healthy Communities."

The total National Priorities funding includes $4.1 million in funding for competitively awarded extramural research grants to fund high-priority water quality and availability research by not-for-profit organizations the same as FY2015.[142] The additional $10.0 million is distributed as specified in the explanatory statement:[143] $3.0 million (including $2.0 million for extramural funding) for further EPA research on oil and gas development in the Appalachian Basin;[144] and $7.0 million for certification and compliance activities related to vehicle and engine emissions. As in previous requests, the President's FY2016 budget request did not include funding for these "national priorities."[145]

As indicated in **Table 18** the total amount proposed in the House and Senate committee-reported bills would have provided less funding overall compared to the President's FY2016 request and FY2015 enacted, including reductions in funding for most programs and activities as requested, and several as enacted in FY2015. The House committee-reported bill was $64.2 million (8.2%) less than the President's FY2016 budget request for EPA's S&T account, including transfers and 4.3% below for FY2015 enacted level. The total amount proposed in the Senate committee-reported was 8.3% less than the President's FY2016 budget request for EPA's S&T account, including transfers and 4.4% below the appropriated amount for FY2015.

Title IV of Division G, "General Provisions," contains several provisions (referred to by some as "riders") that would restrict or prohibit the use of FY2016 funds by EPA for implementing or proceeding with a number of regulatory actions, including in some instances conducting research to support these actions. Many of these provisions have been included in previous recent appropriations. The House and Senate reported bills had proposed a number of additional administrative provisions, but most were not included in the FY2016 consolidated appropriations. The proposed general provisions can be found in Title II of each the committee-reported bills, the general provisions in Title IV.

The EPA's Office of Research and Development (ORD) is the primary manager of R&D at EPA headquarters and laboratories around the country, as well as external R&D. A large portion of the S&T account funds EPA R&D activities managed by ORD, including the agency's research laboratories and research grants. Many of the programs implemented by other offices within EPA have a research component, but the research component is not necessarily the primary focus of the program.

(...continued)

epa_fy_2016_congressional_justification.pdf, pp. 83-194.

[142] The grants are to be independent of the Science to Achieve Results (STAR) grant program. The grants are subject to a 25% matching funds requirement as specified in the explanatory statement, see footnote 140.

[143] See footnote 140.

[144] The Explanatory Statement in the December 17, 2016, Congressional Record (see footnote 140), states that the funding is to be provided as specified in H.Rept. 114-170; see p. 50.

[145] EPA refers also to these priorities as "Congressionally Directed Projects" in the FY2016 Budget Justification; see footnote 141, p. 87, p. 1046.

Table 18. Environmental Protection Agency Science &Technology (S&T) Account

(millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 H. Cmte. H.R. 2822	FY2016 S. Cmte. S. 1645	FY2016 Enacted P.L. 114-113
Science and Technology Appropriations Acct.					
Clean Air and Climate	$116.5	$124.8	$107.7	$106.0	$116.5
Clean Air Allowance Trading Program	*NR*	*7.8*	*NR*	*NR*	*NR*
Climate Protection Program	*8.0*	*8.1*	*8.0*	*8.0*	*8.0*
Federal Support for Air Quality Management	*NR*	*8.5*	*NR*	*NR*	*NR*
Federal Vehicle and Fuel Standards and Certification	*NR*	*100.4*	*NR*	*NR*	*NR*
Enforcement	13.7	14.4	13.1	13.7	13.7
Homeland Security	37.1	38.1	37.1	36.3	37.1
Indoor Air and Radiation	6.0	6.6	6.0	6.3	6.0
Indoor Air: Radon	*NR*	*0.0*	*NR*	*NR*	*NR*
Radiation: Protection	*NR*	*2.2*	*NR*	*NR*	*NR*
Radiation: Response Preparedness	*NR*	*4.0*	*NR*	*NR*	*NR*
Reduce Risks from Indoor Air	*NR*	*0.4*	*NR*	*NR*	*NR*
IT/Data Management/Security	3.1	3.2	3.1	3.2	3.1
Operations and Administration	68.3	79.2	68.3	68.3	68.3
Pesticide Licensing	6.0	7.7	6.0	6.1	6.0
Research: Air, Climate, and Energy	91.9	100.3	88.3	90.4	91.9
Research: Chemical Safety and Sustainability	126.9	140.7	126.9	125.9	126.9
Human Health Risk Assessment	*NR*	*39.3*	*NR*	*NR*	*NR*
Research: Computational Toxicology	*21.4*	*33.8*	*21.4*	*21.4*	*21.4*
Research: Endocrine Disruptor	*16.3*	*15.4*	*16.3*	*15.4*	*15.4*
Research: Other Activities	*NR*	*52.3*	*NR*	*NR*	*NR*
Research: Safe and Sustainable Water Resources	107.4	111.0	102.6	104.9	107.4
Research: Sustainable and Healthy Communities	150.0	139.2	135.1	135.1	140.0
Water: Human Health Protection (Drinking Water Programs)	3.5	3.8	3.5	3.7	3.5
Research: National [Congressional] Priorities (Water Quality and Availability)	4.1	0.0	7.1	4.1	14.1
Subtotal S&T Account Base Appropriations	**734.6**	**769.1**	**704.9**	**704.0**	**734.6**
Transfer in from Hazardous Substance Superfund Account	**18.8**	**16.2**	**16.2**	**16.2**	**18.8**
EPA, Total (Science and Technology)	**753.5**	**785.3**	**721.1**	**720.2**	**753.5**

Source: Prepared by CRS. The FY2016 and FY2015 enacted appropriations are as reported in the "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the House *Congressional Record*, vol. 161, no. 184-Book III (December 17, 2015), https://www.gpo.gov/fdsys/pkg/CREC-2015-12-17/pdf/CREC-2015-12-17-house-bk3.pdf. Under Division G, see discussion regarding EPA S&T account under "Title II—

Environmental Protection Agency," p. H10219; and in the funding table, pp. H10256-H10263. FY2016 requested amounts are as reported in the explanatory statement and EPA's *Fiscal Year 2016 Justification of Appropriations Estimates for the Committee on Appropriations: Science and Technology*, February 2015, http://www2.epa.gov/sites/production/files/2015-02/documents/epa_fy_2016_congressional_justification.pdf, pp. 83-194. FY2016 amounts recommended by the House and Senate Committees on Appropriations are as presented in the House and Senate Committee-reported bills and their accompanying reports, H.Rept. 114-170 and S.Rept. 114-70. Numbers may not add up due to rounding.

Notes: The NR (not reported) indicates those instances where the reports accompanying the House and Senate committee reported bills did not specify funding amounts for these sub-program activities. Totals may differ from the sum of the components.

Department of Transportation[146]

The Department of Transportation (DOT) seeks to ensure a fast, safe, efficient, accessible, and convenient transportation system. DOT's goals include improving public health and safety by reducing transportation-related fatalities and injuries; ensuring that the United States maintains critical transportation infrastructure in a state of good repair; promoting transportation policies and investments that bring lasting and equitable economic benefits; fostering livable communities by integrating transportation policies, plans, and investments with housing and economic development policies; and advancing environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.

Division L of the Consolidated Appropriations Act, 2016 (P.L. 114-113) provides appropriations for the Department of Transportation. Funding for research and development is generally included in accounts with non-R&D funding. Accordingly, R&D funding is generally not known until the agency reports how much of the appropriated funds will be used for R&D.

President Obama requested $1.046 billion for Department of Transportation R&D and R&D facilities in FY2016, an increase of $244.6 million (30.5%) from the FY2015 enacted level. (See **Table 19**.) Two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for more than three-fourths of the department's R&D funding (79.1% in the FY2016 request).[147]

Funding for DOT R&D is generally included in appropriations line items that also include non-R&D activities; therefore, it is not possible to identify precisely how much of the funding that would be provided by appropriations bills is allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOT agencies allocate their final appropriations to specific activities and report those figures.

Federal Highway Administration

Under the President's request, the Federal Highway Administration would have received $453.3 million in R&D funding in FY2016, an increase of $89.5 million (24.6%) from the FY2015 enacted level. The President's request would have provided $130.0 million for highway R&D, up $22.0 million (20.4%); $139.5 million for Intelligent Transportation Systems R&D, up $64.1 million (84.8%); $167.1 million for State Planning and Research, up $3.2 million (1.9%); and

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

[147] Except as noted otherwise, the R&D funding figures in this section come from unpublished data provided by the DOT budget office to CRS by email on February 24, 2015.

$16.7 million for R&D-related administrative expenses.[148] Allocations for these activities are not specified in the House and Senate bills.

Federal Aviation Administration

Under the President's request, the Federal Aviation Administration would have received $374.2 million for R&D and R&D facilities in FY2015, an increase of $93.7 million (33.4%) from the FY2015 enacted level.[149] The FY2016 request included $342.0 million for research and development, an increase of $86.7 million (34.0%),[150] and $32.3 million for R&D facilities, an increase of $7.0 million (27.7%).

Of this FY2016 request, $166.0 million constituted the FAA's Research, Engineering, and Development (RE&D) account (up $9.3 million, 5.9%). All RE&D account funding is for research and development. The RE&D account supports research in NextGen-specific areas such as wake turbulence, human factors, and clean aircraft technologies, as well as in fire safety, propulsion systems, advanced materials, aircraft icing, and continued airworthiness. The House-passed version of H.R. 2577 would have provided $156.8 million for the RE&D account, the same as the FY2015 level and $9.3 million (5.6%) less than the request. The Senate Committee on Appropriations-reported bill recommended $163.3 million for FY2016, $6.6 million (4.2%) more the FY2015 level and the FY2016 House-passed level, and $2.7 million (1.6%) below than the request.

Other DOT Components

A number of other DOT components also fund research and development.

- The President's FY2016 request for National Highway Traffic Safety Administration (NHTSA) R&D and R&D facilities was $76.6 million, an increase of $14.1 million (22.5%) above the FY2015 level.
- The President's FY2016 request for Federal Railroad Administration (FRA) R&D and R&D facilities was $65.3 million, an increase of $22.5 million (52.6%) above the FY2015 level.
- The President's FY2016 request for Federal Transit Administration (FTA) R&D and R&D facilities was $28.2 million, an increase of $15.5 million (122.1%) above the FY2015 level.
- The President's FY2016 request for Pipeline and Hazardous Materials Safety Administration (PHMSA) R&D and R&D facilities was $22.0 million, an increase of $0.8 million (3.7%) above the FY2015 level.
- The President's FY2016 request for Federal Motor Carrier Safety Administration (FMCSA) R&D and R&D facilities was $10.6 million, an increase of $4.5 million (74.0%) above the FY2015 level.
- The President's FY2016 request for Office of the Secretary of Transportation (OST) R&D was $15.4 million, an increase of $4.0 million (35.4%) above the

[148] FHWA, *Budget Estimates Fiscal Year 2016: Federal Highway Administration*, http://www.dot.gov/sites/dot.gov/files/docs/FY2016-BudgetEstimate-FHWA.pdf.

[149] The FAA notes that $74 million of this increase is due to a reclassification of certain NextGen FY2016 funding as applied R&D "to better align with OMB Circular A-11 Research Definitions."

[150] Ibid.

FY2015 level. The request includes $14.6 million for the Office of the Assistant Secretary for Research and Technology, $1.6 million (12.2%) above the FY2015 level. On June 9, 2015, the House passed H.R. 2577, which would have provided $11.4 million for this office, $1.6 million (12.4%) less than the FY2015 level and $3.2 million (21.9%) less than the request. On June 25, 2015, the Senate Committee on Appropriations reported H.R. 2577. The Senate-reported bill recommended $13.0 million for FY2016, equal to FY2015 funding, $1.6 million (10.8%) less than the request, and $1.6 million (14.2%) more than the House-passed level.

Table 19 summarizes R&D funding for the DOT components.

Table 19. Department of Transportation R&D and R&D Facilities

(budget authority, in millions of dollars)

	FY2015 Enacted	FY2016 Request	FY2016 House	FY2016 S. Cmte.	FY2016 Final[b]
Federal Highway Administration	$363.8	$453.3	___[a]	___[a]	TBD[a]
Federal Aviation Administration	280.5	374.2	___[a]	___[a]	TBD[a]
Research, Engineering, and Development	*156.8*	166.0	*156.8*	*163.3*	*166.0*
National Highway Traffic Safety Administration	62.5	76.6	___[a]	___[a]	TBD[a]
Federal Railroad Administration	42.8	65.3	___[a]	___[a]	TBD[a]
Railroad Research and Development	*39.1*	*39.3*	*39.1*	*39.1*	*39.1*
Federal Transit Administration	12.7	28.2	___[a]	___[a]	TBD[a]
Pipeline and Hazardous Materials Safety Administration	21.2	22.0	___[a]	___[a]	TBD[a]
Office of the Secretary	11.4	15.4	11.4	13.0	13.0
Federal Motor Carrier Safety Administration	6.1	10.6	___[a]	___[a]	TBD[a]
DOT, R&D Total	**801.0**	**1,045.6**	___[a]	___[a]	TBD[a]

Source: DOT FY2016 department and agency budget justifications; email communication between CRS and the Department of Transportation, February 24, 2015; P.L. 114-113.

Notes: Figures include R&D and R&D facilities. Totals may differ from the sum of the components due to rounding. TBD=To be determined.

a. Cannot be determined as R&D is included in accounts with non-R&D funding.

b. P.L. 114-113.

Department of Veterans Affairs[151]

The Department of Veterans Affairs (VA) was created to provide America's veterans with medical care, benefits, social support, and memorials, as well as other support. VA provides a broad range of primary care, specialized care, and related medical and social support services. VA seeks to advance medical R&D in areas that most directly address the diseases and conditions that affect veterans and eligible beneficiaries.

The President requested $1.147 billion for VA R&D in FY2016, up $57.3 million (5.0%) from FY2015. This total includes $621.8 million for the Medical and Prosthetic Research account, up $33.3 million (5.7%), and $525.0 million in funding for research supported by the Medical Care appropriation (up $24.0 million, 4.8%).[152]

The VA Office of Research and Development consists of four main research services:

- biomedical laboratory R&D, which supports preclinical research to understand life processes at the molecular, genomic, and physiological levels;
- clinical science R&D, which administers investigations, including human subject research, to determine the feasibility or effectiveness of new treatments such as drugs, therapy, or devices;
- health services R&D, which supports studies to identify and promote effective and efficient strategies to improve the organization, cost-effectiveness, and delivery of quality of health care; and
- rehabilitation R&D, which develops novel approaches to restore full and productive lives to veterans with traumatic amputation, central nervous system injuries, loss of sight or hearing, or other physical and cognitive impairments.[153]

Division J of the Consolidated Appropriations Act, 2016 (P.L. 113-113) provides appropriations for the Department of Veterans Affairs for FY2016. Funding for VA R&D is generally included in appropriations line items that also include non-R&D activities; therefore, it is not possible to know precisely how much of the funding provided for in appropriations laws will be allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after the VA allocates its appropriations to specific activities and reports those figures.

The House passed H.R. 2577, which provides appropriations for VA for FY2016, on June 9, 2015. The Senate committee reported its version of H.R. 2577 on June 25, 2015. As discussed above, it is not possible to determine the level of R&D funding included in either version of the bill.

Table 20 summarizes R&D funding for VA's Research account and Medical Care Support account.

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

[152] Department of Veterans Affairs, "Volume II Medical Programs and Information Technology Programs," *Department of Veterans Affairs Congressional Submission, FY2016*, p. VHA-280, http://www.va.gov/budget/docs/summary/Fy2016-VolumeII-MedicalProgramsAndInformationTechnology.pdf.

[153] Ibid., pp. VHA-282 to VHA-283.

Table 20. Department of Veterans Affairs R&D

(budget authority, in millions of dollars)

Account	FY2015 Enacted	FY2016 Request	FY2016 House	FY2016 S. Cmte.	FY2016 Enacted
Research	$588.5	$621.8	___[a]	___[a]	TBD[a]
Medical Care Support	501.0	525.0	___[a]	___[a]	TBD[a]
Veterans Affairs, Total	**1,089.5**	**1,146.8**	___[a]	___[a]	**TBD**[a]

Source: VA, *2016 Budget In Brief*, p. 17, http://www.va.gov/budget/docs/summary/Fy2016-BudgetInBrief.pdf.

Note: TBD=To be determined.

a. Cannot be determined as R&D is included in accounts with non-R&D funding.

Table 21 provides amounts to be spent in Designated Research Areas (DRAs) which VA describe as "areas of particular importance to our veteran patient population."[154] Funding for research projects that span multiple areas may be included in several DRAs; thus, amounts in **Table 21** total to more than the appropriation or request for the VA Research account.

Table 21. Department of Veterans Affairs R&D by Designated Research Area

(in millions of dollars)

	FY2015 Estimate	FY2016 Request
Acute & Traumatic Injury	$20.3	$21.3
Aging	146.9	154.2
Autoimmune, Allergic & Hematopoietic Disorders	27.7	29.1
Cancer	55.0	57.8
CNS Injury & Associated Disorders	89.0	93.5
Degenerative Diseases of Bones & Joints	30.2	31.8
Dementia & Neuronal Degeneration	24.8	26.1
Diabetes & Major Complications	35.0	36.8
Digestive Diseases	20.7	21.7
Emerging Pathogens/Bio-Terrorism	1.0	1.0
Gulf War Veterans Illness	9.5	15.0
Health Systems	62.5	72.7
Heart Disease/Cardiovascular Health	62.3	65.4
Infectious Diseases	33.0	34.7
Kidney Disorders	20.9	22.0
Lung Disorders	27.0	28.3
Mental Illness	110.3	115.8
Military Occupations & Environ Exposures	14.0	16.6
Other Chronic Diseases	4.9	5.1

[154] Ibid., p. VHA-308.

	FY2015 Estimate	FY2016 Request
Prosthetics	15.1	15.8
Sensory Loss	17.1	17.9
Special Populations	19.6	20.6
Substance Abuse	29.4	30.9

Source: VA, "Volume II Medical Programs and Information Technology Programs," *Department of Veterans Affairs Congressional Submission, FY2016*, http://www.va.gov/budget/docs/summary/Fy2016-VolumeII-MedicalProgramsAndInformationTechnology.pdf.

Notes: Amounts in this table add to more than the totals in **Table 20** because projects that span multiple areas may be included in several DRAs.

Appendix. Acronyms and Abbreviations

Glossary

ACE	Air, Climate, and Energy
ACI	American Competitiveness Initiative
AD	Alzheimer's Disease
AFRI	Agriculture and Food Research Initiative
AISL	Advancing Informal STEM Learning
AMP	Advanced Manufacturing Partnership – or – Accelerating Medicines Partnership
AMTech	Advanced Manufacturing Technology Consortia
AOAM	Agency Operations and Award Management
ARPA-E	Advanced Research Projects Agency–Energy
ARS	Agricultural Research Service
ATE	Advanced Technological Education
B&F	Buildings & Facilities
BD2K	Big Data to Knowledge
BES	Basic Energy Sciences
BIA	Bureau of Indian Affairs
BIO	Directorate for Biological Sciences
BioMaPS	Research at the Interface of Biological, Mathematical, and Physical Sciences
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BRAIN	Brain Research through Advancing Innovative Neurotechnologies
BSEE	Bureau of Safety and Environmental Enforcement
CAN	Cures Acceleration Network
CAUSE	Catalyzing and Advancing Undergraduate STEM Education
CEMMSS	Cyber-enabled Materials, Manufacturing, and Smart Systems
CIF21	Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education
CISE	Computer and Information Science and Engineering
CRF	Construction of Research Facilities
CR	Continuing Resolution
DARPA	Defense Advanced Projects Research Agency
DHP	Defense Health Program
DHS	Department of Homeland Security
DKIST	Daniel K. Inouye Solar Telescope
DNDO	Domestic Nuclear Detection Office
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DRAs	Designated Research Areas
ECR	EHR Core Research

EERE	Office of Energy Efficiency and Renewable Energy
EHR	Education and Human Resources
ENG	Engineering
EPA	Environmental Protection Agency
EPM	Environmental Program and Management
EPSCoR	Experimental Program to Stimulate Competitive Research
ERS	Economic Research Service
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FDAAA	Food and Drug Administration Amendments Act of 2007
FHWA	Federal Highway Administration
FIC	Fogarty International Center
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FWS	Fish and Wildlife Service
GAO	Government Accountability Office
GDP	Gross Domestic Product
GEO	Directorate for Geosciences
GRF	Graduate Research Fellowship
GRO	Greater Research Opportunities
GWOT	Global War on Terror
HBCU	Historically Black Colleges and Universities
HBCU-UP	Historically Black Colleges and Universities—Undergraduate Program
HHS	Department of Health and Human Services
IARPA	Intelligence Advanced Research Projects Activity
ICER	Integrative and Collaborative Education and Research
I-Corps	Innovation Corps
ICs	Institutes and Centers
IFF	Iraqi Freedom Fund
IG	Inspector General
IGERT	Integrative Graduate Education and Research Traineeship
IA	Integrative Activities
ISS	International Space Station
ITER	International Thermonuclear Experimental Reactor
ITS	Industrial Technology Services
IUSE	Improving Undergraduate STEM Education
JIEDDF	Joint Improvised Explosive Device Defeat Fund
LBNE	Long Baseline Neutrino Experiment
LCLS-II	Linac Coherent Light Source II
LSAMP	Louis Stokes Alliances for Minority Participation
LSST	Large Synoptic Survey Telescope
MEP	Manufacturing Extension Partnership
MGI	Materials Genome Initiative

MPS	Mathematical and Physical Sciences
MRAPVF	Mine Resistant and Ambush Protected Vehicle Fund
MREFC	Major Research Equipment and Facilities Construction
Mu2e	Muon to Electron Conversion Experiment
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service
NBAF	National Bio and Agro-Defense Facility
NCATS	National Center for Advancing Translational Sciences
NCCAM	National Center for Complementary and Alternative Medicine
NCCIH	National Center for Complementary and Integrative Health
NCI	National Cancer Institute
NCSES	National Center for Science and Engineering Statistics
NEI	National Eye Institute
NEON	National Ecological Observatory Network
NESDIS	National Environmental Satellite, Data, and Information Service
NHGRI	National Human Genome Research Institute
NHLBI	National Heart, Lung, and Blood Institute
NHTSA	National Highway Traffic Safety Administration
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIAID	National Institute of Allergy and Infectious Diseases
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NIBIB	National Institute of Biomedical Imaging and Bioengineering
NICHD	National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDCD	National Institute on Deafness and Other Communication Disorders
NIDCR	National Institute of Dental and Craniofacial Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS	National Institute of Environmental Health Sciences
NIFA	National Institute of Food and Agriculture
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIMH	National Institute of Mental Health
NIMHD	National Institute on Minority Health and Health Disparities
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute of Nursing Research
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development
NLM	National Library of Medicine
NMFS	National Marine Fisheries Service
NMI	Network for Manufacturing Innovation
NNI	National Nanotechnology Initiative
NNMI	National Network for Manufacturing Innovation
NOAA	National Oceanic and Atmospheric Administration

NOS	National Ocean Service
NPS	National Park Service
NRC	National Research Council
NRI	National Robotics Initiative
NRT	NSF Research Traineeships
NSB	National Science Board
NSET	Nanoscale Science, Engineering, and Technology (NSTC Subcommittee)
NSF	National Science Foundation
NSLS-II	National Synchrotron Light Source II
NSTC	National Science and Technology Council
NWS	National Weather Service
OAR	Oceanic and Atmospheric Research
OCO	Overseas Contingency Operations
OCO-3	Orbiting Carbon Observatory 3
OD	NIH Office of the Director
OGSI	Opportunity, Growth, and Security Initiative
OIG	Office of the Inspector General
OISE	Office of International Science and Engineering
OMAO	Office of Marine and Aviation Operations
OMB	Office of Management and Budget
OOI	Ocean Observatories Initiative
ORD	Office of Research and Development
OST	Office of the Secretary of Transportation
OSTP	Office of Science and Technology Policy
PE	Program Element
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHS	Public Health Service
PMI	Precision Medicine Initiative
PS	Program Support
R&D	Research and Development
R&E	Research and Experimentation
RAMIA	Revitalize American Manufacturing and Innovation Act of 2014
RDT&E	Research, Development, Test, and Evaluation
RE&D	Research, Engineering, and Development
REE	Research, Education, and Economics
REU	Research Experiences for Undergraduates
RIID	Radioisotope Identification Device
RITA	Research and Innovative Technology Administration
RPG	Research Project Grant
RRA	Research and Related Activities
S&T	Science and Technology
SaTC	Secure and Trustworthy Cyberspace
SBE	Social, Behavioral and Economic Sciences
SEES	Science, Engineering, and Education for Sustainability

SIR	Surveys, Investigations, and Research
SLS	Space Launch System
SMGI	Subcommittee on the Materials Genome Initiative (NSTC)
SOFIA	Stratospheric Observatory for Infrared Astronomy
SSW	Safe and Sustainable Water
STAG	State and Tribal Assistance Grants
STAR	Science to Achieve Results
STEM	Science, Technology, Engineering, and Mathematics
STEM+C	Science, Technology, Engineering, and Mathematics + Computing
STRS	Scientific and Technical Research and Services
TCUP	Tribal Colleges and Universities Program
USARC	U.S. Arctic Research Commission
USDA	Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VA	Veterans Administration
WFM	Wildland Fire Management
WIN Fund	Wireless Innovation Fund`

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