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Federal Research and Development Funding: FY2017

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Summary

President Obama's budget request for FY2017 included $152.333 billion for research and development (R&D), an increase of $6.195 billion (4.2%) over the estimated FY2016 enacted R&D funding level of $146.138 billion.

Funding for R&D is concentrated in a few departments and agencies. Under President Obama's FY2017 budget request, seven federal agencies would have received 95.6% of total federal R&D funding, with the Department of Defense (47.8%) and the Department of Health and Human Services (21.5%) accounting for nearly 70% of all federal R&D funding.

In dollars, the largest increases in agency R&D funding in President Obama's request would have gone to the Department of Energy (up $2.755 billion, 19.1%), the Department of Defense (up $1.953 billion, 2.8%), and the Department of Health and Human Services (up $772 million, 2.4%).

President Obama's FY2017 request sought to continue support for a number of multiagency R&D initiatives: the National Nanotechnology Initiative, Networking and Information Technology Research and Development program, U.S. Global Change Research Program, Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative, Precision Medicine Initiative, Cancer Moonshot, Materials Genome Initiative, National Robotics Initiative, and National Network for Manufacturing Innovation.

As of September 28, 2016, Congress had not completed action on any of the 12 regular appropriations bills for FY2017. The House Committee on Appropriations had reported all nine of the regular appropriations bills that provide R&D funding, and the House had passed three of them. The Senate Committee on Appropriations had reported all nine of the regular appropriations bills that provide R&D funding, and the Senate had passed three of them.

On September 29, 2016, President Obama signed into law the Continuing Appropriations and Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2017, and Zika Response and Preparedness Act (P.L. 114-223). This act, among other things, provided full-year funding for military construction and the Department of Veteran's Affairs, as well as continuing appropriations for most federal agencies through December 9, 2016, at about 99.5% of FY2016 funding. On December 10, President Obama signed into law the Further Continuing and Security Assistance Appropriations Act, 2017 (P.L. 114-254). Division A, Further Continuing Appropriations Act, 2017, generally provides continuing appropriations for most federal agencies at 99.8% of FY2016 funding through April 28, 2017, subject to other provisions in the act, pending final action on the remaining 11 regular appropriations acts for FY2017. Division B, Security Assistance Appropriations Act, 2017, included additional funding for DOD RDT&E, designated by Congress as Overseas Contingency Operations/Global War on Terrorism funding.

In May 2017, Congress enacted the Consolidated Appropriations Act, 2017 (P.L. 115-31). The act provides FY2017 funding for most federal agencies, except those already provided for in P.L. 114-223. Where possible, R&D funding provided under this act is identified in the following sections of this report. For some agencies, however, funding for R&D is 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 provided in appropriations laws is allocated to R&D specifically. No further updates of this report are anticipated.

Completion of the annual appropriations process after the start of the fiscal year and the use of continuing resolutions 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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Introduction

The 115th Congress continues to take an interest in U.S. research and development (R&D) and in evaluating 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 drove 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 President Obama'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 and for other purposes) in light of the current federal deficit and debt. As Congress acted to complete the FY2017 appropriations process, it faced two overarching issues: the extent to which federal R&D investments could grow in the face of increased pressure on discretionary spending and the prioritization and allocation of the available funding. Budget caps may have limited overall R&D funding and may have required movement of resources across disciplines, programs, or agencies to address priorities. Moving funding between programs/accounts/agencies can be complex and difficult because the funding for different programs/accounts/agencies is often provided through different appropriations bills.

This report begins with a discussion of the overall level of President Obama's FY2017 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 nearly 99% of total federal R&D funding. Selected terms associated with federal R&D funding are defined in the text box on the next page. The **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 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" (June 2015). This document provides guidance to agencies in the preparation of President Obama'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 major equipment for research and development. Includes acquisition or design and production of movable equipment, such as spectrometers, research satellites, detectors, and other instruments.

National Science Foundation. The National Science Foundation provides the following definitions of R&D-related terms in its *Science and Engineering Indicators: 2016* 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.

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.

President Obama's FY2017 Budget Request

On February 9, 2016, President Obama released his proposed FY2017 budget. This report provides government-wide, multiagency, and individual agency analyses of President Obama's FY2017 request as it relates to R&D and related activities, as well as House and Senate action on President Obama's budget request through appropriations bills that provide funding for R&D and related activities. For FY2017, President Obama's budget request included both discretionary and mandatory funding. As presented in the "Research and Development" chapter of the Analytical Perspectives volume of the *Budget of the U.S. Government FY2017*, the discretionary and

mandatory funding are combined into a single figure for each agency. In addition, a change in the Department of Energy's reporting of administrative expenses led to an increase in reporting of R&D investments "on the order of $2 to $3 billion a year."[1] Factors such as these can complicate the analysis of year-to-year changes in R&D funding, both in aggregate and for selected agencies.

For FY2017, President Obama proposed $152.333 billion for R&D, an increase of $6.195 billion (4.2%) over the estimated FY2016 enacted R&D funding level of $146.138 billion.[2] Adjusted for anticipated inflation of approximately 1.8%, President Obama's FY2016 R&D request represented a constant dollar increase of 2.4% from the estimated FY2016 enacted level.[3]

President Obama's R&D request included continued funding of existing single-agency and multiagency programs and activities, as well as new initiatives. Single-agency initiatives are discussed in their respective sections of this report. Multiagency initiatives are discussed in the section "Multiagency R&D Initiatives."

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 R&D funding through the authorization and appropriations processes primarily from the perspective of individual agencies and programs. **Table 1** provides data on R&D by agency for FY2015 (actual), FY2016 (estimate), and FY2017 (request).[4]

Under President Obama's FY2017 budget request, seven federal agencies would have received 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

[1] Executive Office of the President, Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, p. 306, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

[2] 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.

[3] As calculated by CRS using the Gross Domestic Product (GDP) (chained) price index for FY2016 and FY2017 in Table 10.1, "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2021," *Budget of the United States Government, Fiscal Year 2016,* https://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/hist10z1.xls.

[4] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, p. 305, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

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.

The largest agency R&D increases in President Obama's FY2017 request (as measured in dollars), compared with FY2016, were for DOE, up $2.755 billion (19.1%); DOD, up $1.953 billion (2.8%); HHS, up $772 million (2.4%); NSF, up $412 million (6.7%); and USDA, up $249 million (9.3%). NASA would see a decrease in R&D funding of $367 million (3.0%) and DOC funding would drop by $25 million (1.3%).

Table 1. Federal Research and Development Funding by Agency, FY2015-FY2017

(budget authority, dollar amounts in millions)

				Change, FY2016-FY2017	
Department/Agency	**FY2015 Actual**	**FY2016 Enacted**	**FY2017 Request**	**Dollar**	**Percent**
Department of Defense	65,547	70,872	72,825	1,953	2.8%
Dept. of Health and Human Services	30,453	31,942	32,714	772	2.4%
Department of Energy	14,354	14,405	17,160	2,755	19.1%
NASA	12,145	12,410	12,043	-367	-3.0%
National Science Foundation	5,944	6,117	6,529	412	6.7%
Department of Agriculture	2,452	2,674	2,923	249	9.3%
Department of Commerce	1,524	1,913	1,888	-25	-1.3%
Department of Veterans Affairs	1,178	1,220	1,252	32	2.6%
Department of the Interior	863	981	1,082	101	10.3%
Department of Transportation	885	924	1,065	141	15.3%
Department of Homeland Security	919	579	585	6	1.0%
Environmental Protection Agency	523	516	530	14	2.7%
Other	1,491	1,585	1,737	152	9.6%
Total	**138,278**	**146,138**	**152,333**	**6,195**	**4.2%**

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, p.305, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Notes: 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.

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 FY2017 request included $34.485 billion for basic research, up $975 million (2.9%) from FY2016; $38.361 billion for applied research, up $2.922 million (8.2%); $76.704 billion for development, up $2.238 million (3.0%); and $2.783 billion for facilities and equipment, up $60 million (2.2%).

Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2015-FY2017

(budget authority, dollar amounts in millions)

	FY2015 Actual	FY2016 Estimate	FY2017 Request	Change, FY2016-FY2017 Dollar	Change, FY2016-FY2017 Percent
Basic research	31,854	33,510	34,485	975	2.9%
Applied research	34,178	35,439	38,361	2,922	8.2%
Development	69,719	74,466	76,704	2,238	3.0%
Facilities and Equipment	2,527	2,723	2,783	60	2.2%
Total	**138,278**	**146,138**	**152,333**	**6,195**	**4.2%**

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, pp. 305-306, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

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 justification 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 47.0% of U.S. basic research in 2013.[5] Industry funded 26.4% of U.S. basic research in 2012, with state governments, universities, and other non-profit organizations funding the remaining 26.7%.[6]

In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 51.1% in 2013, while the federal government accounted for an estimated 36.8%.[7]

Industry also provides the vast majority of funding for development. Industry accounted for 80.6% of development in 2013, while the federal government provided 17.8%.[8]

[5] National Science Foundation, National Center for Science and Engineering Statistics, *U.S. R&D Increased in 2013, Well Ahead of the Pace of Gross Domestic Product*, Infobriefs, NSF 15-330, September 8, 2015, http://www.nsf.gov/statistics/nsf14304/. More recent data are not yet available.

[6] Ibid.

[7] Ibid.

[8] 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 President Obama's FY2017 budget request, the Department of Health and Human Services, primarily NIH, accounted for nearly half (47.3%) of all federal funding for basic research. HHS would have also been the largest federal funder of applied research, accounting for about 42.1% of all federally funded applied research in President Obama's FY2017 budget request. DOD would have been the primary federal funder of development, accounting for 85.6% of total federal development funding in President Obama's FY2017 budget request.[9]

Table 3. Top R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2015-FY2017

(budget authority, dollar amounts in millions)

	FY2015 Actual	FY2016 Enacted	FY2017 Request	Change, FY2016-FY2017	
				Dollar	Percent
Basic Research					
Dept. of Health and Human Services	15,055	15,972	16,323	351	2.2%
National Science Foundation	4,878	4,941	5,257	316	6.4%
Dept. of Energy	4,477	4,609	4,932	323	7.0%
Applied Research					
Dept. of Health and Human Services	15,199	15,760	16,138	378	2.4%
Dept. of Energy	5,624	5,346	7,108	1,762	33.0%
Dept. of Defense	4,653	5,056	4,884	-172	-3.4%
Development					
Dept. of Defense	58,553	63,463	65,631	2,168	3.4%
NASA	6,481	5,954	5,357	-597	-10.0%
Dept. of Energy	3,263	3,338	3,982	644	19.3%
Facilities and Equipment					
Dept. of Energy	990	1,112	1,138	26	2.3%
National Science Foundation	375	424	459	35	8.3%
Dept. of Commerce	231	400	331	-69	-17.3%

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, pp. 305-306, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Note: The top three funding agencies in each category, based on the FY2017 request, are listed.

[9] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017,* February 9, 2016, pp. 305-306, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

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 52.5% in FY2015.[10] President Obama's FY2017 budget included $80.0 billion in defense-related R&D funding (about 52.5% of the total R&D request) and $72.4 billion for non-defense R&D (about 47.5% of the total R&D request).[11]

Multiagency R&D Initiatives

President Obama's FY2017 budget request supported several multiagency R&D initiatives. These initiatives are presented below in order of the size of the FY2017 budget requests.

Networking and Information Technology Research and Development Program[12]

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 requested $4.542 billion in NITRD funding for FY2017, $48.8 million (1.1%) more than the FY2016 estimate level of $4.494 billion (see **Table 4**). The largest agency increases in NITRD funding under the Administration's FY2017 request are for the DOE (up $38.3 million, 5.3%) and NIST (up $13.6 million, 9.2%). President Obama's budget would have reduced NITRD funding at DOD by $19.6 million (1.5%), though Defense Advanced Research Projects Agency (DARPA) funding would have increased by $14.8 million (3.5%).[13]

Table 4. Networking and Information Technology Research and Development Program Funding, FY2015-FY2017

(budget authority, in millions of current dollars)

FY2015 Actual	FY2016 Estimate	FY2017 Request	Change, FY2016-FY2017	
			Dollar	Percent
$4,378.6	$4,493.6	$4,542.4	$48.8	1.1%

Source: CRS analysis of data provided to CRS by OSTP on February 18, 2016.

[10] CRS analysis of National Science Foundation, *Federal R&D Funding, by Budget Function: Fiscal Years 2014–16*, Infobriefs, NSF 16-303, Table 24, November 23, 2015, http://www.nsf.gov/statistics/2016/nsf16303/.

[11] John P. Holdren, Assistant to the President for Science and Technology and Director of the Office of Science and Technology Policy, "The 2017 Budget: Investing in America's Future," presentation, Washington, DC, February 2016.

[12] 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.

[13] CRS analysis of data provided to CRS by OSTP on February 18, 2016.

U.S. Global Change Research Program[14]

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."[15] Thirteen departments and agencies participate in the USGCRP. President Obama's request for USGCRP funding for FY2017 was $2.8 billion.[16]

National Nanotechnology Initiative[17]

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.[18] Federal nanotechnology efforts are coordinated by the National Science and Technology Council (NSTC) Subcommittee on Nanoscale Science, Engineering, and Technology (NSET).

President Obama requested $1.443 billion in funding for the NNI in FY2017, an increase of $8.7 million (0.6%) over the FY2016 level of $1.435 billion. The largest agency increase in NNI funding under FY2017 request was for the DOE (up $31.3 million, 9.5%), while the largest decreases in agency NNI funding were for the Department of Homeland Security (down $19.5 million, 92.9%) and NASA (down $4.9 million, 44.5%). NNI funding in FY2017 under the request was down $469.4 million (24.5%) from the NNI's peak funding level in FY2010.

Table 5. National Nanotechnology Initiative Funding, FY2015-FY2017

(budget authority, in millions of current dollars)

FY2015 Actual	FY2016 Estimate	FY2017 Request	Change, FY2016-FY2017	
			Dollar	Percent
$1,496.3	$1,434.7	$1,443.4	$8.7	0.6%

Source: Nanoscale Science, Engineering, and Technology Committee, National Science and Technology Council, The White House, *Supplement to President Obama's Budget for Fiscal Year 2017, The National Nanotechnology Initiative: Research and Development Leading to a Revolution in Technology and Industry*, March 2016.

[14] 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.

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

[16] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2017*, February 9, 2016, pp. 305-306, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

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

[18] 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.

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."[19] 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."[20] 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.[21]

According to OSTP, the NITRD efforts in robotics and intelligent systems reflect most of the activity in the NRI. FY2016 funding for the NRI is $225 million. President Obama requested $221 million for FY2017, including $44 million for NSF, $103 million for DOD, $12 million for DOE, $8 million for NIST, $54 million for NASA, and $1 million for the Department of Justice.[22]

National Network for Manufacturing Innovation[23]

President Obama first proposed the establishment of a National Network for Manufacturing Innovation (NNMI) in his FY2013 budget, which requested $1 billion in mandatory funding to support the establishment of up to 15 institutes. As originally conceived, the Administration described the NNMI as

> 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.[24]

In the absence of explicit congressional authorization and appropriations for the NNMI, the Obama Administration awarded several institutes for manufacturing innovation using the broad agency authorities and appropriations of the DOD and DOE. In December 2014, Congress passed

[19] 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.

[20] Ibid.

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

[22] Email correspondence between OSTP and CRS, March 2, 2016.

[23] For additional information on the NNMI, see CRS Report R44371, *The National Network for Manufacturing Innovation*, by John F. Sargent Jr.

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

the Revitalize American Manufacturing and Innovation Act of 2014 (RAMI), 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. The RAMI Act provides a statutory foundation for the effort, directing the Secretary of Commerce to establish a Network for Manufacturing Innovation (NMI) program within the Commerce Department's NIST.

For FY2017, President Obama requested more than $250 million in discretionary spending to create or sustain manufacturing innovation institutes. The budget would have supported the establishment of five manufacturing institutes in FY2017, joining the seven institutes that have been awarded to date, two that are currently being competed, and four others that are to be funded in FY2016. In addition, President Obama's request included $1.9 billion in mandatory funding to establish 27 additional institutes over 10 years that would complete the Administration's vision for a 45-institute network.

Cancer Moonshot

In his 2016 State of the Union address, President Obama announced a cancer "moonshot" initiative to "cure cancer once and for all."[25] In his FY2017 budget, President Obama requested an increase in federal spending of $755 million to accelerate progress in the prevention, diagnosis, and treatment of cancer. Of this amount, $680 million would go to NIH and $75 million to FDA. A key target of these additional funds was research "to help realize the promise of cancer immunotherapy."[26] Other agencies, including the Department of Defense and Department of Veterans Affairs, were expected to participate in the effort as well, but dedicated initiative funding was not requested for those agencies for FY2017.[27]

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 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

[25] President Barack Obama, State of the Union Address (as delivered), January 13, 2016, https://www.whitehouse.gov/the-press-office/2016/01/12/remarks-president-barack-obama-%E2%80%93-prepared-delivery-state-union-address.

[26] EOP, OMB, *Budget of the United States Government, Fiscal Year 2017*, February 9, 2016, p. 28, https://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/budget.pdf.

[27] The White House, "Fact Sheet: Investing in the National Cancer Moonshot," press release, February 1, 2016, https://www.whitehouse.gov/the-press-office/2016/02/01/fact-sheet-investing-national-cancer-moonshot; email correspondence between OSTP and CRS, March 2, 2016.

[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.

behavior,"[29] and to help improve the prevention, diagnosis, and treatment of brain diseases such as Parkinson's and Alzheimer's.

President Obama requested more than $439 million in FY2017 for the BRAIN Initiative, approximately $139 million (46%) more than the effort's estimated FY2016 funding level of $300 million. Proposed FY2017 funding included an estimated $195 million in funding for NIH, $118 million for DARPA, $74 million for NSF, $9 million for the DOE Office of Science, and $43 million for the Intelligence Advanced Research Projects Activity (IARPA).[30] IARPA is an organization with the Office of the Director of National Intelligence.

Precision Medicine Initiative

In his January 2015 State of the Union address, President Obama announced the Precision Medicine Initiative (PMI), an undertaking among HHS agencies. The PMI seeks to build on research and discoveries that allow medical treatments to be tailored to "specific characteristics of individuals, such as a person's genetic makeup, or the genetic profile of an individual's tumor."[31] Total funding for PMI in FY2016 is $200 million. President Obama's FY2017 request for the PMI was $309 million, including $300 million for NIH, $4 million for the Food and Drug Administration (FDA), and $5 million for the Office of the National Coordinator for Health Information Technology (ONC).[32] ONC is located in the Office of the Secretary of Health and Human Services. The Department of Veterans Affairs also notes in its FY2017 request that it was prioritizing its research portfolio toward precision medicine, including a substantial $50 million investment in genomic sequencing.[33]

Materials Genome Initiative

Announced in June 2011 by President Obama, the Materials Genome Initiative (MGI) is a multiagency 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.[34]

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 human genetic code.[35] According to the White House, such

[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.

[30] Email correspondence between OSTP and CRS, March 2, 2016.

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

[32] Email correspondence between OSTP and CRS, March 2, 2016.

[33] Department of Veterans Affairs, *Budget In Brief, 2017,p. BiB-23,* http://www.va.gov/budget/docs/summary/Fy2017-BudgetInBrief.pdf.

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

[35] John P. Holdren, Director, OSTP, EOP, testimony before the Senate Committee on Commerce, Science, and (continued...)

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.[36]

Like President Obama's FY2015 and FY2016 budgets, the FY2017 budget did not include 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, and NIH. MGI also coordinates its efforts with two other multiagency initiatives, the NNI and NITRD.[37]

Doubling Federal Funding for Clean Energy R&D

In November 2011, President Obama and other world leaders announced Mission Innovation, a global effort to accelerate public and private clean energy innovation. Under the initiative, 20 countries—representing 80% of the world's clean energy R&D investment—committed to doubling their government's clean energy R&D over five years. President Obama's FY2017 budget proposed a five-year doubling of federal clean energy R&D that would increase funding from $6.4 billion in FY2016 to $12.8 billion in FY2021. The initiative included the efforts of 12 federal agencies, including the Department of Energy, National Science Foundation, NASA, and Department of Agriculture. The Administration asserted that the FY2017 budget would have increased the federal investment in clean energy to $7.7 billion.[38]

FY2017 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 nearly 99% of total federal R&D funding. Agencies are presented in order of the size of their R&D budgets, with the largest presented first. Annual appropriations for these agencies are provided through 9 of the 12 regular appropriations bills. For each agency covered in this report, **Table 6** shows the corresponding regular appropriations bill that provides primary funding for the agency, including its R&D activities.

As of September 28, 2016, Congress had not completed action on any of the 12 regular appropriations bills for FY2017. The House Committee on Appropriations had reported all nine of the regular appropriations bills that provide R&D funding, and the House had passed three of them. The Senate Committee on Appropriations had reported all nine of the regular appropriations bills that provide R&D funding, and the Senate had passed three of them.

(...continued)

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.

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

[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] EOP, OMB, *Budget of the United States Government, Fiscal Year 2017*, February 9, 2016, pp. 19-20, https://www.whitehouse.gov/sites/default/files/omb/budget/fy2017/assets/budget.pdf.

On December 10, President Obama signed into law the Further Continuing and Security Assistance Appropriations Act, 2017 (P.L. 114-254). Division A, Further Continuing Appropriations Act, 2017, generally provides continuing appropriations for most federal agencies at 99.8% of FY2016 funding through April 28, 2017, subject to other provisions in the act, pending final action on the remaining 11 regular appropriations acts for FY2017. Division B, Security Assistance Appropriations Act, 2017, includes additional funding for DOD RDT&E, designated by Congress as Overseas Contingency Operations/Global War on Terrorism funding.

On September 29, 2016, President Obama signed into law the Continuing Appropriations and Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2017, and Zika Response and Preparedness Act (P.L. 114-223). This act, among other things, had provided continuing appropriations for most federal agencies through December 10, 2016, at about 99.5% of FY2016 funding.

On December 10, 2016, President Obama signed into law the Further Continuing Appropriations Act, 2017 (CR; Division A, P.L. 114-254), providing continued funding for agencies through April 28, 2017, generally at the FY2016 level, less an across-the-board reduction of 0.1901%. The act generally funded continuing projects and activities, under the same authority and conditions, and to the same extent and manner, as for FY2016.

In May 2017, Congress passed and President Trump signed into law the Consolidated Appropriations Act, 2017 (P.L. 115-31). The act provides FY2017 funding for most federal agencies, except those already provided for in P.L. 114-223. Where possible, R&D funding provided under this act is identified in the following sections of this report. For some agencies, however, funding for R&D is 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 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.

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 web page, *Status Table of Appropriations*, available at http://www.crs.gov/AppropriationsStatusTable/Index.

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. Funding for R&D is often 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 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.

Table 6. 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 Report R40858, *Locate an Agency or Program Within Appropriations Bills*, by Justin Murray.

Department of Defense[39]

Congress supports R&D 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 appropriations bill. (See **Table 7**.) 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 on breast, prostate, and ovarian cancer; traumatic brain injuries; orthotics and prosthetics; and other medical conditions. Congress appropriates funds for this program in Title VI (Other Department of Defense Programs) of the defense appropriations bill.

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

The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program 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-Threat Defeat Fund (JIDF, formerly the Joint Improvised Explosive Device Defeat Fund) 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-Threat Defeat Organization (JIDO), which administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. JIDF 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 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 declined as operations in Iraq and Afghanistan were reduced.

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 Forces Fund, the Afghanistan Security Forces Fund, and the Pakistan Counterinsurgency Capability Fund. Congress typically makes a single appropriation into each of these funds and authorizes the Secretary to make transfers to other accounts, including RDT&E, at his discretion. These transfers are eventually reflected in Title IV prior year funding figures.

For FY2017, the Obama Administration requested $71.392 billion for DOD's baseline Title IV RDT&E. This is $1.423 billion (2.2%) above the enacted FY2016 level.

In addition to the baseline Title IV RDT&E request, the Administration requested $823 million in RDT&E through the Defense Health Program and $389 million in RDT&E through the Chemical Agents and Munitions Destruction program for FY2017. President Obama requested no RDT&E funding in FY2017 for the National Defense Sealift Fund.

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 may also contribute to advances in commercial technologies.

President Obama's FY2017 request for Title IV baseline S&T funding was $12.501 billion, $495 million below the FY2016 enacted baseline level ($535 million below the FY2016 level including OCO funding).

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 it represents the major source of funds in some areas of science and technology (such as electrical engineering and materials science). The Administration is requesting $2.102 billion for DOD basic research for FY2017. This is $207 million (9.1%) less than what was enacted for FY2016.

On December 10, President Obama signed into law the Further Continuing and Security Assistance Appropriations Act, 2017 (P.L. 114-254). Division A, Further Continuing Appropriations Act, 2017, generally provides continuing appropriations for most DOD activities at 99.8% of FY2016 funding through April 28, 2017, subject to other provisions in the act, pending final action on the remaining 11 regular appropriations acts for FY2017. Division B, Security Assistance Appropriations Act, 2017, includes additional funding for DOD RDT&E, designated by Congress as GWOT/OCO funding. This funding includes $78.7 million for Army RDT&E and $3.0 million for Defense-wide RDT&E, as well as $87.8 million for the Joint Improvised Explosive Device Defeat Fund, a portion of which may be used to support RDT&E.

On June 16, 2016, the House passed the Department of Defense Appropriations Act, 2017 (H.R. 5293). The bill provides baseline funding and GWOT/OCO funding. The House bill designates part of the OCO funding as being intended to meet GWOT/OCO requirements and a portion to meet baseline requirements. The House-passed bill would provide $70.293 billion in funding for baseline RDT&E, $325 million (0.5%) more than the FY2016 baseline funding level and $1.099 billion (1.5%) less than the FY2017 request.

The House–passed bill would provide $497 million in GWOT/OCO funding for FY2017, of which $163 million is intended to address baseline requirements. The balance of GWOT/OCO funding, $334 million, is $103 million (44.4%) more than the FY2016 GWOT/OCO funding level and $40 million (10.8%) below the request.

The House-passed bill would provide $1.467 billion for RDT&E for the Defense Health Program for FY2017, $654 million (30.8%) below the FY2016 level and $644 million (78.3%) above the FY2017 request; $389 million for RDT&E for Chemical Agents and Munitions Destruction for FY2017, $190 million (32.9%) below the FY2016 level and equal to the request; and $3 million for RDT&E work of the Inspector General for FY2017, $1 million above the FY2016 level and equal to the request.

With respect to S&T funding (budget activities 6.1-6.3), the House-passed bill would provide essentially the same funding for FY2017 as the enacted FY2016 level and $529 million (4.2%) more than the request.

On May 26, 2016, the Senate Committee on Appropriations reported the Department of Defense Appropriations Act, 2017 (S. 3000). Like the House bill, S. 3000 provides both baseline funding

and GWOT/OCO funding. The Senate-reported bill would provide $70.801 billion in funding for baseline RDT&E, $833 million more than the FY2016 baseline funding level, $591 million less than the request, and $508 million more than the House-passed bill.

The Senate-reported bill would provide $374 million in GWOT/OCO funding for FY2017, $143 million more than the FY2016 level and equal to the request.

The Senate-reported bill includes: $1.730 billion for RDT&E for the Defense Health Program for FY2017, $391 million below the FY2016 level, $907 million above the request, and $263 million above the House-passed level; $389 million for RDT&E for Chemical Agents and Munitions Destruction for FY2017, $190 million below the FY2016 level, and equal to the request and House-passed levels; and $3 million for RDT&E work of the Inspector General for FY2017, $1 million above the FY2016 level and equal to the request and House-passed levels.

With respect to S&T funding (budget activities 6.1-6.3), the Senate-reported bill would provide $13.364 billion, $328 million above the FY2016 level, $863 million above the request, and $335 million above the House-passed level.

In early May 2017, Congress passed and President Donald Trump signed the Consolidated Appropriations Act, 2017 (P.L. 115-31), which provides funding for the Department of Defense for FY2017, among other things. The act provides both baseline funding and GWOT/OCO funding. The act provides $72.302 billion in baseline Title IV RDT&E funding for FY2017, an increase of $2.334 billion (3.3%) above the FY2016 enacted level.

For FY2017, the act also $2.102 billion in RDT&E funding for the Defense Health Program, down $19 million (0.9%) from the FY2016 funding level, and $389 million in RDT&E funding for Chemical Agents and Munitions Destruction, a decrease of $190 million (32.8%) from the FY2016 funding level.

In addition, the act provides $1.397 billion of OCO/ GWOT RDT&E funding for FY2017, up $1.166 billion (504.8%) from the FY2016 funding level.

FY2017 funding for the S&T portion of Title IV RDT&E (baseline and OCO/GWOT) is $14.029 billion, an increase of $953 million (7.3%) from the FY2016 funding level.

Table 7. Department of Defense RDT&E

(obligational authority, in millions of dollars)

	FY2016 Enacted		FY2017 Request		FY2017 House H.R. 5293		FY2017 Senate-Reported S. 3000		FY2017 Enacted	
Budget Account	**Base-line**	**OCO**	**Base-line**	**OCO**	**Base-line**	**OCO**	**Base-line**	**OCO**	**Base-line**	**OCO[a]**
Army	7,564	2	7,515	101	7,865	168	7,767	101	8,333	264
Navy	18,147	36	17,276	78	16,831	106	16,878	78	17,215	327
Air Force	25,212	17	28,112	33	27,107	43	27,491	33	27,789	365
Defensewide	18,859	177	18,309	162	18,311	180	18,478	162	18,779	439
Director, Operational Test and Evaluation	187	0	179	0	179	0	187	0	187	3
Total Title IV—By Account[c]	**69,968**	**231**	**71,392**	**374**	**70,293**	**497**	**70,801**	**374**	**72,302**	**1,397**

Budget Account	FY2016 Enacted		FY2017 Request		FY2017 House H.R. 5293		FY2017 Senate-Reported S. 3000		FY2017 Enacted	
	Base-line	OCO	Base-line	OCO	Base-line	OCO	Base-line	OCO	Base-line	OCO[a]
Budget Activity										
6.1 Basic Research	2,309	0	2,102	0	2,124	0	2,265	n/a	2,276	0
6.2 Applied Research	4,996	0	4,815	0	4,962	13	5,115	n/a	5,296	0
6.3 Advanced Dev.	5,731	40	5,584	0	5,943	13	5,984	n/a	6,439	18
6.4 Advanced Component Dev. and Prototypes	14,290	2	14,981	51	14,734	161	14,817	n/a	15,128	248
6.5 Systems Dev. And Demo	12,789		12,995	84	12,546	0	12,422	n/a	12,591	190
6.6 Management Support[d]	4,417		4,312		4,397	0	4471	n/a	4,506	69
6.7 Op. Systems Dev.[e]	25,435	190	26,603	238	25,636	309	25,727	n/a	26,115	872
Total Title IV—by Budget Activity[c]	**69,968**	**231**	**71,392**	**374**	**70,293[b]**	**497**	**70,801**	**374**	**72,302[b]**	**1,397**
Title V—Revolving and Management Funds										
National Defense Sealift Fund	25	0	0	0	0	0	0	0	0	0
Title VI—Other Defense Programs										
Defense Health Program	2,121	0	823	0	1,467	0	1,730	0	2,102	0
Chemical Agents and Munitions Destruction	579	0	389	0	389	0	389	0	389	0
Inspector General	2	0	3	0	3	0	3	0	3	0
Grand Total[c]	**72,697**	**231**	**72,606**	**374**	**72,152**	**497**	**72,923**	**374**	**74,795**	**1,397**

Source: CRS analysis of Explanatory Statement for P.L. 115-31; *Department of Defense Budget, Fiscal Year 2016 RDT&E Programs (R-1)*, February 2016; H.R. 5293; H.Rept. 114-577; S. 3000; and S.Rept. 114-263.

Notes: Figures for the columns headed "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed, respectively. The column heading OCO refers to OCO/GWOT funding.

a. OCO funding includes both regular OCO/GWOT funding and additional OCO/GWOT funding specified in the Explanatory Statement. "Budget activity" figures calculated by CRS using the Explanatory Statement for P.L. 115-31 and classification taxonomy provided in *Department of Defense Budget, Fiscal Year 2016 RDT&E Programs (R-1)*, February 2016.

b. Includes $50 million undistributed reduction in DARPA funding.

c. Numbers may not add due to rounding.

d. Includes funding for Director of Test and Evaluation.

e. Includes funding for Classified Programs.

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."[40] This section focuses on HHS R&D funded through the National Institutes of Health, an HHS agency which accounts for more than 95% of total HHS R&D funding.[41] Other HHS agencies that provide funding for R&D include the Centers for Disease Control and Prevention (CDC), the Food and Drug Administration (FDA), the Agency for Healthcare Research and Quality (AHRQ), Health Resources and Services Administration (HRSA), and the Administration for Children and Families (ACF).[42]

National Institutes of Health[43]

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 illness and disability."[44] The agency's organization consists of the Office of the NIH Director and 27 institutes and centers.

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 81% 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 30,000 non-federal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions.[45] The NIH Office of the Director (OD) sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The institutes and centers (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 8**, separate appropriations are provided 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 annual Labor, HHS, and Education (LHHS) 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. In addition, NIH receives mandatory funding of $150 million annually that is provided in the Public Health Service (PHS) Act for a special program on type 1 diabetes research and

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

[41] CRS analysis of data provided by the Office of Management and Budget to CRS by email, February 22, 2016.

[42] Ibid.

[43] 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.

[44] National Institutes of Health, "About NIH, What We Do, Mission and Goals," at http://www.nih.gov/about-nih/what-we-do/mission-goals.

[45] Department of Health and Human Services, *Fiscal Year 2017 Budget in Brief*, Washington, DC, February 9, 2016, p. 47, http://www.hhs.gov/sites/default/files/fy2017-budget-in-brief.pdf.

funding from a PHS Act transfer. The total funding available for NIH activities, taking account of add-ons and transfers, is known as the NIH program level.

President Obama's FY2017 budget requested an NIH program level total of $33.136 billion, an increase of $825 million (2.6%) over FY2016 (see **Table 8**). The FY2017 program level request for NIH included $77 million for Superfund-related research, and $150 million in mandatory funding for research on type 1 diabetes.[46] The FY2017 request also included $1.825 billion in additional mandatory funds, of which $825 million is for the following targeted increases: $680 million for the National Cancer Moonshot, $100 million for the Precision Medicine Initiative (PMI) Cohort, and $45 million for the Brain Research through Application of Innovative Neurotechnologies (BRAIN) Initiative.[47] Aside from these targeted increases, the remainder of the NIH FY2017 budget request "is at the same overall program level as FY2016, but $1 billion of that is from mandatory funds."[48] Generally, mandatory spending is not controlled by the annual appropriations process; new mandatory spending would usually occur as a result of authorizing legislation.

The FY2017 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). This provision 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 tap to no more than 1% of eligible appropriations, in recent years the annual LHHS appropriations act has specified a higher amount (2.5% in FY2016) and has also typically directed specific amounts of funding from the 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 historically been the largest "donor" of program evaluation funds; until recently, it had been a relatively minor recipient.[49]

Under President Obama's FY2017 budget request, the ICs would not have received an increase compared to FY2016 except, as discussed above, the $680 million (13%) increase for the

[46] The Superfund amount is provided in the Department of the Interior, Environment, and Related Agencies Appropriations Acts. Mandatory funds for type 1 diabetes research (under PHS Act §330B) were provided by P.L. 114-10 for FY2016 and FY2017.

[47] Department of Health and Human Services, *Fiscal Year 2017 Budget in Brief*, Washington, DC, February 9, 2016, p. 47, http://www.hhs.gov/sites/default/files/fy2017-budget-in-brief.pdf; and the *NIH FY2017 Budget Roll-Out*, p. 3, at http://www.nih.gov/sites/default/files/about-nih/nih-director/budget-requests/fy17-budget-rollout-slides-20160209.pdf.

[48] *NIH FY2017 Budget Roll-Out*, p. 3, at http://www.nih.gov/sites/default/files/about-nih/nih-director/budget-requests/fy17-budget-rollout-slides-20160209.pdf.

[49] The FY2012 and FY2013 appropriations acts capped the set-aside at 2.5%. The President's FY2014 budget proposed increasing the PHS set-aside to 3.0%. The Senate committee rejected the increase, largely because of its effect on NIH, estimating that it would have taken an extra $147 million from NIH. (See S.Rept. 113-71 on S. 1284, p. 41 and p. 83.) The Consolidated Appropriations Act, 2014 (P.L. 113-76) set the assessment at 2.5%. The President's FY2015 Budget again proposed increasing the tap to 3.0%; P.L. 113-235 set the assessment at 2.5%. 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 the agency received in the past 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 8** 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.

National Cancer Institute targeted for the National Cancer Moonshot and a $145 million (9.2%) increase for OD targeted for the PMI Cohort and the BRAIN Initiative.

The House Appropriations Committee-reported version of the FY2017 LHHS appropriations bill (H.R. 5926) would have provided NIH with a total of $33.334 billion, including $792 million provided by the evaluation tap. Adding to this total the amounts for Superfund-related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would have brought the FY2017 NIH program level to $33.561 billion. The Senate Appropriations Committee-reported version of the FY2017 LHHS appropriations bill (S. 3040) would have provided NIH with a total of $34.084 billion, including $857 million provided by the evaluation tap and an estimated $300 million in new funding from the HHS Non-recurring Expenses Fund (NEF).[50] Adding to this total the amounts for Superfund-related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would have brought the FY2017 NIH program level to $34.311 billion.

The explanatory statement accompanying the FY2017 LHHS appropriation (Division H of H.R. 244; P.L. 115-31) states that it provides $34.084 billion for NIH activities, which is a $2 billion (6.2%) increase over FY2016. This amount is calculated by including the $824 million from the evaluation tap as well as $352 million for the NIH Innovation account that was previously appropriated to the agency for FY2017 (see text box and **Table 8**). Adding the amounts for Superfund-related activities ($77 million in Division G of H.R. 244; P.L. 115-31) and the mandatory type 1 diabetes program ($150 million) brings the FY2017 NIH program level to $34.311 billion.

Except for the mandatory type 1 diabetes funding, Congress has not usually specified amounts for particular diseases or research areas. Congress generally has appropriated specific amounts to each IC and has left it to NIH and its scientific advisory panels to allocate funding to different research areas in order to allow maximum flexibility to pursue scientific opportunities that are important to public health.[51] Some bills may propose authorizations for designated research purposes, but funding generally has remained subject to the NIH peer review process as well as the overall discretionary appropriation to the agency. This pattern has changed in recent years, most notably with Alzheimer's disease research. The overview below outlines research priorities highlighted by the Administration in the FY2017 NIH budget request and selected responses from congressional report language.[52]

[50] 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 FY2017 Labor/HHS/ED appropriations bill includes language that would repurpose a portion of the NEF for NIH biomedical research activities. The House Appropriations Committee-reported FY2017 Labor/HHS/ED appropriations bill would terminate the NEF and rescind unobligated balances.

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

[52] The amounts discussed in the text below regarding the FY2017 President's request are based on the NIH section in *Fiscal Year 2017 Budget in Brief*, pp. 46-51. Amounts and quotes regarding the FY2017 recommendation of the House Committee on Appropriations are taken from H.Rept. 114-699. Amounts and quotes regarding the FY2017 recommendation of the Senate Committee on Appropriations are taken from S.Rept. 114-274. Amounts and quotes regarding funding for FY2017 in Division H of H.R. 244 are taken from the accompanying explanatory statement in the March 5, 2017, *Congressional Record* (Part III), p. H3952-H3953 and H3982-H3984.

Basic Research. About 52% of the proposed NIH budget was targeted for basic biomedical and behavioral research. One example of basic research is the BRAIN Initiative, a collaborative effort with the National Science Foundation, Defense Advanced Research Projects Agency, and Food and Drug Administration. The BRAIN Initiative develops and applies new tools for the study of complex brain functions. Insights into brain circuitry and activity gained via the BRAIN Initiative are expected to help reveal the underlying problems in brain disorders and may provide therapeutic or prevention approaches for neurological and psychiatric conditions. The request would have provided the NIH portion of the BRAIN Initiative with $195 million in FY2017, an increase of $45 million over FY2016. The House Appropriations Committee recommended the same amount for NIH as the request; the Senate Appropriations Committee recommended a total of $250 million for the NIH portion of the BRAIN Initiative. The explanatory statement accompanying H.R. 244 (P.L. 115-31) states it increases funding for the BRAIN Initiative by $110 million; $10 million was previously appropriated to the NIH Innovation account (see text box).

Translating Discovery into Health. NIH estimated it would spend $910 million on Alzheimer's disease research in FY2017, the same amount as in FY2016. The House Appropriations Committee recommended "an increase of $350 million" within the National Institute on Aging "to support a total of at least $1.26 billion on Alzheimer's disease research." The Senate Appropriations Committee recommendation included "an increase of $400 million for Alzheimer's disease research, bringing the total available in FY2017 to approximately $1.391 billion." The explanatory statement says it provides a total of $1.391 billion for Alzheimer's disease research in FY2017.

NIH would target $413 million in FY2017, the same level as FY2016, to respond to the growing public health threat posed by antimicrobial resistance bacteria. The Senate Appropriations Committee recommended an increase of $50 million in funding for antibiotic resistance research and this same increase was included in the explanatory statement.

The 21st Century Cures Act and the NIH Innovation Account

Section 194 of the Further Continuing and Security Assistance Appropriations Act, 2017 (CR, P.L. 114-254) appropriates $352 million in the NIH Innovation account for necessary expenses to carry out the four NIH Innovation Projects as described in Section 1001(b)(4) of the 21st Century Cures Act (P.L. 114-255). This $352 million is available until expended and is in addition to amounts for FY2017 provided elsewhere by the CR. The Cures Act created the NIH Innovation account and specified that funds in the account must be appropriated in order to be available for expenditure; the appropriation in Section 194 of the CR was necessary to fulfill this requirement. The four projects authorized by the Cures Act are the Precision Medicine Initiative ($40 million for FY2017), the BRAIN Initiative ($10 million for FY2017), cancer research ($300 million for FY2017), and regenerative medicine using adult stem cells ($2 million for FY2017). The NIH Director may transfer these amounts from the NIH Innovation account to other NIH accounts but only for the purposes specified in the Cures Act. If the NIH Director determines that the funds for any of the four Innovation Projects are not necessary, the amounts may be transferred back to the NIH Innovation account. This transfer authority is in addition to other transfer authorities provided by law.

NIH plans to spend a total of $6.3 billion on cancer research in FY2017; of this amount, $5.894 billion is the budget for the National Cancer Institute. The FY2017 request proposed $755 million for the Cancer Moonshot; $680 million in mandatory funding was to be allocated for the National Cancer Institute at NIH and $75 million was to be transferred from NIH to the Food and Drug Administration. The Senate Appropriations Committees did not provide a recommended amount for the Cancer Moonshot. The House Appropriations Committee stated that it "strongly supports the goals of the Cancer Moonshot initiative" and that it "continues the $195 million used in FY2016 for this initiative." The House committee also stated that it "looks forward to ... spending details once the taskforce completes its work at the end of the calendar year." The explanatory

statement mentions the amount previously appropriated for cancer research in the NIH Innovation account (see text box) but does not direct any additional funds for such research.

Precision Medicine Initiative. The FY2017 budget request proposed a total of $309 million for PMI, a multiagency effort: $4 million to the Food and Drug Administration 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 $300 million (a $100 million increase) to support research at NIH. The $100 million increase, to come from mandatory funds, would support a scale-up of the national research cohort, composed of 1 million or more volunteers, whose health, genetic, environmental, and other data would be collected and used in research studies to identify novel therapeutics and prevention strategies. Funding would continue for the National Cancer Institute's efforts on elucidating the genetics of cancer. Both the House and Senate Appropriations Committees recommend a $100 million increase in FY2017 for PMI at NIH, but this would be provided in discretionary not mandatory funds. The explanatory statement mentions the amount previously appropriated for PMI in the NIH Innovation account (see text box).

Biomedical Research Workforce. NIH estimated it would spend $849 million to support 16,421 individuals in its major research training program, the Ruth L. Kirschstein National Research Service Awards, with a 2% stipend increase in FY2017 for predoctoral and postdoctoral trainees. The House Appropriations Committee "expects NIH to support an increased number of Ruth L. Kirschstein National Research Service Awards and other training grants in proportion to at least the general IC level funding increase. NIH is also expected to provide a stipend level increase to training grantees that is consistent with any FY2017 Federal employee pay raise." The explanatory statement directs that the number of NIH training grants in FY2017 should be "in proportion to at least the general IC level funding increase" of 3%. In addition, the "agreement expects NIH to provide a stipend level and inflationary increase to grantees that is at least consistent with any fiscal year 2017 Federal employee pay raise."

Research Project Grants. The main funding mechanism for supporting extramural research is research project grants (RPGs), which are competitive, peer-reviewed, and largely investigator-initiated. The FY2017 budget requested total funding for RPGs of $18.2 billion, representing about 55% of NIH's proposed budget. The request would have supported an estimated 36,440 RPG awards. Within that total, 9,946 would have been new RPGs and competing RPGs (renewals of existing grants), a decrease of 807 grants compared with FY2016. The Senate Appropriations Committee recommendation was "estimated to support over 11,200 new and competing grants in FY2017." The House Appropriations Committee expected its recommendation to support "at least 11,175 new RPGs. It also stated that the Committee strongly urges NIH to restore extramural support to at least 90% of all NIH funding." As stated earlier, currently about 81% of NIH's budget goes out to the extramural research community as grants, contracts, and other awards. The explanatory statement addresses the number of RPGs in FY2017 as follows: "The agreement expects the 6.2 percent increase of funds over the fiscal year 2016 level to support an increase in the number of new and competing Research Project Grants."

Table 8. National Institutes of Health Funding

(budget authority, in millions of dollars)

	FY2016	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Cancer Institute (NCI)	$5,214	$5,894	$5,338	$5,430	$5,389
Heart, Lung, and Blood Institute (NHLBI)	3,114	3,114	3,190	3,243	3,207
Dental/Craniofacial Research (NIDCR)	413	413	426	431	426
Diabetes/Digestive/Kidney (NIDDK)[a]	1,816	1,816	1,862	1,892	1,871
Neurological Disorders/Stroke (NINDS)	1,695	1,695	1,751	1,803	1,784
Allergy/Infectious Diseases (NIAID)	4,716	4,716	4,739	4,961	4,907
General Medical Sciences (NIGMS)[b]	1,732	1,665	1,792	1,777	1,826
Child Health/Human Development (NICHD)	1,338	1,338	1,373	1,396	1,380
National Eye Institute (NEI)	708	708	736	741	733
Environmental Health Sciences (NIEHS)	694	694	710	722	714
National Institute on Aging (NIA)	1,598	1,598	1,982	2,067	2,049
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	542	542	555	564	558
Deafness/Communication Disorders (NIDCD)	423	423	434	442	437
National Institute of Mental Health (NIMH)	1,519	1,519	1,600	1,620	1,602
National Institute on Drug Abuse (NIDA)	1,051	1,051	1,108	1,103	1,091
Alcohol Abuse/Alcoholism (NIAAA)	467	467	480	489	483
Nursing Research (NINR)	146	146	150	152	150
Human Genome Research Institute (NHGRI)	513	513	531	535	529
Biomedical Imaging/Bioengineering (NIBIB)	344	344	357	361	357
Minority Health/Health Disparities (NIMHD)	281	281	286	292	289
Complementary/Integrative Health (NCCIH)[c]	130	130	135	136	135
Advancing Translational Sciences (NCATS)	685	685	713	714	706
Fogarty International Center (FIC)	70	70	72	73	72
National Library of Medicine (NLM)	396	396	403	412	408
Office of Director (OD)	1,571	1,716	1,689	1,444	1,665
Buildings & Facilities (B&F)	129	129	129	129	129
NIH Innovation Fund (P.L. 114-254)					352
PHS Evaluation Tap funding[b]	780	847	792	857	824
Non-Recurring Expense Fund	0	0	0	300	0
Subtotal, NIH	**32,084**	**32,910**	**33,334**	**34,084**	**34,084**
Superfund (Interior approp. to NIEHS)[d]	77	77	77	77	77
Mandatory type 1 diabetes funds[e]	150	150	150	150	150
Total, NIH program level	**32,311**	**33,136**	**33,561**	**34,311**	**34,311**

Source: Department of Health and Human Services, *Fiscal Year 2017 Budget in Brief*, Washington, DC, February 9, 2016, pp. 46-47, http://www.hhs.gov/sites/default/files/fy2017-budget-in-brief.pdf, H.Rept. 114-699, S.Rept. 114-258, Division H of H.R. 244 and the accompanying explanatory statement in the March 5, 2017, *Congressional Record* (Part III), p. H3982-H3984.

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 8** do not subtract the amount of transfers, such as the evaluation tap, from the agencies' appropriation. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

a. Amounts for the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) do not include mandatory funding for type 1 diabetes research (see note e).

b. Amounts for National Institute of General Medical Sciences (NIGMS) do not include funds from PHS Evaluation Set-Aside (§241 of PHS Act).

c. 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.

d. This is a separate account in the Interior/Environment appropriations for National Institute of Environmental Health Sciences (NIEHS) research activities related to Superfund.

e. Mandatory funds available to NIDDK for type 1 diabetes research under PHS Act §330B (provided by P.L. 114-10 for FY2016 and FY2017).

Department of Energy[53]

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 agencies with defense-related nuclear programs that dated back to the Manhattan Project. Today, DOE conducts basic scientific research in fields 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 $14.705 billion for FY2017 for DOE R&D and related activities, including programs in three broad categories: science, national security, and energy. This request was 14.4% more than the enacted FY2016 amount of $12.858 billion. Unusually, $750 million of the request was for mandatory funding. Considering only discretionary funding, the request was $13.955 billion, an increase of 8.5%. The House bill (H.R. 5055 as reported by the House Committee on Appropriations, with H.Rept. 114-532) would have provided $12.857 billion.[54] The Senate bill (H.R. 2028 as passed by the Senate, with S.Rept. 114-236) would have provided $13.007 billion.[55] Neither bill would have included any mandatory funding. The final appropriation was $13.140 billion, all of it discretionary. (See **Table 9** for details.)

The request for the DOE Office of Science was $5.672 billion, an increase of 6.1% from the FY2016 appropriation of $5.347 billion. The request included $100 million in mandatory funding for a program of grants to universities. Without this mandatory funding, the request for discretionary appropriations was $5.572 billion, an increase of 4.2%. The House and Senate bills would each have provided $5.400 billion. The final appropriation was $5.392 billion. There is no

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

[54] The discussion in this section does not reflect floor amendments to H.R. 5055, as the House rejected the amended bill on final passage.

[55] S.Rept. 114-236 accompanied S. 2804, whose text, as amended, was adopted in H.R. 2028 as an amendment in the nature of a substitute.

authorized funding level for the Office of Science for FY2017. The most recent authorization act (the America COMPETES Reauthorization Act of 2010, P.L. 111-358) authorized appropriations through FY2013.

The Office of Science includes six major research programs. The request for the largest program, Basic Energy Sciences (BES), was $1.937 billion, an increase of 4.8%. Within BES, a requested increase of $33 million for Energy Frontier Research Centers was to support five new awards for centers in the field of subsurface geochemistry and geophysics. A new activity in computational chemical sciences was to receive $14 million. Funding for the continued construction of the Linac Coherent Light Source II (LCLS-II) was to decrease by $10 million, in line with the previously projected construction schedule. The House bill would have provided $1.860 billion, and the House committee report "strongly caution[ed] the Department against assuming an ever-increasing budget when planning the balance among facility runtime, construction, and research funding." The Senate bill would have provided $1.913 billion. The final appropriation was $1.872 billion.

The request for High Energy Physics was $818 million, an increase of 2.9%. Construction funding for the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) was to increase by $19 million. Following a review in July 2015, DOE approved a revised conceptual design for LBNF/DUNE in November 2015. The projected total project cost range is now $1.260 billion to $1.860 billion, up from the range of $805 million to $1.110 billion reported in FY2016 budget documents. The projected start of operations has slipped from FY2027 to FY2030. The House bill would have provided $823 million, including $5 million more than the request for LBNF. The Senate bill would have provided $833 million, including $10 million more than the request for LBNF. Both the House and Senate committee reports expressed "strong support" for the strategic planning recommendations of the Particle Physics Project Prioritization Panel.[56] The final appropriation was $825 million.

The request for Biological and Environmental Research (BER) was $662 million, an increase of 8.7%. This program consists of two roughly equal parts: Biological Systems Science and Climate and Environmental Sciences. In the Biological Systems Science program, funding for Genomic Science was to increase by $43 million. Funding for Radiological Sciences was to be eliminated. In Climate and Environmental Sciences, funding for Climate and Earth System Modeling was to increase by $5 million. The House bill would have provided $595 million. The Senate bill would have provided $637 million. The final appropriation was $612 million. The House and Senate committee reports and the final explanatory statement all directed DOE to give priority to optimizing the operation of BER user facilities.

The request for Nuclear Physics was $636 million, an increase of 3.1%. The proposed increase was spread across most areas of research and operations. No additional funding was requested for construction of the Continuous Electron Beam Accelerator Facility (CEBAF) upgrade because that project was expected to move from the construction phase in FY2016 to the commissioning phase in FY2017. The House bill would have provided $620 million. The Senate bill would have provided $636 million. The final appropriation was $622 million.

The request for Advanced Scientific Computing Research (ASCR) was $663 million, an increase of 6.8%. A new Exascale Computing program (part of the DOE-wide Exascale Computing Initiative) was to receive $154 million. According to DOE, this program would consolidate

[56] Particle Physics Project Prioritization Panel, *Building for Discovery: Strategic Plan for U.S. Particle Physics in the Global Context*, May 2014, http://science.energy.gov/~/media/hep/hepap/pdf/May-2014/FINAL_P5_Report_Interactive_060214.pdf.

ongoing activities currently funded through other ASCR programs, and the requested funding would represent a net decrease of $4 million for those activities. Proposed decreases in other ASCR programs mostly reflected activities transferred to the new program. The House bill would have provided $621 million, including $151 million for Exascale Computing. The Senate bill would have provided $656 million, including the requested $154 million for Exascale Computing. The final appropriation was $647 million, including $164 million for the exascale initiative.

The request for Fusion Energy Sciences was $398 million, a decrease of 9.1%. Funding for most elements of the program was to decrease, but funding for U.S. contributions to the construction of the International Thermonuclear Experimental Reactor (ITER) was to increase to $125 million from $115 million in FY2016. The House bill would have provided $450 million, including the requested amount for ITER. The Senate bill would have provided $280 million, including no funds for ITER. The Senate committee report explained this decision by stating that ITER funding "continues to crowd out other Federal science investments, including domestic fusion research." The final appropriation was $380 million, including $50 million for ITER and reprogramming authority to allocate up to an additional $50 million to ITER.

The cost of U.S. participation in ITER—and especially its impact on the availability of funding for the rest of the fusion program—has long been controversial. Project delays, design and scope changes, and other factors have delayed formal approval of a revised cost and schedule estimate. The Consolidated Appropriations Act, 2016 (P.L. 114-113) 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.

Submitted in late May 2016, the DOE report recommended continued U.S. partnership in ITER through FY2018 and a reevaluation of U.S. participation prior to submittal of the FY2019 budget.[57] The House committee report directed DOE to submit a follow-up report by December 1, 2016. The final explanatory statement directed DOE to hold additional workshops and report to Congress on the fusion energy science community's continued long-term planning efforts.

The request for DOE national security R&D was $3.702 billion, a 1.8% increase from $3.636 billion in FY2016. In the Weapons Activities account, a proposed decrease of $53 million for Component Manufacturing Development was more than offset by proposed increases in other areas, the largest being an increase of $40 million for Advanced Simulation and Computing. In the Naval Reactors program, a proposed overall increase of $45 million included an increase of $27 million for development of replacement reactor systems for *Ohio* class submarines. Funding for Defense Nuclear Nonproliferation R&D was to decrease by $25 million. The House bill would have provided $3.753 billion for national security R&D, including $97 million more than the request for Defense Nuclear Nonproliferation R&D, for development and demonstration activities to reduce the use of highly enriched uranium in high-performance research reactors and molybdenum-99 production. The Senate bill would have provided $3.631 billion, including $68 million less than the request for Naval Reactors operations and infrastructure. The final appropriation of $3.760 billion included $53 million for the development of new fuels for high-performance research reactors and the requested amount for the Naval Reactors program.

[57] Department of Energy, *U.S. Participation in the ITER Project*, May 2016, http://science.energy.gov/~/media/fes/pdf/DOE_US_Participation_in_the_ITER_Project_May_2016_Final.pdf.

The FY2017 request for DOE energy R&D was $5.332 billion, up 37.6% from $3.875 billion in FY2016. The requested total included $650 million in mandatory funding. Considering only discretionary funding, the request was $4.442 billion, an increase of 14.6%. Discretionary funding for R&D on Energy Efficiency and Renewable Energy (EERE) was to increase by 42.6%, with increases requested for all major EERE programs. Within EERE, the largest requested increases were for Vehicle Technologies ($469 million, up from $310 million) and a new Crosscutting Innovation Initiatives program ($215 million). The latter was to support new regional and small business partnerships, business accelerators that leverage the capabilities of the national laboratories, and funding opportunities for "off-roadmap" R&D projects. The request for $500 million in mandatory funding for EERE was to support R&D on clean transportation, biofuels, and smart mobility. Discretionary funding for the Advanced Research Projects Agency–Energy (ARPA-E) was to increase by 20.3%. The request proposed to maintain a 60:40 split between ARPA-E project funding in the areas of Stationary Power Systems and Transportation Systems. A proposed five-year ARPA-E trust was to provide $150 million in mandatory funding in FY2017, rising to $650 million in FY2021, with the goal of reaching total ARPA-E funding of $1 billion per year. In the Fossil Energy program, the request included an increase for natural gas technologies, mostly directed toward carbon capture, from $43 million in FY2016 to $58 million in FY2017. The House bill would have provided $3.704 billion for energy R&D. The Senate bill would have provided $3.977 billion. For EERE, both bills would have provided less than the FY2016 amount (and much less than the requested amount). Both would have provided a smaller than requested increase for ARPA-E, and more than the request for fossil energy R&D overall. For natural gas technologies, the House bill would have provided $25 million, while the Senate bill would have provided $46 million. The final appropriation was $3.988 billion, including slightly more than the FY2016 amount for EERE (but much less than the request), the House amount for ARPA-E, more than either the House or Senate bill for fossil energy R&D overall, and $43 million for natural gas technologies.

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

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Science	**$5,347**	**$5,672**	**$5,400**	**$5,400**	**$5,392**
Basic Energy Sciences	1,849	1,937	1,860	1,913	1,872
High Energy Physics	795	818	823	833	825
Biological and Environmental Research	609	662	595	637	612
Nuclear Physics	617	636	620	636	622
Advanced Scientific Computing Research	621	663	621	656	647
Fusion Energy Sciences	438	398	450	280	380
University Grants (Mandatory)	—	100	—	—	—
Other	418	458	431	445	435
National Security	**3,636**	**3,702**	**3,753**	**3,631**	**3,760**
Weapons Activities RDT&E	1,819	1,855	1,818	1,839	1,842
Naval Reactors	1,375	1,420	1,420	1,352	1,420
Defense Nuclear Nonproliferation R&D	419	394	492	407	470
Defense Environmental Cleanup Technol. Devel.	23	33	23	33	28

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Energy	**3,875**	**5,332**	**3,704**	**3,977**	**3,988**
Energy Efficiency and Renewable Energy[a]	1,804	3,072	1,560	1,802	1,812
Discretionary	*1,804*	*2,572*	*1,560*	*1,802*	*1,812*
Mandatory	—	*500*	—	—	—
Fossil Energy R&D	632	600[b]	645	632[c]	668[c]
Nuclear Energy	986	994	1,012	1,058	1,017
Electricity Delivery and Energy Reliability R&D	162	165	182	160	185
Advanced Research Projects Agency–Energy	291	500	306	325	306
Discretionary	*291*	*350*	*306*	*325*	*306*
Mandatory	—	*150*	—	—	—
DOE, Total	**12,858**	**14,705**	**12,857**	**13,007**	**13,140**

Source: DOE FY2017 congressional budget justification, http://energy.gov/cfo/downloads/fy-2017-budget-justification; H.R. 5055 as reported in the House and H.Rept. 114-532; H.R. 2028 as passed by the Senate and S.Rept. 114-236; and P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017.

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

a. Excluding Weatherization and Intergovernmental Activities.

b. Includes use of $240 million in prior-year balances.

c. Bill would also rescind $240 million in prior-year balances.

National Aeronautics and Space Administration[58]

The National Aeronautics and Space Administration was created in 1958 by the National Aeronautics and Space Act (P.L. 85-568) 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 $15.890 billion for NASA R&D in FY2017. This amount was 2.4% less than the FY2016 level of about $16.282 billion.[59] Unusually, the FY2017 request included $763 million in mandatory funds. The House bill (H.R. 5393 as reported) would have provided about $16.483 billion. The Senate bill (S. 2837) would have provided about $16.274 billion. Neither bill would have provided any mandatory funds. The final appropriation provided about $16.657 billion. For a breakdown of these amounts, see **Table 10**. NASA R&D funding comes through five accounts: Science, Aeronautics, Space Technology, Exploration, and the International Space Station and Commercial Crew portions of Space Operations.

[58] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division. For more information, see CRS Report R44397, *NASA: FY2017 Budget and Appropriations*, by Daniel Morgan.

[59] FY2016 amounts in this section are based on the operating plan reported in the NASA FY2018 congressional budget justification.

The FY2017 request for Science was $5.601 billion, an increase of 0.3%. Within this total, funding for Earth Science, Astrophysics, and Heliophysics were to increase, while funding for Planetary Science and the James Webb Space Telescope were to decrease. The House bill would have provided $4 million less than the request, while the Senate bill would have provided $206 million less. Relative to the request, the House bill would have shifted more than $300 million from Earth Science to Planetary Science. In contrast, most of the Senate bill's decrease would have been in Planetary Science. The final appropriation was $5.765 billion. It included the House bill's level of funding for Planetary Science, but with less reduction for Earth Science.

Within Earth Science, the request included $131 million (up from $100 million in FY2016) for the Landsat-9 land imaging satellite. Launch is anticipated "as early as" 2021. NASA previously proposed the Thermal Infrared Free Flyer, a lower-cost satellite intended to reduce the risk of a gap in data availability prior to the launch of Landsat-9. Congress rejected funding for the Thermal Infrared Free Flyer in the FY2016 appropriations cycle, and the mission was not included in the FY2017 request. The House report directed NASA to prioritize funds for Landsat-9 and to evaluate commercially available data in the event of a data gap in the Landsat program. The Senate report recommended the requested amount for Landsat-9 and directed NASA to provide a plan detailing the technical and schedule progress needed for a 2020 launch date. The final explanatory statement also included the requested amount.

Within Planetary Science, the request included $50 million (down from $175 million in FY2016) for a mission to Jupiter's moon Europa. Although a mission to Europa was a high priority of the 2011 National Research Council (NRC) decadal survey of planetary science,[60] the NRC expressed reservations about its anticipated cost. For several years, Congress has appropriated more for formulation of a Europa mission than NASA has requested. As directed by the Consolidated Appropriations Act, 2016, NASA's FY2017 congressional budget justification included a five-year estimate of the funding required assuming a 2022 launch. The justification stated that "the notional outyear profile in the Budget may support a launch as early as the late 2020s, assuming the mission concept and scope remain stable.... Acceleration of the launch to 2022 is not recommended, given potential impacts to the rest of the Science portfolio." The House report recommended at least $260 million for Europa orbiter and lander missions, with the orbiter launch no later than 2022 and the lander launch no later than 2024. The Senate report called for "an expeditious launch and reduced travel time" in order to maximize the scientific return of a Europa mission, but it did not specify a funding level or a launch date. It directed NASA to provide a report on options for the mission "to assist the Committee in evaluating potential mission configurations." The final explanatory statement provided $275 million "as outlined by the House" and explicitly omitted the Senate language regarding an analysis of options.

The FY2017 request for Aeronautics was $790 million, an increase of 24.7% from FY2016. The request included New Aviation Horizons (NAH), a new initiative of experimental aircraft and systems demonstrations. NAH projects on subsonic aircraft were to receive $100 million in mandatory funding from the proposed 21st Century Clean Transportation Plan.[61] An additional $56 million in mandatory funding was to fund a low-boom supersonic flight demonstrator. The House bill would have provided $78 million less than the request for Aeronautics, while the

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

[61] See "Fact Sheet: President Obama's 21st Century Clean Transportation System," White House press release, February 4, 2016, https://obamawhitehouse.archives.gov/the-press-office/2016/02/04/fact-sheet-president-obamas-21st-century-clean-transportation-system.

Senate bill would have provided $189 million less. The House committee's recommendation included $61 million (of discretionary funds) for a low-boom demonstrator. The House and Senate committee reports both directed NASA to work with the Federal Aviation Administration on research related to the integration of unmanned aerial systems in the National Airspace System.[62] The final appropriation was $660 million. The explanatory statement did not mention the low-boom flight demonstrator; it supported the House language on unmanned aerial systems.

The FY2017 request for Space Technology was $827 million, an increase of 20.4% from FY2016. 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. Proposed mandatory funding of $136 million accounted for almost all of the requested increase in FY2017. The bulk of the mandatory funding was to support technology demonstration missions, including the Restore-L satellite servicing mission for which Congress appropriated $133 million in FY2016. The House bill would have provided $88 million less than the request for Space Technology, or $48 million more than the FY2016 appropriation, while the Senate bill would have provided the FY2016 amount. The Senate committee report recommended $130 million (of discretionary funds) for Restore-L. The House and Senate committee reports both identified nuclear propulsion research and a small launch technology demonstration platform as funding priorities. The final appropriation for Space Technology was the FY2016 amount. Within this total, the explanatory statement allocated funding for both nuclear propulsion and small launch capabilities. It did not mention Restore-L.

The FY2017 request for Exploration was $3.337 billion, a decrease of 16.5% from FY2016. The Exploration account primarily funds development of the Orion Multipurpose Crew Vehicle and the Space Launch System (SLS) heavy-lift rocket, the capsule and launch vehicle mandated by the NASA Authorization Act of 2010 for future human exploration beyond Earth orbit. The account previously also funded development of a commercial crew transportation capability for U.S. astronaut access to the International Space Station (ISS), but Congress transferred this activity to Space Operations in FY2016. Within Exploration, the FY2017 request for Orion, the SLS, and related ground systems (known collectively as Exploration Systems Development) was $2.860 billion, a decrease of 21.5% from FY2016. The bulk of the proposed reduction was for SLS launch vehicle development, which was to receive $1.263 billion, down 34.3% from $1.922 billion in FY2016. At the time of the FY2017 budget release, NASA was targeting a first test flight of SLS carrying Orion but no crew (known as EM-1) in November 2018; that schedule has since slipped to 2019. The launch readiness date for the first flight of Orion and the SLS with a crew on board (known as EM-2) continues to be FY2023. The House and Senate bills would have provided $4.183 billion and $4.330 billion, respectively, for Exploration. These increases relative to the request would have funded the SLS at the FY2016 level (in the House bill) or higher (in the Senate bill). The House and Senate reports both recommended funding for development of the SLS Exploration Upper Stage (EUS)—$250 million and $300 million, respectively—which was not included in the Administration request. The House report specified that none of the funds in the House bill were for the Asteroid Redirect Mission, which was proposed in the FY2014 budget but faced ongoing opposition in Congress. The final appropriation for Exploration was $3.324 billion. The explanatory statement directed NASA to continue developing certain technologies associated with the Asteroid Redirect Mission, but also directed that these activities "should not distract from the overarching goal of sending humans to Mars."

[62] For more information on this issue, see CRS Report R44352, *Unmanned Aircraft Operations in Domestic Airspace: U.S. Policy Perspectives and the Regulatory Landscape*, by Bart Elias.

In the Space Operations account, the request for the ISS was $1.431 billion, a decrease of 0.4% from FY2016, and the request for Commercial Crew was $1.185 billion, a decrease of 4.7%. The FY2017 budget was the first to request Commercial Crew funding within Space Operations. Commercial Crew is now part of the Space Transportation budget item, which also includes the cost of U.S. commercial cargo flights to the ISS and payments to Russia for Soyuz flights carrying ISS crews. The House and Senate bills would have provided $186 million less and $125 million less, respectively, than the request for Space Operations. For the most part, the committee reports did not specify how the recommended funding should be allocated. However, the Senate report did note that its total included $1.185 billion for Commercial Crew, the same as the request. The enacted bill provided the same amount as the Senate for Space Operations overall and for Commercial Crew, again without specifying funding for the ISS.

Table 10. National Aeronautics and Space Administration R&D

(budget authority, in millions of dollars)

	FY2016 Actual	FY2017 Request (Total)	FY2017 Request (Mandatory)	FY2017 Request (Discr.)	FY2017 House	FY2017 Senate	FY2017 Enacted
Science	**5,584**	**5,601**	**298**	**5,303**	**5,597**	**5,395**	**5,765**
Earth Science	1,927	2,032	60	1,972	1,690	1,984	1,921
Planetary Science	1,628	1,519	128	1,391	1,846	1,356	1,846
Astrophysics	762	782	85	697	793	807	750
James Webb Space Telescope	620	569	—	569	569	569	569
Heliophysics	647	699	25	674	699	679	679
Aeronautics	**634**	**790**	**156**	**635**	**712**	**601**	**660**
Space Technology	**686**	**827**	**136**	**691**	**739**	**687**	**687**
Exploration	**3,996**	**3,337**	**173**	**3,164**	**4,183**	**4,330**	**4,324**
Exploration Systems Development	3,641	2,860	173	2,687	3,779	3,934	3,929
Exploration R&D	355	477	—	477	404	396	395
International Space Station	1,436	**1,431**	**—**	**1,431**	**n/s[a]**	**n/s[a]**	**n/s[a]**
Commercial Crew	**1,244**	**1,185**	**—**	**1,185**	**n/s[a]**	**1,185**	**1,185**
Subtotal R&D	**13,581**	**13,170**	**—**	**12,409**	**13,751**	**13,579**	**14,005**
Non-R&D Programs[b]	2,505	2,599	—	2,599	2,523	2,530	2,519
Safety, Security, and Mission Services	2,772	2,837	—	2,837	2,835	2,797	2,769
Associated with R&D[c]	*2,341*	*2,369*	—	*2,369*	*2,396*	*2,357*	*2,347*
Construction & Environmental C&R	427	420	—	420	398	400	361[a]
Associated with R&D[c]	*361*	*351*	—	*351*	*336*	*337*	*306*
NASA, Total (R&D)	**16,282**	**15,890**	**763**	**15,127**	**16,483**	**16,274**	**16,657**
NASA, Total	**19,285**	**19,025**	**763**	**18,262**	**19,508**	**19,306**	**19,653[a]**

Sources: FY2016 actual from operating plan as of NASA FY2018 congressional budget justification, http://www.nasa.gov/news/budget/. FY2017 request from NASA FY2017 congressional budget justification. FY2017 House from H.R. 5393 as reported and H.Rept. 114-605. FY2017 Senate from S. 2837 and S.Rept. 114-239. FY2017 enacted from P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017, pp. H3374-H3375.

Notes: Totals may differ from the sum of the components due to rounding. The Request (Total) column includes both discretionary and mandatory funding. For readability, a dash indicates zero. C&R = Compliance and Remediation.

a. Not specified. The R&D totals shown lower in the table assume that unspecified amounts within Space Operations are allocated in proportion to the Administration request.

b. Space Operations other than ISS and Commercial Crew; Education; and Inspector General.

c. 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.

d. Does not include $109 million in emergency appropriations for natural disaster repairs.

National Science Foundation[63]

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."[64] 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 (STEM) education program portfolio and federal STEM student aid and support.[65]

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 and FY2017 funding for these accounts are tracked in **Table 11**.

Overall. The Obama Administration requested $7.964 billion for the NSF in FY2017, a $501 million (6.7%) increase over the FY2016 estimate of $7.463 billion. This request included $7.564 billion in discretionary budget authority and $400 million in new one-time mandatory budget authority (excluding new mandatory funding, the total NSF request is $101 million [1.3%] greater than the FY2016 appropriation). The request would have increased budget authority in three accounts relative to the FY2016 estimate: RRA by $392 million (6.5%), EHR by $73 million (8.3%), and AOAM by $43 million (13%). The request would have provided NSB and OIG accounts with about the same amount as in FY2016 and decreased funding for the MREFC account by $7 million (3.6%).

As reported by the Senate, S. 2837 would have provided a total of $7.510 billion to NSF for FY2017, which is $46 million (0.6%) above the FY2016 estimate and $54 million (0.7%) below the FY2017 discretionary request. As reported by the House, H.R. 5393 would have provided a total of $7.406 billion to NSF for FY2017, which is $57 million (0.8%) below the FY2016 estimate, and $158 million (2.1%) below the FY2017 discretionary request. Neither bill would have provided mandatory funding. The Consolidated Appropriations Act, 2017 (P.L. 115-31),

[63] This section was written by Laurie Harris, Analyst in Science and Technology Policy, CRS Resources, Science, and Industry Division.

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

[65] 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 R44679, *The National Science Foundation: FY2017 Appropriations and Funding History*, by Laurie A. Harris and Frank Gottron.

signed by the President on May 5, 2017, provides $7.472 billion in discretionary funding to NSF, 0.1% above the FY2016 enacted amount. The increase of nearly $9 million for NSF is provided entirely within the MREFC account.

The FY2017 NSF budget justification identifies two areas of major emphasis, four cross-foundation investments, and six ongoing NSF-wide priorities. The two areas of major emphasis are Clean Energy R&D and strengthening support for core activities. The FY2017 request would have increased funding for Clean Energy R&D by $141 million to $512 million (37.9%). Strengthening support for core services would have been funded by new mandatory budget authority of $400 million.

NSF identifies four cross-foundation activities that aim to bring researchers from different fields of science and engineering together to address cross disciplinary questions. These activities are Understanding the Brain (UtB, $142 million requested, 3.6% decrease); Risk and Resilience ($43 million requested, 4.9% increase); Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS, $62 million requested, 27.7% increase); and NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES, $16 million requested, 3.2% increase).

NSF identifies six foundation-wide priorities for FY2017. These are Cyber-Enabled Materials, Manufacturing, and Smart Systems (CEMMSS, $257 million requested, 0.3% increase); Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21, $100 million requested, 24.4% decrease); Innovation Corps (I-Corps, $30 million requested, no change); Research at the Interface of Biological, Mathematical, and Physical Sciences (BioMaPS, $30 million requested, 4.8% decrease); Science, Engineering, and Education for Sustainability (SEES, $52 million requested, 29.8% decrease); and Secure and Trustworthy Cyberspace (SaTC, $150 million requested, 15.4% increase). The report to accompany S. 2837, S.Rept. 114-239 (Senate report), expressed support for the I-Corps program but did not specify a funding level. The report to accompany H.R. 5393, H.Rept. 114-605 (House report), recommended $5 million above the requested level for the program. The explanatory statement accompanying P.L. 115-31 directs NSF to provide $30.0 million for I-Corps.

Research. The Obama Administration sought a $392 million (6.5%) increase in funding for RRA in FY2017, for a total of $6.425 billion. Of this total, the request included $6.079 billion as discretionary funding and $346 million as new mandatory budget authority.

The FY2017 request included increases for all of the RRA subaccounts except for the U.S. Arctic Research Commission (USARC), which would not have changed. The largest percentage increase would have gone to Engineering (ENG, 9.4%). The largest increase in dollars would have gone to Mathematical and Physical Sciences (MPS, $87.3 million). The other subaccounts would have received increases between 6.0% and 6.5%, except for International and Integrative Activities (IIA), which would have received a 2.9% increase. The FY2017 request included an increase for the widely tracked RRA program Experimental Program to Stimulate Competitive Research (EPSCoR) from $160 million to $171 million (6.7%), of which $8.56 million was requested as new mandatory funding. The explanatory statement accompanying P.L. 115-31 specifies no less than $160 million for EPSCoR.

In recent years, policymakers have actively debated congressional funding directives at the major subaccount level within 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. For FY2016, P.L. 114-113 did not specify the funding distribution within RRA, except to limit the budget authority for Social, Behavioral and Economic Sciences to its FY2015 level.[66] For FY2017, S. 2837 and H.R. 5393 did not specify allocations within RRA, though the accompanying reports specified funding amounts for a subset of programs. Similarly, the Consolidated Appropriations Act, 2017, which provides $6.033 billion overall for RRA, does not specify allocations at the RRA subaccount level but does specify that $544 million remain available for polar research and operations support, including activities for the U.S. Antarctic program.

Education. The FY2017 request included a $73 million (8.3%) increase for EHR, for a total of $953 million. Of that total, $54 million was requested as mandatory budget authority. As reported by the Senate and House Committees on Appropriations, both S. 2837 and H.R. 5393 would have kept EHR funding at the FY2016 enacted level of $880 million. Similarly, P.L. 115-31 provides $880 million in discretionary funding with no mandatory funding.

By program, the largest increase in the FY2017 EHR request was for EHR Core Research (ECR): STEM Learning, within the Division of Research on Learning in Formal and Informal Settings.[67] The FY2017 request for ECR: STEM Learning was $52 million, or double the FY2016 estimate of $26 million. Congress did not fund a similar requested increase for FY2016.

EHR programs that are widely tracked by congressional policymakers include the Graduate Research Fellowship (GRF) and National Research Traineeship (NRT). The FY2017 request for GRF was $332 million, which was essentially the same as the FY2016 estimate. GRF funding would have been split equally between RRA and EHR, which would each have contributed $166 million. The FY2017 request for NRT was $59 million, a $4 million (8.3%) increase from FY2016. Funding for the NRT would have been split between EHR and RRA, but not equally. The RRA contribution would have been $21 million, $2 million below the FY2016 estimate. The EHR contribution would have been $35 million, $6 million above the FY2016 estimate.

Other widely tracked EHR programs include Advanced Technological Education ($66 million requested, no change); Robert Noyce Teacher Scholarship Program ($61 million requested, no change); Cybercorps: Scholarships for Service ($70 million requested, 40.0% increase); Advancing Informal STEM Learning (AISL, $63 million requested, no change in total but $8 million was requested as mandatory funding); Science, Technology, Engineering, and Mathematics + Computing Partnerships (STEM+C, $52 million requested, no change in total but $31 million was requested as mandatory funding); Historically Black Colleges and Universities Undergraduate Program (HBCU-UP, $35 million requested, no change); Tribal Colleges and University Programs ($14 million requested, no change); and the Louis Stokes Alliance for Minority Participation ($46 million requested, no change). The Senate report recommended $55 million for the CyberCorps program (10% increase); the House report did not specify an amount. The Senate and House reports additionally recommended $5 million and $30 million, respectively, for broadening participation in STEM fields at Hispanic Serving Institutions (HSIs).

The explanatory statement accompanying P.L. 115-31 directs NSF to provide funding levels for numerous programs at the requested levels, including the HBCU Program, STEM+C Partnerships, Tribal Colleges and University Programs, and AISL. For the CyberCorps:Scholarships for Service program, the explanatory statement specifies $55 million, which is $15 million below the NSF requested amount, equal to the Senate report

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

[67] Each EHR division has a core research program. ECR:STEM Learning is the core research program of the Division of Research on Learning in Formal and Informal Settings (DRL).

recommendation, and 10% above the FY2016 funding level for that program.[68] Further, though NSF reports ~$226.3 million in investments to HSIs in FY2015 through various agency programs,[69] the explanatory statement directs NSF to establish a specific HSI program at no less than $15 million and encourages the foundation to "use this program to build capacity at institutions of higher education that typically do not receive high levels of NSF grant funding."

Construction. Other accounts that fund R&D at NSF include the MREFC account, which supports large construction projects and scientific instruments. The Obama Administration sought just over $193 million for MREFC in FY2017, $7 million less than the FY2016 estimate. In FY2017, MREFC funding would have supported continued construction of the Large Synoptic Survey Telescope ($67 million requested, 32.7% decrease) and Daniel K. Inouye Solar Telescope ($20 million requested, no change).[70] Most of this request ($106 million) would have funded the Regional Class Research Vessels (RCRV) program to build two ships to support science in U.S. coastal waters.

The Senate report recommended increasing MREFC funding to $247 million ($54 million above the request), including $159 million to build three ships for the RCRV program. In contrast, the House report recommended decreasing funding to $87 million ($106 million below the request) and did not discuss the RCRV program. The Consolidated Appropriations Act, 2017, provides $209 million, 4.3% more than the FY2016 estimate. The accompanying explanatory statement directs NSF to provide $122 million to build three RCRVs. This amounts to $41 million per ship, compared to the FY2017 request of $53 million per ship.

Historically, the MREFC account has typically supported between four and six projects at a time. The FY2015-FY2017 requests for three projects were lower than the historical trend, which could indicate that some potentially scientifically valuable projects have been delayed or overlooked. On the other hand, when these large projects come online their operations costs must be shouldered by research accounts. For example, NSF requested $65 million to operate and maintain a MREFC project that received its final construction funding in FY2016, the National Ecological Observatory Network (NEON). This represented 8.2% of the FY2017 RRA Biological Sciences (BIO) request. In a constrained budget environment, this dynamic could precipitate difficult choices between funding for research and funding for research facilities and equipment.

Other accounts and initiatives. The Obama Administration sought $373 million for AOAM, a $43 million (13.0%) increase. A multi-year plan to relocate NSF headquarters accounts for the majority of this increase. Funding for NSB ($4 million) and OIG ($15 million) would not have changed significantly between FY2016 and FY2017 under the request. In line with the recommendations from the House and Senate reports, P.L. 115-31 provides approximately the same levels as in FY2016 for these accounts: $330 million for AOAM (including $41 million for relocating the NSF headquarters), $4 million for NSB, and $15 million for OIG.

The FY2017 NSF budget request included funding for three multiagency initiatives. The National Nanotechnology Initiative would have received $415 million, about the same as in FY2016. The Networking and Information Technology Research and Development would have received $1.254 billion, an increase of $59 million (4.9%). Most of this increase ($56 million) was requested as mandatory budget authority. The U.S. Global Change Research Program would have received

[68] The explanatory statement further directs, of the $55 million for CyberCorps, "no less than $7.5 million for qualified community colleges as directed by the Senate."

[69] NSF, Report to Congress, *National Science Foundation Support to Hispanic Serving Institutions (HSIs)*, September 2016, provided via email to CRS on April 3, 2017.

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

$348 million, $9 million (2.6%) more than the FY2016 estimate. The House and Senate reports did not include recommendations for these initiatives, nor does P.L. 115-31 specify funding for them.

Table 11. National Science Foundation Funding

(budget authority in millions of dollars)

Account	FY2016 Estimate	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Research and Related Activities (RRA)	6,033.7	6,425.4	6,079.4	6,033.6	6,033.6
Biological Sciences (BIO)	744.2	790.5	n/s	n/s	n/s
Discretionary	*744.2*	*745.7*	–	–	–
Mandatory	*0*	*44.8*	–	–	–
Computer and Information Science and Engineering (CISE)	935.8	994.8	n/s	n/s	n/s
Discretionary	*935.8*	*938.4*	–	–	–
Mandatory	*0*	*56.4*	–	–	–
Engineering (ENG)	916.2	1,002.7	n/s	n/s	n/s
Discretionary	*916.2*	*946.4*	–	–	–
Mandatory	*0*	*56.3*	–	–	–
Geosciences (GEO)	1,318.5	1,398.8	n/s	n/s	n/s
Discretionary	*1,318.5*	*1,319.6*	–	–	–
Mandatory	*0*	*79.3*	–	–	–
Mathematical and Physical Sciences (MPS)	1,349.2	1,436.5	n/s	n/s	n/s
Discretionary	*1,349.2*	*1,355.1*	–	–	–
Mandatory	*0*	*81.4*	–	–	–
Social, Behavioral, and Economic Sciences (SBE)	272.2	288.8	n/s	n/s	n/s
Discretionary	*272.2*	*272.4*	–	–	–
Mandatory	*0*	*16.4*	–	–	–
Office of International Science and Engineering (OISE)	49.1	52.1	n/s	n/s	n/s
Discretionary	*49.1*	*49.1*	–	–	–
Mandatory	*0*	*3.0*	–	–	–
International and Integrative Activities (IIA)	447.1	459.9	n/s	n/s	n/s
Discretionary	*447.1*	*451.3*	–	–	–
Mandatory	*0*	*8.6*	–	–	–
U.S. Arctic Research Commission (USARC)	1.4	1.4	n/s	n/s	n/s
Discretionary	*1.4*	*1.4*	–	–	–
Mandatory	*0*	*0*	–	–	–

Account	FY2016 Estimate	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
RRA Subtotal	6,033.7	6,425.4	6,079.4	6,033.6	6,033.6
Discretionary	*6,033.7*	*6,079.4*	*6,079.4*	*6,033.6*	*6,033.6*
Mandatory	*0*	*346.0*	*0*	*0*	*0*
Education and Human Resources (EHR)	880.0	952.9	880.0	880.0	880.0
Discretionary	*880.0*	*898.9*	*880.0*	*880.0*	*880.0*
Mandatory	*0*	*54.0*	*0*	*0*	*0*
Major Research Equipment and Facilities Construction (MREFC)	200.3	193.1	87.1	246.6	209.0
Agency Operations and Award Management (AOAM)	330.0	373.0	340.0	330.0	330.0
National Science Board (NSB)	4.4	4.4	4.4	4.4	4.4
Office of the Inspector General (OIG)	15.2	15.2	15.2	15.2	15.2
NSF, Total	7,463.5	7,964.0	7,406.1	7,509.8	7,472.2
Discretionary	*7,463.5*	*7,564.0*	*7,406.1*	*7,509.8*	*7,472.2*
Mandatory	*0*	*400.0*	*0*	*0*	*0*

Source: Data in the columns titled, "FY2016 Estimate" and "FY2017 Request" are from the FY2017 *NSF Budget Request to Congress*. Data in the column headed "FY2017 House" are from H.R. 5393 as reported and H.Rept. 114-605. Data in the column headed "FY2017 Senate" are from S. 2837 as reported and S.Rept. 114-239. Data in the column headed "FY2017 Enacted" are from the Consolidated Appropriations Act, 2017 (P.L. 115-31).

Notes: Totals may differ from the sum of the components due to rounding. The term "n/s" means "not specified."

Department of Agriculture[71]

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.

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).

For FY2017, the enacted Agriculture appropriation is in the Consolidated Appropriations Act, P.L. 115-31. Both the House and the Senate Appropriations Committees reported their Agriculture appropriations bills (H.R. 5054, S. 2956) in April and May 2016. In addition to discretionary

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

appropriations, agricultural research is also funded by state matching contributions and private donations or grants, as well as mandatory funding from the farm bill.[72]

The enacted FY2017 appropriation provides $2.891 billion for agricultural research, down $45 million from the enacted FY2016 total (-1.5%). This overall change is comprised of $67 million more for research programming across the four agencies, and $112 million less for buildings and facilities than in FY2016. The enacted bill is less of a reduction than either the House or Senate bills, generally providing more to research programs than the House bill proposed, and reducing building and facilities by less than the Senate bill proposed. (See **Table 12**.)

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 6,600 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 FY2017, the enacted appropriation provides $1.170 billion for ARS salaries and expenses, $26 million more than FY2016 (+2.3%; **Table 12**). The House-reported bill would have increased this amount by $8 million and the Senate-reported bill by $34 million.

ARS had proposed increases across several programmatic areas for prioritized research projects, coupled with reductions in funding for several existing programs. The enacted appropriation, via the explanatory statement, expressly rejects those specific reductions and reprogramming.

The enacted appropriation does not include concerns that were mentioned in the FY2016 appropriation about animal care are ARS research facilities. However, the Animal and Plant Health Inspection Service (APHIS) is instructed in the explanatory statement to continue its inspections of ARS facilities and post the results online.

For the ARS buildings and facilities account, the enacted appropriation provides $99.6 million in FY2017, a decrease from the $212 million appropriated in FY2016. USDA had requested $94.5 million for FY2017. The appropriation directs that funding be used for priorities identified in the "USDA ARS Capital Investment Strategy."[73] ARS's priorities include completion of the Foreign Disease and Weed Science Research Unit in Fort Detrick, MD ($30.2 million) and Phase I of the Agricultural Research Technology Center in Salinas, CA ($64.3 million).[74]

[72] For background on agricultural research, see CRS Report R40819, *Agricultural Research: Background and Issues*, by Jim Monke. For background on FY2017 agricultural appropriations, see CRS Report R44588, *Agriculture and Related Agencies: FY2017 Appropriations*, coordinated by Jim Monke.

[73] USDA-ARS, *The USDA Agricultural Research Service Capital Investment Strategy*, April 2012, http://www.ars.usda.gov/sp2UserFiles/Subsite/ARSLegisAffrs/USDA_ARS_Capital_Investment_Strategy_FINAL_eeo.pdf.

[74] In FY2016, ARS buildings and facilities funding went to construction of a biocontainment laboratory at the ARS 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.[75] Federal funds enhance capacity at universities and institutions by statutory formula funding, competitive awards, and grants.

For FY2017, the enacted appropriation provides $1.363 billion for NIFA, an increase of $36 million over FY2016 (+2.7%; **Table 12**). The President had requested slightly more discretionary funding for NIFA plus an increase in mandatory funding as described below.

The Agriculture and Food Research Initiative (AFRI)—USDA's flagship competitive grants program with 25% of NIFA's total budget—received the Administrations requested increase of $25 million, for a $375 million appropriation. The Administration had also requested an additional $325 million of new mandatory money to "fully fund" AFRI at its farm-bill authorized level of $700 million. New mandatory funding is generally more germane to the authorization process (such as the farm bill) rather than the annual appropriations, and the House and Senate did not include this request in their bills or the final appropriation.

Formula-funded programs in both research and extension are held constant under the FY2017 appropriation, though the Administration had requested an increase for the Evans-Allen program that supports historically black colleges of agriculture.

The FY2017 appropriation continues to direct that at least 15% of NIFA's competitive grant funding be available for research enhancement awards such as USDA-EPSCoR.

The President's request again proposed to consolidate federal science, technology, engineering, and mathematics (STEM) education funding so that USDA would no longer fund Higher Education Challenge Grants, Graduate and Post-graduate Fellowship Grants, the Higher Education Multicultural Scholars Program, the Women and Minorities in STEM Program, Agriculture in the Classroom, and Secondary/Postsecondary Challenge Grants. As in prior years, the enacted appropriation rejected that proposal and continues to fund these STEM programs in USDA. In fact, an additional $500,000 was appropriated to Rural Development to develop a plan to increase access to STEM education in rural areas via the Distance Learning and Telemedicine program. For more on efforts to reorganize federal STEM education programs, see CRS In Focus IF10229, *The Changing Federal STEM Education Effort*, by Heather B. Gonzalez.

National Agricultural Statistics Service

The National Agricultural Statistics Service 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 FY2017, the enacted appropriation provides NASS $171 million, an increase of $2.8 million over FY2016 (+2.7%). Most of that increase ($1.6 million) is targeted to expand a feed cost survey at the national level.

[75] 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.

Economic Research Service

The Economic Research Service supports economic and social science analysis about agriculture, rural development, food, commodity markets, and the environment. It collects and disseminates data concerning USDA programs and policies. For FY2017, the enacted appropriation provides ERS $86.8 million, a $1.4 million increase over FY2016 (+1.6%). The increase is supposed to support additional research on groundwater modeling and drought resilience.

Table 12. U.S. Department of Agriculture R&D

(budget authority, in millions of dollars)

Agency or Major Program	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Agricultural Research Service (ARS)	1,143.8	1,161.3	1,151.8	1,177.9	1,170.2
Buildings and Facilities	212.1	94.5	99.6	64.3	99.6
Subtotal, ARS	**1,355.9**	**1,255.8**	**1,251.4**	**1,242.2**	**1,269.8**
National Institute of Food and Agriculture (NIFA)					
Research and Education					
AFRI (competitive grants)	350.0	375.0**Error! Reference source not found.**	375.0	375.0	375.0
Hatch Act (1862 institutions)	243.7	243.7	243.7	243.7	243.7
Evans-Allen (1890 institutions)	54.2	58.0	54.2	54.2	54.2
McIntire-Stennis (forestry)	34.0	34.0	34.0	34.0	34.0
Other	137.8	126.3	126.0	144.6	142.7
Subtotal	**819.7**	**836.9**	**832.9**	**851.5**	**849.5**
Extension					
Smith-Lever (b) and (c)	300.0	300.0	300.0	300.0	300.0
Smith-Lever (d)	85.5	106.9	85.5	85.5	85.5
Other	90.4	95.0	91.9	90.7	91.9
Subtotal	**475.9**	**501.9**	**477.4**	**476.2**	**477.4**
Integrated Activities	30.9	28.9	30.9	36.0	36.0
Subtotal, NIFA	**1,326.5**	**1,374.0**	**1,341.2**	**1,363.7**	**1,362.9**
National Agricultural Statistics Service (NASS)	**168.4**	**176.6**	**168.4**	**169.6**	**171.2**
Economic Research Service (ERS)	**85.4**	**91.3**	**86.0**	**86.8**	**86.8**
Total, USDA Research Mission Area	**2,936.2**	**2,897.7**	**2,847.0**	**2,862.4**	**2,890.7**

Source: CRS, compiled from P.L. 114-113 (including tables in the joint explanatory statement), H.R. 5054, S. 2956 (including tables in the committee reports), and P.L. 115-31 (including tables in the joint explanatory statement).

Notes: Components may not add to subtotals due to rounding.

a. In addition to this discretionary funding, the Administration separately requested $325 million of mandatory funding to "fully fund" AFRI at its $700 million authorized level.

Department of Commerce

Two agencies of the Department of Commerce have major R&D programs: the National Institute of Standards and Technology and the National Oceanic and Atmospheric Administration.

National Institute of Standards and Technology[76]

The mission of the National Institute of Standards and Technology (NIST) is "to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life."[77] NIST research provides measurement, calibration, and quality assurance methods and techniques that support U.S. commerce, technological progress, product reliability, manufacturing processes, and public safety. NIST's responsibilities include the development, maintenance, and custodial retention 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.[78]

President Obama requested $1.015 billion in discretionary funding for NIST in FY2017, an increase of $50.5 million (5.2%) over the FY2016 enacted appropriation of $964.0 million. (See **Table 13**.) NIST discretionary funding is provided through three accounts: Scientific and Technical Research and Services (STRS), Industrial Technology Services (ITS), and Construction of Research Facilities (CRF). In addition, President Obama requested $2.0 billion in mandatory funding for NIST, including $1.9 billion for the National Network for Manufacturing Innovation (NNMI) to complete the development of a network of 45 institutes by FY2025,[79] and $100.0 million to supplement the Construction of Research Facilities discretionary funding request to renovate and modernize NIST facilities to maintain and improve current R&D capabilities.[80]

President Obama's FY2017 discretionary request included $730.5 million for R&D, standards coordination, and related services in the STRS account, an increase of $40.5 million (5.9%) above the FY2016 level. Funding for laboratory programs would have increased by $33.5 million (5.5%) to $638.7 million, corporate services by $4.0 million (23.1%) to $21.3 million, and standards coordination and special programs by $3.0 million (4.4%) to $70.5 million.[81]

President Obama requested $189.0 million for the ITS account for FY2017, up $34.0 million (21.9%) from the FY2016 level. The ITS request included $142.0 million for the Manufacturing Extension Partnership (MEP) program, up $12.0 million (9.2%) from FY2016, and $47 million for the NNMI, up $22.0 million (88.0%).[82] P.L. 114-113 provided NIST $25.0 million for the

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

[77] NIST website, "General Information," http://nist.gov/public_affairs/general_information.cfm.

[78] 15 U.S.C. 272.

[79] For additional information on the NNMI, see CRS Report R44371, *The National Network for Manufacturing Innovation*, by John F. Sargent Jr.

[80] According to the Department of Commerce, "Mandatory funding is presented in the FY2017 Budget throughout the Federal R&D enterprise to support research across a range of topics from health to clean energy technologies, reflecting the high priority of R&D in a time of limited discretionary funding." U.S. Department of Commerce, Department of Commerce, *Budget in Brief, Fiscal Year 2016*, p. 128, http://www.osec.doc.gov/bmi/budget/FY17BIB/AllFilesWithCharts2.pdf.

[81] U.S. Department of Commerce, Department of Commerce, *Budget in Brief, Fiscal Year 2017*.

[82] For additional information on the MEP program, see CRS Report R44308, *The Manufacturing Extension Partnership*

(continued...)

NNMI in FY2016, and the explanatory language accompanying the act directed NIST to merge its Advanced Manufacturing Technology (AMTech) Consortia program with the NNMI; President Obama's FY2017 request includes no separate funding for AMTech.[83]

President Obama requested $95.0 million for FY2017 for the NIST CRF account, down $24.0 million (20.2%) from the FY2016 level.[84] President Obama's mandatory funding request (discussed above) would have, in part, provided supplementary funding for activities funded by this account.

The House and Senate Committees' on Appropriations reported their respective Commerce, Justice, Science, and Related Agencies appropriations bills—H.R. 5393 (H.Rept. 114-605) and S. 2837 (S.Rept. 114-239)—on June 7, 2016, and April 21, 2016, respectively. The House-reported funding levels included $680.0 million for STRS, a decrease of $10.0 million from the FY2016 level and $50.5 million less than the request; $135.0 million for ITS, $20 million below the FY2016 level and $54.0 million below the request; and $50.0 million for CRF, $69.0 million below the FY2016 level and $45 million below the request. The Senate-reported funding levels included $700.0 million for STRS, $10.0 million above the FY2016 level, $30.5 million below the request, and $20.0 million above the House-reported level; $155.0 million for ITS, equal to the FY2016 level, $34.0 million below the request, and $20 million below the House-reported level; and $119.0 million for CRF, equal to the FY2016 level, $24 million above the request, and $69.0 million above the House-reported level.

In May 2017, Congress enacted P.L. 115-31, providing $954.0 million in discretionary funding for NIST in FY2017, a decrease of $10.0 million (1.0%) from the FY2016 enacted appropriation of $964.0 million.

The act provides $690 million for the STRS account, the same as provided for FY2016. According to the explanatory statement, NIST may spend up the FY2016 enacted level for its "Lab to Market activities and for Standards Coordination and Special Programs," and no less than the FY2016 level for its "biomanufacturing activities and for the Urban Dome program."[85] In addition, the explanatory statement for the act acknowledges a transfer of $3.0 million from the Department of Justice to NIST to support ongoing interagency forensics programs.

The act provides $155.0 million for the ITS account, the same as provided for FY2016. This amount includes $130.0 million for the MEP program and $25.0 million for the NNMI, to include funding for center establishment and up to $5,000,000 for coordination activities.

The act provides $109.0 million for the CRF account, $10.0 million (8.4%) below the FY2016 level. According to the explanatory statement, no less than $60.0 million of this funding is to be used for the design and renovation of NIST's "outdated and unsafe radiation physics infrastructure."

(...continued)

Program, by John F. Sargent Jr.

[83] U.S. Department of Commerce, Department of Commerce, *Budget in Brief, Fiscal Year 2017*.

[84] Ibid.

[85] Explanatory Statement for P.L. 115-31, https://rules.house.gov/sites/republicans.rules.house.gov/files/115/OMNI/DIVISION%20B%20-%20CJS%20SOM%20OCR%20FY17.pdf.

Table 13. National Institute of Standards and Technology Funding

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House Reported	FY2017 Senate Reported	FY2017 Enacted
Discretionary Budget Authority					
Scientific and Technical Research and Services	$690.0	$730.5	$680.0	$700.0	$690.0
Industrial Technology Services	155.0	189.0	135.0	155.0	155.0
Manufacturing Extension Partnership	130.0	142.0	130.0	130.0	130.0
Network for Manufacturing Innovation	25.0	47.0	5.0	25.0	25.0
Construction of Research Facilities	119.0	95.0	50.0	119.0	109.0
NIST, Total (Discretionary)	**964.0**	**1,014.5**	**865.0**	**974.0**	**954.0**
Mandatory Budget Authority					
Public Safety Communications Research Fund[a]	—	—			0
Network for Manufacturing Innovation	—	1,900.0			0
Construction of Research Facilities	—	100.0			0
NIST, Total (Mandatory)	—	**2,000.0**			**0**

Sources: U.S. Department of Commerce, Department of Commerce, *Budget in Brief, Fiscal Year 2016*, p. 128, http://www.osec.doc.gov/bmi/budget/FY17BIB/AllFilesWithCharts2.pdf; H.R. 5393; H.Rept. 114-605; S. 2837; S.Rept. 114-239; P.L. 115-31 and accompanying explanatory statement..

Notes:

a. In FY2017, NIST intends to use mandatory resources provided in FY2015 through the NIST Public Safety Communications Research Fund to help develop wireless technologies for public safety users, as part of the National Wireless Initiative included in the Middle Class Tax Relief and Job Creation Act of 2012 (P.L. 112-96). This act provides approximately $285.0 million in mandatory funds for NIST from the spectrum auction proceeds in FY2015 to help industry and public safety organizations conduct research and develop new standards, technologies and applications to advance public safety communications in support of the initiative's efforts to build an interoperable nationwide broadband network for first responders.

National Oceanic and Atmospheric Administration[86]

The National Oceanic and Atmospheric Administration (NOAA) conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; collects and provides data on the oceans and atmosphere; and manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[87] The reorganization was intended to unify elements of the nation's environmental programs 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

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

[87] "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.

the pieces of its research program and ensuring research is linked to the broader science needs of the agency."[88]

NOAA's Research Council[89] has developed a five-year plan (2013-2017) to guide the agency's R&D efforts.[90] These R&D efforts are intended to support the long-term goals and enterprise objectives of NOAA's *Next Generation Strategic Plan*.[91] The strategic plan is organized into four categories of long-term goals including (1) climate adaptation and mitigation, (2) a weather-ready nation,[92] (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 to help 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 [requires] 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 FY2017, the Consolidated Appropriations Act (P.L. 115-31) provided $848.0 million for NOAA R&D, an increase of $173.0 million (25.6%) over the FY2016 funding level of $675.0 million, and $33.2 million (4.1%) more than the FY 2017 request of $814.8 million. R&D funding for FY2017 consisted of $497.8 million for research (58.7% of total R&D funding), $86.9 million for development (10.3%), and $263.3 million for R&D equipment (31.0%).[93] R&D accounted for 14.9% of NOAA's total FY2017 enacted discretionary budget of $5,675.4 million, an increase from 11.7% of NOAA's enacted budget in FY2016.

NOAA's administrative structure includes seven line offices that reflect its diverse mission. Five of the line offices are divided according to general program areas including the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite,

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[88] 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.

[89] According to NOAA, "The NOAA Research Council is an internal body composed of senior scientific personnel from every line office in the agency who provide corporate oversight to ensure NOAA's research and development activities are of the highest quality, meet near- to long-term mission requirements and societal needs, take advantage of emerging scientific and technological opportunities, shape a forward-looking research agenda, and are accomplished in an efficient and cost-effective manner." Source: NOAA website, "NOAA Research Council," http://nrc.noaa.gov.

[90] 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.

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

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

[93] Vicki Schwantes, NOAA Budget Office, email to CRS, June 14, 2017.

Data, and Information Service (NESDIS); National Weather Service (NWS); and the Office of Oceanic and Atmospheric Research (OAR). The Office of Marine and Aviation Operations (OMAO) and Mission Support (formerly Program Support) provide general support and services across the agency. OMAO is responsible for the agency's ships and aircraft that collect data in support of NOAA's environmental and scientific missions. Mission Support is a cross-cutting budget activity that funds the Office of Education and administrative functions related to planning, procurement, information technology, human resources, and infrastructure.[94]

Table 14 provides FY2016 enacted R&D funding, the Administration's FY2017 R&D request, and FY2017 enacted R&D funding.[95] Funding for NOAA R&D is included in budget 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 legislation 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. Thus R&D funding levels for House and Senate committee-reported appropriations bills are not available.

Most of NOAA's R&D activities are conducted by OAR and in most years OAR accounts for over half of NOAA's R&D funding. In FY2017, P.L. 115-31 includes $480.1 million for OAR R&D, an increase of $76.7 million (19.0%) over the FY2016 funding level of $403.4 million, and $2.4 million (0.5%) less than the FY2017 request of $482.5 million.[96]

OAR conducts research in three major areas: weather and air chemistry; climate; and oceans, coasts, and the Great Lakes. A large portion of these efforts are undertaken through partnerships with cooperative research institutes. NOAA supports 16 cooperative research institutes that work with NOAA's seven research laboratories in OAR's research areas. The President's FY2017 request would have provided $171.0 million for laboratories and cooperative institutes, $3.0 million (1.8%) more than the FY2016 enacted funding level of $168.0 million. The House committee-reported bill would have funded laboratories and cooperative institutes with a total of $155.0 million, $16.0 million (9.4%) less than the FY2017 request and $13 million (7.7%) less than the FY2016 enacted funding level. The Senate committee-reported bill would have funded laboratories and cooperative institutes with a total of $164.7 million, $9.7 million (6.3%) more than the House committee-reported bill, $6.3 million (3.7%) less than the FY2017 request, and $3.3 million (2.0%) less than the FY2016 enacted funding level. P.L. 115-31 funds the cooperative institutes with a total of $172.0 million, $7.3 million (4.4%) more than the Senate committee-reported bill, $17.0 million (11.0%) more than the House committee-reported bill, $1.0 million (0.6%) more than the FY2017 request, and $4.0 million (2.4%) more than the FY2016 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 FY2017 request would have provided the National Sea Grant College Program $68.9 million, $4.1 million (5.6%) less than the FY2016 enacted funding level of $73.0 million. The House committee-reported bill would have funded Sea Grant with a total of $66.0 million, $2.9 million (4.2%) less than the FY2017 request, and $7.0 million (9.6%) less than the FY2016 enacted funding level. The Senate committee-reported bill would have funded Sea Grant with a total of $74.0 million, $8.0 million (12.1%) more than the House-

[94] Nearly all of NOAA's discretionary funding for the five offices, OMAO, and Mission Support is from the Operations, Research and Facilities and the Procurement, Acquisition, and Construction accounts.

[95] Ibid.

[96] Ibid.

committee-reported bill, $5.1 million (7.4%) more than the FY2017 request, and $1.0 million (1.4%) more than the FY2016 enacted funding level.[97] P.L. 115-31 funds Sea Grant with a total of $72.5 million, $1.5 million (2.0%) less than the Senate committee-reported bill, $6.5 million (9.8%) more than the House committee-reported bill, $3.6 million (5.2%) more than the FY2017 request, and $0.5 million (0.7%) less than the FY2016 enacted funding level.

Climate research includes funding for laboratories and cooperative institutes, regional climate data and information, and competitive research. The President's FY2017 request would have provided climate research $189.9 million, $31.9 million (20.2 %) more than the FY2016 enacted funding level of $158.0 million.[98] The House committee-reported bill would have funded climate research with a total of $128.0 million, $61.9 million (32.6%) less than the FY2017 request, and $30 million (19.0%) less than the FY2016 enacted funding level. The Senate committee-reported bill would have funded climate research with a total of $158.0 million, $30.0 million (23.4%) more than the House committee-reported bill, $31.9 million (16.8%) less than the FY2017 request, and an amount equal to the FY2016 enacted funding level. P.L. 115-31 funds climate research with a total of $158.0 million, an amount equal to the Senate committee-reported bill, $30.0 million (23.4%) more than the House committee-passed bill, $31.9 million (16.8%) less than the FY2017 request, and an amount equal to the FY2016 enacted funding level.

Table 14. National Oceanic and Atmospheric Administration R&D

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House Reported	FY2017 Senate Reported	FY2017 Enacted
National Ocean Service (NOS)	66.7	79.3	n/a	n/a	75.2
National Marine Fisheries Service (NMFS)	70.2	74.8	n/a	n/a	70.1
National Weather Service (NWS)	25.7	23.1	n/a	n/a	23.1
National Environmental Satellite, Data, and Information Service (NESDIS)	23.0	33.4	n/a	n/a	31.0
Office of Marine and Aviation Operations[a] (OMAO)	86.0	117.1	n/a	n/a	163.1
Office of Oceanic and Atmospheric Research (OAR)	403.4	482.5	n/a	n/a	480.1
Mission Support	n/a	4.6	n/a	n/a	4.6
Total, R&D	**675.0**	**814.8**	**n/a**	**n/a**	**848.0**
OAR Total, R&D and Non-R&D[b]	**482.0**	**519.8**	**464.0**	**480.3**	**514.1**
NOAA Total, R&D and Non-R&D[b]	**5,765.6**	**5,848.2**	**5,580.6**	**5,691.2**	**5,675.4**

Source: Vicki Schwantes, NOAA Budget Office, email to CRS concerning NOAA R&D, June 14, 2017.

Notes: n/a = not available. R&D funding levels for the columns headed "FY2017 House Reported" and "FY2017 Senate Reported" are not provided by congressional committees.

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

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

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

[98] Approximately 35% to 40% of climate research funding is provided for laboratories and cooperative institutes (e.g., $60.0 million in FY2016).

Department of Veterans Affairs[99]

The Department of Veterans Affairs (VA) operates programs to provide America's veterans with medical care, benefits, social support, and memorials. 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.

Funding for VA R&D is generally included in line items that also include non-R&D funding. Therefore it is not possible to know precisely how much of the funding provided for in appropriations legislation 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.

President Obama proposed $1.252 billion for VA R&D in FY2017, up $32 million (2.6%) from FY2016. The VA request for FY2017 included $663 million for its Medical and Prosthetic Research account, up $32.6 million (5.2%), and $589 million in funding for research supported by its Medical Services account, equal to its FY2016 funding.

The VA's medical and prosthetics research is managed by the Veterans Health Administration's Office of Research and Development, which consists of four main research services:

- Biomedical laboratory R&D supports preclinical research to understand life processes at the molecular, genomic, and physiological levels.
- Clinical science R&D 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 supports studies to identify and promote effective and efficient strategies to improve the organization, cost-effectiveness, and delivery of quality health care.
- Rehabilitation R&D 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.

Each service oversees a number of research centers of excellence and is headed by a director. These directors report to the Chief Research and Development Officer, who in turn reports to the Deputy Under Secretary for Health for Policy and Services.

The House-passed Military Construction and Veterans Affairs, and Related Agencies Appropriations Act, 2017 (H.R. 4974) would have fully funded the Medical and Prosthetic Research request at $663 million, $33 million (5%) more than the FY2016 enacted level of $631 million. Division B (Military Construction, the Department of Veterans Affairs, and Related Agencies) of the Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2017 (H.R. 2577), as passed by the Senate, included $675.4 million for the Medical and Prosthetic Research account, $45 million (7%) more than the FY2016 enacted level and $12 million (2%) more than the House-passed level.

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

On June 23, 2016, the House approved the conference report on H.R. 2577 (H.Rept. 114-640). The bill would have provided $675.4 million in FY2017 funding for the Medical and Prosthetic Research account.

On September 28, 2016, the House and Senate passed the Continuing Appropriations and Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2017, and Zika Response and Preparedness Act (P.L. 114-223). On September 29, 2016, President Obama signed the bill into law. Division A of the act, designated as the Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2017, provides funding for the Department of Veterans Affairs, including $675.4 million for the Medical and Prosthetic Research account.

Table 15 summarizes R&D program funding for VA, in the Medical and Prosthetic Research account and Medical Services account. **Table 16** provides amounts to be spent in Designated Research Areas (DRAs) which VA describes as "areas of particular importance to our veteran patient population."[100] Funding for research projects that span multiple areas may be included in several DRAs; thus, the amounts in **Table 16** total to more than the appropriation or request for the VA Medical and Prosthetic Research account.

Table 15. Department of Veterans Affairs R&D

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House (H.R. 4974)	FY2017 Senate (H.R. 2577)	FY2017 Enacted
Medical and Prosthetic Research	631	663	663	675	673[a]
Medical Services	589	589	n/a	n/a	n/a
Veterans Affairs, Total	**$1,220**	**$1,252**	n/a	**n/a**	**n/a**

Source: Email communication between the Office of Management and Budget and CRS, February 22, 2016; H.R. 4974; H.Rept. 114-497; S.Rept. 114-237; and P.L. 114-223.

Notes: n/a = not available. Figures for the column headed "FY2017 Enacted" will be added, if available, when action is completed.

a. Reflects $2.0 million rescission included in P.L. 114-223.

Table 16. Department of Veterans Affairs Amounts by Designated Research Areas

(in millions of dollars)

	FY2016 Estimate	FY2017 Request[a]
Acute and Traumatic Injury	21.3	21.3
Aging	154.2	150.3
Autoimmune, Allergic, and Hematopoietic Disorders	29.1	28.4
Cancer	57.8	59.5
Central Nervous System Injury and Associated Disorders	93.5	91.2
Degenerative Diseases of Bones and Joints	31.8	31.0

[100] Ibid, p. VHA-308.

	FY2016 Estimate	FY2017 Request[a]
Dementia and Neuronal Degeneration	26.1	25.4
Diabetes & Major Complications	36.8	35.8
Digestive Diseases	21.7	21.2
Emerging Pathogens/Bio-Terrorism	1.0	1.0
Gulf War Veterans Illness	12.5	12.2
Health Systems	72.7	70.9
Heart Disease/Cardiovascular Health	65.4	63.8
Infectious Diseases	34.7	33.8
Kidney Disorders	22.0	21.4
Lung Disorders	28.3	27.6
Mental Illness	115.8	115.8
Military Occupations and Environmental Exposures	16.6	16.2
Other Chronic Diseases	5.1	5.0
Prosthetics	15.8	15.4
Sensory Loss	17.9	17.5
Special Populations	20.6	20.1
Substance Abuse	30.9	30.1

Source: Department of Veterans Affairs, *Budget In Brief, 2017, p. BiB-24,* http://www.va.gov/budget/docs/summary/Fy2017-BudgetInBrief.pdf.

Notes: Projects that span multiple areas may be included in several DRAs; thus, amounts in this table for each fiscal year total to more than the VA research appropriation/request. Columns for "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" are not included in this table as these figures will only be available after Congress completes the appropriations process and VA determines how much of the appropriated funds will be allocated to each DRA.

a. According to VA, "In [FY]2017, VA is prioritizing its research portfolio towards precision medicine, including a substantial $50 million investment in genomic sequencing on Veterans enrolled in MVP. This genomic sequencing initiative is not a project, per se, and as a result it is not reflected in the [table above]. Thus, most DRAs show a minor decrease from 2016 levels, as some additional program resources are directed towards precision medicine." Source: Department of Veterans Affairs, *Budget In Brief, 2017, p. BiB-23.*

Department of the Interior[101]

The Department of the Interior (DOI) was created to protect and manage the nation's natural resources and cultural heritage and to provide 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.[102]

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

[102] 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.

President Obama requested $1.048 billion in DOI R&D funding for FY2017, $84.5 million (8.8%) above its FY2016 enacted level of $963.5 million.[103]

According to DOI,

> Activities supported include scientific analysis of natural systems and applied field research to address specific problems, such as thawing permafrost, invasive species, and flooding. The Department's scientific research is used by land managers, for example, to support conservation efforts on the front lines of a changing climate and to confront the unpredictable nature of its impacts.[104]

Of President Obama's FY2017 DOI R&D funding request, 5.7% was for basic research, 79.0% was for applied research, and 15.4% was for development. The U.S. Geological Survey (USGS) is the only DOI component that conducts basic research.[105]

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 provided in appropriations legislation is allocated to R&D specifically 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 appropriations to specific activities and report those figures.

The House passed H.R. 5538, the Department of the Interior, Environment, and Related Agencies appropriations act for FY2017 on July 14, 2016. The Senate Committee on Appropriations reported its version of the act, S. 3068, on June 16, 2016.

On May 5, 2017, President Trump signed into law P.L. 115-31, providing FY2017 funding for the Department of the Interior and other departments and agencies.

U.S. Geological Survey

The USGS accounts for more than two-thirds of all DOI R&D funding. A single appropriations account, Surveys, Investigations, and Research (SIR), provides all USGS funding. 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.

President Obama's total FY2017 budget request for USGS was $1.168 billion. Of this amount, $736.3 million was for R&D, an increase of $59.4 million (8.8%) over the FY2016 level of $676.9 billion. This total included $173.9 million for Ecosystems, up $13.7 million (8.6%); $120.3 million for Climate and Land Use Change, up $18.6 million (18.3%); $99.5 million for Energy, Minerals, and Environmental Health, up $5.0 million (5.3%); $121.2 million for Natural Hazards, up $7.9 million (6.9%); $130.8 million for Water Resources, up $9.9 million (8.2%); $90.1 million for Core Science Systems, up $4.3 million (5.1%); and $0.5 million for Science Support, up $12,000 (2.5%).[106]

The Consolidated Appropriations Act, 2017 (P.L. 115-31) provides $1.085 billion for USGS for FY2017, essentially the same as FY2016 funding of $1.082 billion and $83 million (7.6%) below

[103] Email correspondence between the DOI and CRS on February 9, 2016.

[104] Department of the Interior, *Fiscal Year 2017: The Interior Budget in Brief*, February 2016, p. DH-54, https://www.doi.gov/sites/doi.gov/files/uploads/2017_Highlights_Book.pdf.

[105] Email correspondence between the DOI and CRS on February 9, 2016.

[106] Ibid.

the request. No additional details are available that would allow for an assessment of how much of the FY2017 funding will be devoted to R&D.

Other DOI Components

President Obama's FY2017 request also included R&D funding for the following DOI components:[107]

- Bureau of Reclamation (BOR): $91.9 million in applied research and development funding for FY2017, up $3.3 million (3.8%) from FY2016.
- Bureau of Ocean Energy Management (BOEM): $73.3 million in applied research and development funding for FY2017, up $0.5 million (0.6%) from FY2016.
- Fish and Wildlife Service (FWS): $38.6 million in applied research for FY2017, up $6.1 million (18.9%) from FY2016.
- Bureau of Land Management (BLM): $30.5 million in applied research and development for FY2017, up $6.9 million (29.4%) from FY2016.
- National Park Service (NPS): $28.7 million in applied research and development for FY2017, up $1.7 million (6.3%) from FY2016.
- Bureau of Safety and Environmental Enforcement (BSEE): $26.7 million in applied research for FY2017, equal to the FY2016 level.
- Bureau of Indian Affairs (BIA): $11.0 million in applied research for FY2017, up $1.5 million (15.3%) from FY2016.
- Wildland Fire Management (WFM): $6.0 million in applied research for FY2017, equal to the FY2016 level.
- Office of Surface Mining Reclamation and Enforcement (OSMRE): $5.0 million in applied research for FY2017; the office received no funding for R&D in FY2016.

Table 17 summarizes FY2016 R&D funding and President Obama's FY2017 R&D funding request for DOI components. As discussed above, it is not possible to ascertain how much of the funding provided in the House-passed and Senate-reported versions of the Department of the Interior, Environment, and Related Agencies appropriations acts for FY2017, or in P.L. 115-31, is intended for R&D activities, due to the inclusion of R&D funding in accounts that also include non-R&D funding.

[107] Ibid.

Table 17. Department of the Interior R&D

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate Reported	FY2017 Enacted
U.S. Geological Survey (USGS)	676.9	736.3	n/a	n/a	n/a
Bureau of Reclamation (BOR)	88.6	91.9	n/a	n/a	n/a
Bureau of Ocean Energy Management (BOEM)	72.8	73.3	n/a	n/a	n/a
Fish and Wildlife Service (FWS)	32.5	38.6	n/a	n/a	n/a
Bureau of Land Management (BLM)	23.5	30.5	n/a	n/a	n/a
National Park Service (NPS)	27.0	28.7	n/a	n/a	n/a
Bureau of Safety and Environmental Enforcement (BSEE)	26.7	26.7	n/a	n/a	n/a
Bureau of Indian Affairs (BIA)	9.5	11.0	n/a	n/a	n/a
Wildland Fire Management (WFM)	6.0	6.0	n/a	n/a	n/a
Office of Surface Mining Reclamation and Enforcement (OSMRE)	—	5.0	n/a	n/a	n/a
Department of the Interior, Total	**963.5**	**1,048.0**	n/a	n/a	n/a

Source: Email correspondence between the DOI and CRS on February 9, 2016; H.R. 5538; and H.Rept. 114-632.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed. n/a=not available

Department of Transportation[108]

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 emissions from transportation sources.

President Obama requested $1,188.8 million for DOT R&D and R&D facilities in FY2017, an increase of $305.7 million (34.6%) from the FY2016 enacted level. (See **Table 18**.) In FY2016, two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation

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

Administration (FAA)—account for more than three-fourths of the department's R&D funding (79%). Under the request, three agencies (FAA, FHWA, and the National Highway Traffic Safety Administration [NHTSA]) would account for 88% of DOT R&D in FY2017.[109]

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 legislation 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 Aviation Administration

The President requested $367.1 million for R&D and R&D facilities funding in FY2017 for the Federal Aviation Administration, a decrease of $12.1 million (3.2%) from the FY2016 enacted level. The FY2017 request included $334.9 million for R&D, a decrease of $12.0 million (3.5%), and $32.2 million for R&D facilities, essentially the same as in FY2016.

President Obama's FY2017 request included $167.5 million for the FAA's Research, Engineering, and Development (RE&D) account (up $1.5 million, 0.9%). All RE&D account funding is classified as R&D. The RE&D funding seeks to improve aviation safety, improve efficiency, and reduce environmental impact through research in fields 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.

On May 19, 2016, the Senate passed H.R. 2577 incorporating both the Transportation-HUD[110] and Military Construction-Veterans Affairs appropriations bills.[111] The Senate-passed bill would have provided $176.0 million for the RE&D account, $8.5 million (5.1%) above the request, and $10.0 million (6.0%) above the FY2016 enacted level. The Consolidated Appropriations Act, 2017 (P.L. 115-31) includes $176.5 million for the RE&D account, an increase of $10.5 million (6.3%) from the FY2016 level and $9.0 million (5.4%) above the request.

National Highway Traffic Safety Administration

NHTSA R&D focuses on crashworthiness, crash avoidance, regulatory analysis, alternative fuels vehicle safety, vehicle electronics, and emerging technologies.

The President requested $344.7 million in R&D and R&D facilities funding in FY2017 for the National Highway Traffic Safety Administration, $258.1 million (298.2%) above the FY2016 enacted level of $86.6 million. The FY2017 request included $200 million to initiate an autonomous vehicle development pilot. The agency anticipated $3.9 billion for this initiative over 10 years. According to NHTSA,

> This pilot will deploy safe and climate smart autonomous vehicles to create better, faster, cleaner urban and corridor transportation networks. To accelerate the development and adoption of autonomous vehicles, this program would fund large-scale deployment pilots

[109] Except as noted otherwise, the R&D funding figures in this section come from unpublished data provided by the DOT to CRS by email on February 12, 2016.

[110] HUD is the abbreviation for the Department of Housing and Urban Affairs.

[111] H.R. 2577 was originally sent to the Senate by the House to provide FY2016 appropriations for Transportation-HUD; FY2016 appropriations for Transportation-HUD were enacted as Division L of the Consolidated Appropriations Act, 2016 (H.R. 2029, P.L. 114-113).

> to test connected vehicle systems in designated corridors throughout the country; and work with industry to ensure a common multi-state interoperability framework for connected and autonomous vehicles.[112]

In addition, NHTSA's FY2017 budget request included an increase of $52.2 million for vehicle electronics and emerging technology R&D.

Federal Highway Administration

The President requested $329.8 million in R&D and R&D facilities funding in FY2017 for the Federal Highway Administration, an increase of $7.4 million (2.3%) above the FY2016 enacted level. President Obama's request would have provided $85.0 million for highway safety R&D, down $0.4 million (0.5%); $80.0 million for Intelligent Transportation Systems R&D, up $4.1 million (5.4%); $149.9 million for State Planning and Research, up $3.5 million (2.4%); and $14.9 million for R&D-related administrative expenses.

Other DOT Components

Several other DOT components also support R&D activities. The President requested FY2017 R&D and R&D facilities funding for

- the Federal Railroad Administration (FRA), totaling $82.5 million, $39.4 million (91.4%) above the FY2016 enacted level of $43.1 million;
- the Pipeline and Hazardous Materials Safety Administration (PHMSA), totaling $23.7 million, $2.2 million (10.4%) above the FY2016 enacted level of $21.5 million;
- the Office of the Secretary of Transportation (OST), totaling $22.5 million, $8.6 million (61.5%) above the FY2016 enacted level of $13.9 million;
- the Federal Motor Carrier Safety Administration (FMCSA), totaling $10.9 million, $2.0 million (22.6%) more than the FY2016 enacted level of $8.9 million; and
- the Federal Transit Administration (FTA), totaling $7.5 million, equal to the FY2016 enacted level.

Table 18 summarizes R&D funding for the DOT components.

[112] DOT, NHTSA, *National Highway Traffic Safety Administration Budget Estimates: FY2017*, February 2016, p. 202, http://www.nhtsa.gov/staticfiles/administration/pdf/Budgets/FY2017-NHTSA_CBJ_FINAL_02_2016.pdf.

Table 18. Department of Transportation R&D and R&D Facilities

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House Passed	FY2017 Senate Reported	FY2017 Enacted
Federal Aviation Administration	379.2	367.1		n/a	n/a
Research, Engineering, and Development	*166.0*	*167.5*	*167.5*	*176.0*	*176.5*
National Highway Traffic Safety Administration	86.6	344.7	n/a	n/a	n/a
Federal Highway Administration	322.4	329.8	n/a	n/a	n/a
Federal Railroad Administration	43.1	82.5	n/a	n/a	n/a
Railroad Research and Development	*39.1*	*53.5*	*43.1*	*40.1*	*40.1*
Pipeline and Hazardous Materials Safety Administration	21.5	23.7	n/a	n/a	n/a
Office of the Secretary	13.9	22.5	n/a	n/a	n/a
Federal Motor Carrier Safety Administration	8.9	10.9	n/a	n/a	n/a
Federal Transit Administration	7.5	7.5	n/a	n/a	n/a
DOT, R&D Total	**$883.1**	**$1,188.8**	n/a	n/a	n/a

Sources: DOT FY2017 department and agency budget justifications; email communication between DOT and CRS, February 12, 2016; H.Rept. 114-606; and H.R. 2577; P.L. 115-31 and accompanying explanatory statement.

Notes: Figures include R&D and R&D facilities. Totals may differ from the sum of the components due to rounding. Lines in italics are components of the agency lines above them and are not counted separately in the total. Figures for the columns headed "FY2017 House" and "FY2017 Enacted" will be added, if available, as each action is completed. n/a=not available.

Department of Homeland Security[113]

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. In its FY2017 budget request, DHS proposed incorporating DNDO, including its R&D responsibilities, into a new Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Office. Congress ultimately did not accept this proposal for the FY2017 appropriations cycle.

The President's FY2017 budget request for DHS included $654 million for activities identified as R&D. This would have been a reduction of 4.5% from the comparable amount for FY2016. The total included $470 million for the S&T Directorate, $152 million for the proposed CBRNE Office (entirely for activities currently part of DNDO), and smaller amounts for five other DHS

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

components. The House bill (H.R. 5634) would have provided $665 million for these activities. The Senate bill (S. 3001) would have provided approximately $703 million. The final appropriation was $678 million. See **Table 19**.

Directorate of Science and Technology (S&T)

The S&T Directorate is the primary DHS R&D organization.[114] 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 FY2017 request of $470 million for the S&T Directorate R&D account was a decrease of 5.4% from the comparable FY2016 amount. Funding for some R&D topics was to increase or decrease by substantially larger percentages. For example, R&D on border security technologies was to increase by 71%, while R&D on detection of explosives and bioagents was to decrease by 31% and 28% respectively. Funding for University Programs, which primarily funds the S&T Directorate's university centers of excellence, was to decrease by 21%.

The House bill would have provided $9 million more than the request for the S&T Directorate R&D account. The entire increase was allocated to university centers of excellence.

The Senate bill used the FY2016 account structure for the S&T Directorate, not the Common Appropriations Structure introduced in the Administration's FY2017 request and used in the House bill. The amounts that the Senate bill would have provided for the S&T Directorate are therefore not directly comparable to amounts in the request and the House bill. After adjusting for these differences, it appears that the Senate bill would have provided $31 million more than the requested amount for activities requested in the S&T Directorate R&D account, including $22 million more for Research, Development, and Innovation and $9 million more for University Programs.

The final appropriation was $471 million, including $7 million less than requested for Research, Development, and Innovation and $8 million more than requested for University Programs.

Domestic Nuclear Detection Office (DNDO)

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's FY2017 request for the proposed CBRNE Office included $152 million for the R&D account, entirely for activities currently part of DNDO. This was a decrease of 3.2% from the comparable FY2016 amount. At the level of detail shown in **Table 19**, the request showed few changes from FY2016; however, priorities within Detection Capability Development were to shift: increased R&D related to international rail and aerial detection was to be mostly offset by decreased R&D related to radiation portal monitor replacement and on-dock rail.

The House bill would have provided the requested amount for the CBRNE Office R&D account.

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

The Senate bill did not support establishment of the CBRNE Office. Moreover, because it used a different account structure, the amounts it would have provided for DNDO are not directly comparable to amounts in the request or the House bill. After adjusting for these differences, however, it appears that the Senate bill would have provided funding for DNDO R&D at the same level as the request.

The final appropriation did not support establishment of the CBRNE Office, but it did adopt the Common Appropriations Structure. It provided $155 million for DNDO. It allocated somewhat less than requested to each of the four DNDO R&D programs identified in the request but provided funding for a fifth program, Architecture Planning and Analysis.

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 were the only DHS components that reported R&D activities to the Office of Management and Budget (OMB), several other DHS components also funded R&D and activities related to R&D.[115] 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.

DHS has made some progress on this issue. In the FY2013 and FY2014 appropriations cycles, Congress responded to GAO's findings by directing DHS to develop new policies and procedures. In September 2014, GAO testified that DHS had updated its guidance to include a definition of R&D, and that efforts to develop a process for coordinating R&D across the department were ongoing though not yet complete.[116] In April 2015, GAO's annual report on fragmented, overlapping, or duplicative federal programs stated that its concerns about DHS R&D had been "partially addressed."[117] In December 2015, however, the explanatory statement for the Consolidated Appropriations Act, 2016 (P.L. 114-113) stated that:

> 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 reflect departmental priorities.[118]

The act authorized DHS to establish a Common Appropriations Structure under which each DHS component would have a standardized set of appropriations accounts.[119] The FY2017 budget request implemented such a structure for all components except the Coast Guard. One of the standardized account titles is Research and Development. While having an account with this title might provide some new insight into the question of which DHS components conduct R&D and how much, it might also give an incomplete picture of some R&D-related activities, especially the construction and operation of R&D facilities. For example, the FY2017 request included $134

[115] 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.

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

[117] 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.

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

[119] P.L. 114-113, Div. F, Sec. 563.

million for laboratory facility operations in the S&T Directorate Operations and Support account, not the Research and Development account. Similarly, FY2017 DHS budget documents showed $300 million in FY2015 funds for construction of the National Bio and Agro-Defense Facility as part of the S&T Directorate Procurement, Construction, and Improvements account, not the Research and Development account.

Appropriations bills and reports in the FY2017 cycle did not explicitly address the issue of DHS R&D coordination. As noted above, the Senate bill did not follow the Common Appropriations Structure, but the enacted bill did.

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)."[120] 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."[121] A provision in the Consolidated Appropriations Act, 2016 (P.L. 114-113) prohibited DHS from using FY2016 funds to establish an Office of CBRNE Defense "until such time as Congress has authorized such establishment."[122] The provision did, however, give DHS the authority to transfer funds for the establishment of such an office, if authorized. In December 2015, the House passed the Department of Homeland Security CBRNE Defense Act of 2015 (H.R. 3875), which would have restructured DHS CBRNE activities and established a CBRNE Office, but the Senate did not take up this bill or pass a similar one. The FY2017 budget request assumed the establishment of a CBRNE Office, and appropriations as requested would have effectively authorized its establishment. The House bill followed the request in this regard, but the Senate bill did not, and the Senate committee report referred in several places to "a new CBRNE Office that is not yet authorized by the Congress." The final explanatory statement noted that "As this proposed CBRNE consolidation was not authorized by Congress, the amounts appropriated for these activities for fiscal year 2017 are provided to the component for which the funds were appropriated in prior years."

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

[121] 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.

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

Table 19. Department of Homeland Security R&D Accounts

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate[a]	FY2017 Enacted
Science and Technology Directorate	**$497**	**$470**	**$479**	**$501**	**$471**
Research, Development, and Innovation	455	437	437	458	430
Salaries and Benefits	*20*	*19*	—	—	—
Apex	*78*	*79*	—	—	—
Border Security	*33*	*56*	—	—	—
Chemical, Biological, and Explosive Defense	*79*	*58*	—	—	—
Counter Terrorist	*83*	*66*	—	—	—
Cyber Security/Information Analytics	*65*	*71*	—	—	—
First Responder/Disaster Resilience	*102*	*87*	—	—	—
University Programs	42	33	42	42	41
DNDO / CBRNE Office (proposed) Error! Reference source not found.	**157**	**152**	**152**	**152**	**155**
Nuclear Forensics	21	21	21	21	19
Transformational R&D	68	65	65	65	62
Detection Capability Assessments	45	45	45	45	39
Detection Capability Development	23	22	22	22	20
Architecture Planning and Analysis	0	0	0	0	15
U.S. Coast Guard	**18**	**18**	**18**	**37**	**36**
Transportation Security Administration	**5**	**5**	**5**	**5**	**5**
National Protection and Programs Directorate	**6**	**4**	**6**	**5**	**6**
Office of the Under Secretary for Management	**3**	**3**	**3**	**2**	**3**
U.S. Secret Service	**<1**	**3**	**3**	**2**	**3**
Total	**685**	**654**	**665**	***703***	**678**

Sources: DHS FY2017 congressional budget justification; H.R. 5634 as reported and H.Rept. 114-668; S. 3001 as reported and S.Rept. 114-264; and P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017.

Notes: Table includes accounts titled "Research and Development" in each DHS component ("Research, Development, Test, and Evaluation" in the case of the U.S. Coast Guard). Some other accounts may also fund R&D-related activities. FY2016 S&T Directorate amounts are as presented in DHS budget documents and have been adjusted by DHS to reflect the account structure used in the FY2017 request. Some totals may not add because of rounding or other factors.

a. FY2017 Senate amounts, except for U.S. Coast Guard, are estimated by CRS for comparability with the other columns. The Senate bill used a different account structure without accounts titled "Research and Development."

b. DNDO for FY2017 Senate and FY2017 Enacted. CBRNE Office for the other columns.

Environmental Protection Agency[123]

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 bills is allocated to R&D alone unless funding is provided at the precise level of the request. In general, R&D funding levels are determined after EPA allocates its appropriations to specific activities and reports those amounts. 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 research 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.[124] The transferred funds are authorized for research on more effective methods to clean up contaminated sites.

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.

Title II of Division G of the Consolidated Appropriations Act, 2017 (P.L. 115-31; H.R. 244) provides $721.9 million for the EPA S&T account for FY2017 including a $7.4 million rescission within the S&T account and transfers ($15.5 million) from the Superfund account. Including the account rescission and the transfer, the FY2017 total for the S&T account represents 9.0% of the $8.06 billion FY2017 appropriations for the agency overall.

P.L. 115-31 stipulates that the rescission of unobligated balances of prior fiscal years appropriations within the S&T account is to be applied to program project areas to "...reflect changes to funding projections due to routine attrition..." during FY2017. In the Explanatory Statement accompanying H.R. 244, the House Committee on Appropriations noted that EPA's current workforce was below FY2016 levels and therefore included separate rescissions within the S&T and the Environmental Programs and Management (EPM) accounts to "...capture expected savings" as a result of the changes.[125] The Act further stipulates that this rescission is not

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

[124] 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.

[125] See "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the *Congressional Record*, vol. 163, no. 76-Book II (May 3, 2017), p. H3883, https://www.gpo.gov/fdsys/pkg/CREC-2017-05-03/pdf/CREC-2017-05-03-bk2.pdf.

to be applied to "Research: National Priorities" within the S&T account. As in previous fiscal year requests, the President's FY2017 budget request did not include funding for these "national priorities."[126] The $4.1 million for these national priorities for FY2017 is for competitively awarded extramural research grants to fund "high-priority water quality and availability research by not-for-profit organizations."[127] The same level of funding for these types of grants was included for FY2016. The FY2017 enacted appropriations did not include an additional $10.0 million provided in FY2016 for further EPA research on oil and gas development in the Appalachian Basin ($3.0 million, including $2.0 million for extramural funding) and for certification and compliance activities related to vehicle and engine emissions ($7.0 million).[128]

As noted earlier in this report Congress did not complete action on 11 of the 12 regular appropriations bills for FY2017 prior to the end of FY2016, including the Interior, Environment, and Related Agencies appropriations. The Senate and House Committees on Appropriations had reported their respective Interior, Environment, and Related Agencies FY2017 appropriations bills during the 114th Congress—S. 3068 (S.Rept. 114-281) and H.R. 5538 (H.Rept. 114-632)—on June 16, 2016, and June 21, 2016, respectively. H.R. 5538 passed in the House on July 14, 2016, but no action was scheduled on the Senate bill. Title II of each of the bills proposed funding for EPA, including the S&T account.

Table 20 at the end of this section presents the FY2017 amounts for program activities within EPA's S&T account as enacted compared to the President's FY2017 budget request, the FY2016 enacted level,[129] as well as, the proposed levels included in the 114th Congress House-passed H.R. 5538 and Senate Committee-reported S. 3068. As indicated in the table, the FY2017 enacted total appropriations for EPA's S&T account is a decrease compared to the amounts enacted for FY2016, requested for FY2017 and proposed in H.R. 5538, but an increase above the proposed level included in S. 3068. As shown in **Table 20**, there is some variability when comparing the enacted FY2017 base amount for the S&T account for individual EPA program and activity line items with the FY2016 enacted and FY2017 proposed funding levels, dependent on the specific activity.

The FY2017 Consolidated Appropriations Explanatory Statement provides additional guidance within the S&T account including two directives adopted from the Senate report, S.Rept. 114-281, accompanying S. 3068 as reported during the 114th Congress.[130] The Explanatory Statement includes the Senate Committee on Appropriations direction for the agency's National Center for Computational Toxicology [NCCT] "to develop data use guidance for ToxCast and other computational data...," as well as the Senate Committee recommendation that EPA support research efforts to establish a best practices approach for Enhanced Aquifer Recharge [EAR] in coordination with the U.S. Geological Survey.[131] The Explanatory Statement includes the

[126] EPA refers also to these priorities as "Congressionally Directed Projects" in the FY2017 Budget Justification; see, EPA's *Fiscal Year 2017 Justification of Appropriations Estimates for the Committee on Appropriations: Science and Technology*, http://www.epa.gov/planandbudget/fy2017, February 2016, pp. 583 and 1103.

[127] 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 125.

[128] "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.

[129] 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.

[130] See footnote 125.

[131] S.Rept. 114-281, p. 62-63.

Committee's recommendation that EPA contract with the National Academy of Sciences to peer review the agency's revised draft Integrated Risk Information System assessment of formaldehyde should the review be completed in FY2017.

Title IV of Division G, "General Provisions," contains provisions that would generally restrict or prohibit the use of FY2017 funds by EPA for implementing or proceeding with a number of regulatory actions, including in some instances conducting research to support these actions. Most of these general provisions have been included in previous fiscal year appropriations. Additional directives have been included in the form of administrative provisions within Title II of Division G.

The 114th Congress House-passed and Senate-reported bills had proposed a number of additional general and administrative provisions, but most were not included in the FY2017 consolidated appropriations. The proposed administrative provisions can be found in Title II and the general provisions in Title IV House-passed H.R. 5538 and Senate Committee-reported S. 3068.

Table 20. Environmental Protection Agency Science and Technology (S&T) Account

(in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House Passed H.R. 5538	FY2017 Senate Reported S. 3068	FY2017 Enacted P.L. 115-31
Science and Technology Appropriations Acct.					
Clean Air and Climate	116.5	128.2	110.9	104.9	116.5
Clean Air Allowance Trading Program	*NR*	*7.8*	*NR*	*NR*	*NR*
Climate Protection Program	*8.0*	*8.1*	*8.0*	*7.2*	*8.0*
Federal Support for Air Quality Management	*NR*	*8.6*	*NR*	*NR*	*NR*
Federal Vehicle and Fuel Standards and Certification	*NR*	*103.6*	*NR*	*NR*	*NR*
Enforcement	13.7	14.6	13.1	13.7	13.7
Homeland Security	37.1	37.2	37.1	36.8	33.1
Indoor Air and Radiation	6.0	7.5	6.0	6.0	6.0
Indoor Air: Radon	*NR*	*0.0*	*NR*	*NR*	*NR*
Radiation: Protection	*NR*	*3.1*	*NR*	*NR*	*NR*
Radiation: Response Preparedness	*NR*	*4.0*	*NR*	*NR*	*NR*
Reduce Risks from Indoor Air	*NR*	*0.4*	*NR*	*NR*	*NR*
Information Technology/Data Management/Security	3.1	3.1	3.1	3.1	3.1
Operations and Administration	68.3	78.4	68.3	68.3	68.3
Pesticide Licensing	6.0	5.3	5.3	5.3	6.0
Research: Air, Climate and Energy	91.9	101.2	88.3	82.7	91.9
Research: Chemical Safety and Sustainability	126.9	134.2	132.3	126.1	126.9
Human Health Risk Assessment	*NR*	*39.3*	*NR*	*NR*	*NR*
Research: Computational Toxicology	*21.4*	*25.7*	*25.7*	*21.4*	*21.4*
Research: Endocrine Disruptor	*16.3*	*15.4*	*16.3*	*15.4*	*16.3*

	FY2016 Enacted	FY2017 Request	FY2017 House Passed H.R. 5538	FY2017 Senate Reported S. 3068	FY2017 Enacted P.L. 115-31
Research: Other Activities	*NR*	*53.8*	*NR*	*NR*	*NR*
Research: Safe and Sustainable Water Resources	107.4	106.3	110.4	106.3	106.3
Research: Sustainable and Healthy Communities	140.0	134.3	134.3	134.3	134.3
Water: Human Health Protection (Drinking Water Programs)	3.5	3.9	3.9	3.5	3.5
Research: National [Congressional] Priorities (Water Quality and Availability)	14.1	0.0	10.0	5.0	4.1
Subtotal S&T Account Base Appropriations	**734.6**	**754.2**	**723.1**	**695.9**	**713.8**
S&T Account Rescission	**—**	**—**	**—**	**—**	**(7.4)**
Total S&T Account Base Appropriations	**734.6**	**754.2**	**723.1**	**695.9**	**706.4**
Transfer in from Hazardous Substance Superfund Account	**18.9**	**15.5**	**15.5**	**15.5**	**15.5**
EPA, Total (Science and Technology)	**753.5**	**769.7**	**738.6**	**711.4**	**721.9**

Source: Prepared by CRS. The FY2016 enacted amounts and the FY2017 proposed amounts included in the House-passed and Senate Committee-reported bills are based on data from the House and Senate Appropriations Committees. FY2017 requested amounts are as reported in EPA's *Fiscal Year 2017 Justification of Appropriations Estimates for the Committee on Appropriations: Science and Technology*, http://www.epa.gov/planandbudget/fy2017, February 2016, pp. 87-201. For FY2016 and FY2017 enacted appropriations see also the "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the *Congressional Record*, vol. 163, no. 76-Book II (May 3, 2017), https://www.gpo.gov/fdsys/pkg/CREC-2017-05-03/pdf/CREC-2017-05-03-bk2.pdf. Under Division G, see discussion under "Title II—Environmental Protection Agency," p. H3883; and in the funding table, pp. H3920-H3928.

Notes: NR (not reported) indicates those instances where the House and Senate Reports and the May 3, 2017, *Congressional Record*, did not specify funding amounts for these sub-program activities. Totals may differ from the sum of the components.

Appendix. Acronyms and Abbreviations

Glossary

ACE	Air, Climate, and Energy
ACF	Administration for Children and Families
AFRI	Agriculture and Food Research Initiative
AHRQ	Agency for Healthcare Research and Quality
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
ASCR	Advanced Scientific Computing Research
B&F	Buildings and Facilities
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
CEBAF	Continuous Electron Beam Accelerator Facility
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
DARPA	Defense Advanced Projects Research Agency
DHP	Defense Health Program
DHS	Department of Homeland Security
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
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
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
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
HRSA	Health Resources and Services Administration
IARPA	Intelligence Advanced Research Projects Activity
I-Corps	Innovation Corps
ICs	Institutes and Centers
IFF	Iraqi Freedom Fund
IIA	International and Integrative Activities
INFEWS	Innovations at the Nexus of Food, Energy, and Water Systems
ISS	International Space Station
ITER	International Thermonuclear Experimental Reactor
ITS	Industrial Technology Services
JIDF	Joint Improvised-Threat Defeat Fund
JIDO	The Joint Improvised-Threat Defeat Organization
LBNF/DUNE	Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment
LCLS-II	Linac Coherent Light Source II
MEP	Manufacturing Extension Partnership
MGI	Materials Genome Initiative
MPS	Mathematical and Physical Sciences
MREFC	Major Research Equipment and Facilities Construction
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
NCCIH	National Center for Complementary and Integrative Health
NCI	National Cancer Institute
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
NSF INCLUDES	NSF Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
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
OIG	Office of the Inspector General
OISE	Office of International Science and Engineering
OMAO	Office of Marine and Aviation Operations
ONC	Office of the National Coordinator for Health Information Technology
OMB	Office of Management and Budget
ORD	Office of Research and Development
OSMRE	Office of Surface Mining Reclamation and Enforcement
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
R&D	Research and Development
RAMI Act	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
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)
SSW	Safe and Sustainable Water
STAG	State and Tribal Assistance Grants
STAR	Science to Achieve Results
STEM	Science, Technology, Engineering, and Mathematics
STRS	Scientific and Technical Research and Services
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

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