Congressional Research Service
Informing the legislative debate since 1914

Federal Research and Development Funding: FY2017

(name redacted), Coordinator
Specialist in Science and Technology Policy

(name redacted)
Specialist in Environmental Policy

(name redacted)
Specialist in Science and Technology Policy

(name redacted)
Specialist in Biomedical Policy

(name redacted)
Acting Section Research Manager

(name redacted)
Specialist in Science and Technology Policy

(name redacted)
Analyst in Natural Resources Policy

June 1, 2016

Congressional Research Service
7-....
www.crs.gov
R44516

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

President Obama's budget request for FY2017 includes $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. The request represents the President's R&D priorities; Congress may opt to agree with part or all of the request, or it may express different priorities through the appropriations process. In particular, Congress will play a central role in determining the growth rate and allocation of the federal R&D investment in a period of intense pressure on discretionary spending. Budget caps may limit overall R&D funding and may require movement of resources across disciplines, programs, or agencies to address priorities.

Funding for R&D is concentrated in a few departments and agencies. Under President Obama's FY2017 budget request, seven federal agencies would receive 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 the President's request would go 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%).

The President's FY2017 request continues 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.

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

Contents

Tables

Appendixes

Contacts

Introduction

The 114th 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 are driving difficult decisions about the prioritization of R&D, both in the context of the entire federal budget and among competing needs within the federal R&D portfolio.

The U.S. government supports a broad range of scientific and engineering R&D. Its purposes include specific concerns such as addressing national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the scientific and engineering workforce; and strengthening U.S. innovation and competitiveness in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of individual funding agencies.

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

Congress plays a central role in defining the nation's R&D priorities as it makes decisions about the level and allocation of R&D funding—overall, within agencies, and for specific programs. Some Members of Congress have expressed concerns about the level of federal spending (for R&D and for other purposes) in light of the current federal deficit and debt. As Congress acts to complete the FY2017 appropriations process, it faces two overarching issues: the extent to which federal R&D investments can grow in the face of increased pressure on discretionary spending and the prioritization and allocation of the available funding. Budget caps may limit overall R&D funding and may require movement of resources across disciplines, programs, or agencies to address priorities. Moving funding between programs/accounts/agencies can 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 the President'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 the President's annual budget and instructions on budget execution.

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

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

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

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

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

R&D Facilities. Amounts for 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.

The President'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 the President's FY2017 request as it relates to R&D and related activities, as well as House and Senate action on the President's budget request through appropriations bills that provide funding for R&D and related activities. For FY2017, the President's budget request includes 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, the President proposes $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%, the President's FY2016 R&D request represents a constant dollar increase of 2.4% from the estimated FY2016 enacted level.[3]

The President's R&D request includes 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.

[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.

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

The largest agency R&D increases in the President's FY2017 request (as measured in dollars), compared with FY2016, are 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%**

[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.

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.

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

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 includes $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)

				Change, FY2016-FY2017	
	FY2015 Actual	FY2016 Estimate	FY2017 Request	Dollar	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]

Federal R&D by Agency and Character of Work Combined

Combining these perspectives, federal R&D funding can be viewed in terms of each agency's contribution to basic research, applied research, development, and facilities and equipment. (See **Table 3**.) The overall federal R&D budget reflects a wide range of national priorities, including supporting advances in spaceflight, developing new and affordable sources of energy, and understanding and deterring terrorist groups. These priorities and the mission of each individual agency contribute to the composition of that agency's R&D spending (i.e., the allocation among basic research, applied research, development, and facilities and equipment). In the President's FY2017 budget request, the Department of Health and Human Services, primarily NIH, would account for nearly half (47.3%) of all federal funding for basic research. HHS would also be the largest federal funder of applied research, accounting for about 42.1% of all federally funded applied research in the President's FY2017 budget request. DOD would be the primary federal funder of development, accounting for 85.6% of total federal development funding in the President'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%

[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.

[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.

	FY2015 Actual	FY2016 Enacted	FY2017 Request	Change, FY2016-FY2017 Dollar	Change, FY2016-FY2017 Percent
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.

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] The President's FY2017 budget includes $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 supports several multiagency R&D initiatives. These initiative are presented below in order of the size of the FY2017 budget requests.

[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.

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.

The President is requesting $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%). The President's budget would reduce NITRD funding at DOD by $19.6 million (1.5%), though Defense Advanced Research Projects Agency (DARPA) funding would increase 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.

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. The President's request for USGCRP funding for FY2017 is $2.8 billion.[16]

[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 (name red acted) .

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

[14] For additional information on the USGCRP, see CRS Report R43227, *Federal Climate Change Funding from FY2008 to FY2014*, by (name redacted), (name redacted), and (name redacted) .

[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.

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).

The President is requesting $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 the Administration's FY2017 request is for the DOE (up $31.3 million, 9.5%), while the largest decreases in agency NNI funding are 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 is 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 the President's Budget for Fiscal Year 2017, The National Nanotechnology Initiative: Research and Development Leading to a Revolution in Technology and Industry*, March 2016.

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

[17] For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by (name redacted)

[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.

[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.

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. The President is requesting $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 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, the President is requesting more than $250 million in discretionary spending to create or sustain manufacturing innovation institutes. The budget would support 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, the President's request includes $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.

[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 (name redacted)

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

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, the President requests 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 is research "to help realize the promise of cancer immunotherapy."[26] Other agencies, including the Department of Defense and Department of Veterans Affairs, are expected to participate in the effort as well, but dedicated initiative funding has not been 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 behavior,"[29] and to help improve the prevention, diagnosis, and treatment of brain diseases such as Parkinson's and Alzheimer's.

The President is requesting 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 includes 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.

[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.

[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.

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. The President's FY2017 request for the PMI is $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 is prioritizing its research portfolio towards 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 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]

---

[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 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.

Like the President's FY2015 and FY2016 budgets, the FY2017 budget does 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. The President's FY2017 budget proposes 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 includes the efforts of 12 federal agencies, including the Department of Energy, National Science Foundation, NASA, and Department of Agriculture. The Administration asserts that the FY2017 budget would increase 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 the date of this report, Congress had not completed action on any of the 12 regular appropriations bills for FY2017. The House had passed one of the regular appropriations bills that provide R&D funding and the Senate had passed three of them.

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.

[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.

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 (name redacted)

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. 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. As the United States steps up its battle with the Islamic State,[40] OCO funding appears likely to continue.

[39] This section was written by (name redacted), Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[40] The Islamic State is also known as the Islamic State of Iraq and the Levant, ISIL/ISIS, and by the Arabic acronym Da'esh.

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 is requesting $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. The Administration is requesting 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.

The FY2017 request for Title IV baseline S&T funding is $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.

Table 7. Department of Defense RDT&E

(obligational authority, in millions of dollars)

Budget Account	FY2016 Enacted		FY2017 Request		FY2017 House		FY2017 Senate		FY2017 Enacted	
	Base	OCO	Base	OCO	Base	OCO	Base	OCO	Base	OCO
Army	$ 7,564	$ 2	$ 7,515	$ 101						
Navy	18,147	36	17,276	78						
Air Force	25,212	17	28,112	33						
Defensewide	18,859	177	18,309	162						
Director, Operational Test & Evaluation	187		179							
Total Title IV—By Account[a]	**69,968**	**231**	**71,392**	**374**						
Budget Activity										
6.1 Basic Research	2,309		2,102							
6.2 Applied Research	4,996		4,815							
6.3 Advanced Dev.	5,731	40	5,584							
6.4 Advanced Component Dev. and Prototypes	14,290	2	14,981	51						
6.5 Systems Dev. And Demo	12,789		12,995	84						
6.6 Management Support[b]	4,417		4,312							
6.7 Op. Systems Dev.[c]	25,435	190	26,603	238						
Total Title IV—by Budget Activity[a]	**69,968**	**231**	**71,392**	**374**						
Title V—Revolving and Management Funds										
National Defense Sealift Fund	25									
Title VI—Other Defense Programs										
Defense Health Program	2,121		823							
Chemical Agents and Munitions Destruction	579		389							
Inspector General	2		3							
Grand Total[a]	**72,697**	**231**	**72,606**	**374**						

Source: CRS, adapted from the *Department of Defense Budget, Fiscal Year 2016 RDT&E Programs (R-1)*, February 2016.

Notes: Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed, respectively.

a. Numbers may not add due to rounding.

b. Includes funding for Director of Test and Evaluation.

c. 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."[41] 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.[42] 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).[43]

National Institutes of Health[44]

The National Institutes of Health 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. An agency in the Department of Health and Human Services, 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."[45] 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.[46] 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**, Congress provides separate appropriations to 24 of the 27 ICs, to OD, and to an intramural Buildings and Facilities account. The other three centers, which perform centralized support services, are funded through assessments on the IC appropriations.

Funding for NIH comes primarily from the annual Labor, HHS, and Education 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,

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

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

[43] Ibid.

[44] This section was written by (name redacted), 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 (name redacted) , and CRS Report R43341, *NIH Funding: FY1994-FY2017*, by (name redacted) .

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

[46] 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.

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 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.

The President's FY2017 budget requests 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 includes $77 million for Superfund-related research, and $150 million in mandatory funding for research on type 1 diabetes.[47] The FY2017 request also includes $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.[48] 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."[49] 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 proposes $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 Labor, HHS, and Education 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 has been a relatively minor recipient.[50]

[47] 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. Except for the mandatory diabetes funding, Congress does not usually specify amounts for particular diseases or research areas. Congress generally appropriates specific amounts to each IC and leaves it to NIH and its scientific advisory panels to allocate funding to different research areas. See NIH website, "Estimates of Funding for Various Research, Condition, and Disease Categories (RCDC)," http://report.nih.gov/categorical_spending.aspx. Some bills may propose authorizations for designated research purposes, but funding generally remains subject to discretionary appropriations and the NIH peer review process.

[48] 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.

[49] *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.

[50] 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 (continued...)

Under the President's FY2017 budget request, the NIH institutes and centers would not receive an increase compared to FY2016 except, as discussed above, the $680 million (13%) increase for the 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 overview below outlines research priorities highlighted by the Administration in the FY2017 NIH budget request.[51]

Basic Research. About 52% of the proposed NIH budget is 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. The NIH portion of $195 million in FY2017 is an increase of $45 million over FY2016. 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.

Translating Discovery into Health. NIH estimates it will spend $910 million on Alzheimer's disease research in FY2017, the same amount as in FY2016. Over 90 drugs are in clinical trials for Alzheimer's disease and more are waiting for regulatory consent to enter clinical testing. The Accelerating Medicines Partnership (AMP), a public-private partnership focused on drug development, recently launched the Alzheimer's Big Data portal to catalyze new analyses and pharmaceutical discovery projects, thereby contributing to meeting the goals set by the National Plan to Address Alzheimer's Disease.

NIH will target $413 million in FY2017, the same level as FY2016, to respond to the growing public health threat posed by antimicrobial resistance bacteria.

The FY2017 request proposes $755 million for the Vice President's Cancer Moonshot; $680 million in mandatory funding is allocated for the National Cancer Institute at NIH and $75 million is transferred from NIH to the Food and Drug Administration. 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.

Precision Medicine Initiative. The FY2017 budget request proposes 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.

(...continued)

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 (name redacted) and (name redacted) .

[51] The amounts discussed in the text below are based on the NIH section in *Fiscal Year 2017 Budget in Brief*, pp. 46-51.

Biomedical Research Workforce. NIH estimates it will 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. NIH will continue with programs to encourage early stage investigators, and further enhance workforce diversity, as well as provide continued support for its High-Risk, High-Reward programs, which allow talented scientists the freedom to innovate and explore new areas of research.

HIV/AIDS. NIH estimates it will spend $3 billion on HIV/AIDS research in FY2017, the same amount spent in FY2016.

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 requests total funding for RPGs of $18.2 billion, representing about 55% of NIH's proposed budget. The request would support an estimated 36,440 RPG awards. Within that total, 9,946 would be competing RPGs, a decrease of 807 grants compared with FY2016. (Competing awards are new grants plus competing renewals of existing grants.) The average amount of a competing RPG in FY2017 is estimated to be $468,489, compared with $470,846 in FY2016.[52]

Table 8. National Institutes of Health Funding

(budget authority, in millions of dollars)

	FY2016	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
National Cancer Institute (NCI)	$5,214	$5,894			
National Heart, Lung, and Blood Institute (NHLBI)	3,114	3,114			
Dental/Craniofacial Research (NIDCR)	413	413			
Diabetes/Digestive/Kidney (NIDDK)[a]	1,816	1,816			
Neurological Disorders/Stroke (NINDS)	1,695	1,695			
Allergy/Infectious Diseases (NIAID)	4,716	4,716			
General Medical Sciences (NIGMS)[b]	1,732	1,665			
Child Health/Human Development (NICHD)	1,338	1,338			
National Eye Institute (NEI)	708	708			
Environmental Health Sciences (NIEHS)	694	694			
National Institute on Aging (NIA)	1,598	1,598			
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	542	542			
Deafness/Communication Disorders (NIDCD)	423	423			
National Institute of Mental Health (NIMH)	1,519	1,519			
National Institute on Drug Abuse (NIDA)	1,051	1,051			
Alcohol Abuse/Alcoholism (NIAAA)	467	467			

[52] NIH, *FY2017 Justification of Estimates for Appropriations Committees*,Volume I, Overview, p. 17, at https://officeofbudget.od.nih.gov/pdfs/FY17/31-Overview.pdf.

	FY2016	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
National Institute of Nursing Research (NINR)	146	146			
National Human Genome Research Institute (NHGRI)	513	513			
Biomedical Imaging/Bioengineering (NIBIB)	344	344			
Minority Health/Health Disparities (NIMHD)	281	281			
Complementary/Integrative Health (NCCIH)[c]	130	130			
Advancing Translational Sciences (NCATS)	685	685			
Fogarty International Center (FIC)	70	70			
National Library of Medicine (NLM)	396	396			
Office of Director (OD)	1,571	1,716			
Buildings & Facilities (B&F)	129	129			
Subtotal, Labor/HHS Appropriation	**31,305**	**32,063**			
PHS Evaluation Tap funding[b]	780	847			
Subtotal, NIH	**32,085**	**32,910**			
Superfund (Interior appropriation to NIEHS)[d]	77	77			
Pre-appropriated type 1 diabetes funds[e]	150	150			
Total, NIH program level	**32,311**	**33,136**			

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.

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 areas ranging from nuclear physics to the biological and environmental sciences, basic and applied R&D relating to energy production and use, and R&D on nuclear weapons, nuclear nonproliferation, and defense nuclear reactors. The department has a system of 17 national laboratories around the country, mostly operated by contractors, that together account for about 40% of all DOE expenditures.

The Administration has requested $14.465 billion for FY2017 for DOE R&D and related activities, including programs in three major categories: science, national security, and energy. This request is 12.5% more than the enacted FY2016 amount of $12.858 billion. Unusually, $750 million of the request is for mandatory funding. Considering only discretionary funding, the request is $13.715 billion, an increase of 6.7%. (See **Table 9** for details.)

The request for the DOE Office of Science is $5.672 billion, an increase of 6.1% from the FY2016 appropriation of $5.347 billion. The request includes $100 million in mandatory funding for a program of grants to universities. Without this mandatory funding, the request for discretionary appropriations is $5.572 billion, an increase of 4.2%. There is no 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), is $1.937 billion, an increase of 4.8%. Within BES, an increase of $33 million for Energy Frontier Research Centers would support five new awards for centers in the field of subsurface geochemistry and geophysics. A new activity in computational chemical sciences would receive $14 million. Funding for the continued construction of the Linac Coherent Light Source II (LCLS-II) would decrease by $10 million, in line with the previously projected construction schedule.

The request for High Energy Physics is $818 million, an increase of 2.9%. Construction funding for the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE) would 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 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 request for Biological and Environmental Research is $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 would increase by $43 million. Funding for Radiological Sciences would be eliminated. In Climate and Environmental Sciences, funding for Climate and Earth System Modeling would increase by $5 million.

[53] This section was written by (name redacted), Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

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

The request for Advanced Scientific Computing Research (ASCR) is $663 million, an increase of 6.8%. A new Exascale Computing program would receive $154 million. According to DOE, this program would consolidate ongoing activities currently funded through other programs, and the requested funding would represent a net decrease of $4 million for those activities. Proposed decreases in other ASCR programs would mostly reflect activities transferred to the new program.

The request for Fusion Energy Sciences is $398 million, a decrease of 9.1%. Funding for most elements of the program would decrease, but construction funding for the International Thermonuclear Experimental Reactor (ITER) would increase by $10 million. 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 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.[54]

The request for DOE national security R&D is $3.702 billion, a 1.8% increase from $3.636 billion in FY2016. In the Weapons Activities account, a decrease of $53 million for Component Manufacturing Development would be more than offset by increases in other areas, the largest being an increase of $40 million for Advanced Simulation and Computing. In the Naval Reactors program, an overall increase of $45 million would include an increase of $27 million for development of replacement reactor systems for *Ohio* class submarines. Funding for Defense Nuclear Nonproliferation R&D would decrease by $25 million.

The FY2017 request for DOE energy R&D is $5.092 billion, up 31.4% from $3.875 billion in FY2016. The requested total includes $650 million in mandatory funding. Considering only discretionary funding, the request is $4.442 billion, an increase of 14.6%. Discretionary funding for R&D on Energy Efficiency and Renewable Energy (EERE) would increase by 42.6%, with increases requested for all major EERE programs. Within EERE, the largest requested increases are for Vehicle Technologies ($469 million, up from $310 million) and a new Crosscutting Innovation Initiatives program ($215 million). The latter would 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 would support R&D on clean transportation, biofuels, and smart mobility. Discretionary funding for the Advanced Research Projects Agency–Energy (ARPA-E) would increase by 20.3%. The request would maintain a 60:40 split between ARPA-E project funding in the areas of Stationary Power Systems and Transportation Systems. The proposed five-year ARPA-E trust would provide $150 million in mandatory funding in FY2017,

[54] The Department of Energy submitted its report to Congress in late-May 2016. The report is available at http://science.energy.gov/~/media/fes/pdf/DOE_US_Participation_in_the_ITER_Project_May_2016_Final.pdf.

rising to $650 million in FY2021, with the goal of reaching total ARPA-E funding of $1 billion per year.

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

(budget authority in millions of dollars)

	FY2015 Enacted	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Science	**$5,068**	**$5,347**	**$5,672**			
Basic Energy Sciences	1,733	1,849	1,937			
High Energy Physics	766	795	818			
Biological and Environmental Research	592	609	662			
Nuclear Physics	596	617	636			
Advanced Scientific Computing Research	541	621	663			
Fusion Energy Sciences	468	438	398			
University Grants (Mandatory)	—	—	100			
Other	373	418	458			
National Security	**3,407**	**3,636**	**3,702**			
Weapons Activities RDT&E	1,766	1,819	1,855			
Naval Reactors	1,234	1,375	1,420			
Defense Nuclear Nonproliferation R&D	393	419	394			
Defense Environmental Cleanup Technical Development	14	23	33			
Energy	**3,453**	**3,875**	**5,092**			
Energy Efficiency and Renewable Energy[a]	1,671	1,804	3,072			
- Discretionary	*1,671*	*1,804*	*2,572*			
- Mandatory	—	—	*500*			
Fossil Energy R&D	561	632	360			
Nuclear Energy	833	986	994			
Electricity Delivery and Energy Reliability R&D	108	162	165			
Advanced Research Projects Agency–Energy	280	291	500			
- Discretionary	*280*	*291*	*350*			
- Mandatory	—	—	*150*			
DOE, Total	**11,928**	**12,858**	**14,465**			

Source: DOE FY2017 congressional budget justification, http://energy.gov/cfo/downloads/fy-2017-budget-justification.

Notes: Totals may differ from the sum of the components due to rounding. FY2015 amounts are as enacted and do not reflect subsequent transfers for Small Business Innovation Research (SBIR) and Small Business Technology

Transfer (STTR). Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed, respectively.

a. Excluding Weatherization and Intergovernmental Activities.

National Aeronautics and Space Administration[55]

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

The Administration has requested $15.890 billion for NASA R&D in FY2017. This amount is 2.8% less than the FY2016 appropriation of about $16.344 billion.[56] Unusually, the FY2017 request includes $763 million in mandatory funds. 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. There is no authorized level for NASA funding in FY2017. The most recent authorization act (the NASA Authorization Act of 2010, P.L. 111-267) authorized appropriations through FY2013.

The FY2017 request for Science is $5.601 billion, an increase of 0.2%. In Earth Science, the request includes $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 is not included in the FY2017 request. In Planetary Science, the request includes $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,[57] 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 includes a five-year estimate of the funding required assuming a 2022 launch. The justification states 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."

[55] This section was written by (name redacted), 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 (name redacted).

[56] FY2016 amounts in this section are based on the Consolidated Appropriations Act, 2016 (P.L. 114-113) and the accompanying explanatory statement, *Congressional Record*, December 17, 2015, at pp. H9741-H9743. Some amounts may change under NASA operating plans that reflect transfers and reprogramming. The R&D total is estimated, because FY2016 funding for the International Space Station was not specified in either the bill or the explanatory statement and will not be determined until approval of an operating plan. See notes to **Table 10**.

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

The FY2017 request for Aeronautics is $790 million, an increase of 23.5% from FY2016. The requested total includes $156 million in mandatory funding. The request includes New Aviation Horizons (NAH), a new initiative of experimental aircraft and systems demonstrations. Of the proposed mandatory funding, $100 million would come from the President's proposed 21st Century Clean Transportation Plan.[58] This would support NAH work focused on subsonic aircraft. The remaining $56 million in mandatory funding would fund a low-boom supersonic flight demonstrator.

The FY2017 request for Space Technology is $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 would account for almost all of the requested increase in FY2017. The bulk of the mandatory funding would support technology demonstration missions, including the Restore-L satellite servicing mission for which Congress appropriated $133 million in FY2016.

The FY2017 request for Exploration is $3.337 billion, a decrease of 17.2% 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) is $2.860 billion, a decrease of 22.3% from FY2016. The bulk of the reduction would be for SLS launch vehicle development, which would receive $1.263 billion, down 35.2% from $1.950 billion in FY2016. According to NASA, the SLS program remains on track for a first test flight carrying Orion but no crew (known as EM-1) in November 2018. 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.

In the Space Operations account, the request for the ISS is $1.431 billion, and the request for Commercial Crew is $1.185 billion. Because Congress gave limited direction about how the FY2016 appropriation for Space Operations should be allocated, it is difficult to determine how the FY2017 request for these items compares to FY2016 in the absence of an approved FY2016 operating plan. The FY2017 budget is the first to request Commercial Crew funding within Space Operations. It 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.

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

Table 10. National Aeronautics and Space Administration R&D

(budget authority in millions of dollars)

	FY2016 Enacted	FY2017 Request (Total)	FY2017 Request (Mandatory)	FY2017 Request (Discr.)	FY2017 House	FY2017 Senate	FY2017 Enacted
Science	**$5,589**	**$5,601**	**$298**	**$5,303**			
Earth Science	1,921	2,032	60	1,972			
Planetary Science	1,631	1,519	128	1,391			
Astrophysics	731	782	85	697			
James Webb Space Telescope	620	569	—	569			
Heliophysics	650	699	25	674			
Education	37	—[a]	—	—[a]			
Aeronautics	**640**	**790**	**156**	**635**			
Space Technology	**687**	**827**	**136**	**691**			
Exploration	**4,030**	**3,337**	**173**	**3,164**			
Exploration Systems Development	3,680	2,860	173	2,687			
Exploration R&D	350	477	—	477			
International Space Station	**n/s[b]**	**1,431**	**—**	**1,431**			
Commercial Crew	**1,244[c]**	**1,185**	**—**	**1,185**			
Subtotal R&D	**13,667**	**13,170**	**—**	**12,409**			
Non-R&D Programs[d]	2,460	2,599	—	2,599			
Safety, Security, and Mission Services	2,769	2,837	—	2,837			
Associated with R&D[e]	*2,346*	*2,369*	—	*2,369*			
Construction & Environmental C&R	389	420	—	420			
Associated with R&D[e]	*330*	*351*	—	*351*			
NASA, Total (R&D)	**16,344**	**15,890**	**763**	**15,127**			
NASA, Total	**19,285**	**19,025**	**763**	**18,262**			

Sources: FY2016 enacted from P.L. 114-113 and pp. H9741-H9743 of the explanatory statement, *Congressional Record*, December 17, 2015. FY2017 request from NASA FY2017 congressional budget justification, http://www.nasa.gov/news/budget/.

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. n/s = not specified. C&R = Compliance and Remediation. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

a. $25 million for education included in Astrophysics. Note that this item is distinct from the Education account, which is included in Non-R&D Programs, lower in the table.

b. Not specified in P.L. 114-113 or the explanatory statement. In the absence of an approved FY2016 operating plan, the R&D totals shown lower in the table are calculated using a CRS estimate of $1.478 billion for FY2016 ISS funding (the average of the FY2015 amount of $1.525 billion and the FY2017 request of $1.431 billion).

c. P.L. 114-113 provided "up to" $1.244 billion. The final amount is to be determined in an operating plan.

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

e. 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.

National Science Foundation[59]

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."[60] 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.[61]

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 seeks $7.964 billion for the NSF in FY2017, a $500 million (6.7%) increase over the FY2016 estimate of $7.464 billion. This request includes $7.564 billion in discretionary budget authority and $400 million in new mandatory budget authority. The request would increase 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 NSB and OIG accounts would receive the same amount as in FY2016. The request would decrease funding for the MREFC account by $7 million (3.6%).

The NSF budget justification identifies two areas of major emphasis, four cross-foundation investments, and six on-going NSF-wide priorities. The two areas of major emphasis are Clean Energy R&D and strengthening support for core activities. The FY2017 request would increase funding for Clean Energy R&D by $141 million to $512 million (37.9%). Strengthening support for core services would be 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,

[59] This section was written by (name redacted), Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

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

[61] For more information about the NSF, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by (name redacted) ; and CRS Report R44170, *The National Science Foundation: FY2016 Budget Request and Funding History*, by (name redacted) .

$30 million requested, 4.8% decrease); Science, Engineering, and Education for Sustainability (SEES, $54 million requested, 29.8% decrease); and Secure and Trustworthy Cyberspace (SaTC, $150 million requested, 15.4% increase).

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

The FY2017 request seeks increases for all of the RRA subaccounts except for the U.S. Arctic Research Commission (USARC), which would not change. The largest percentage increase would go to Engineering (ENG, 9.4%). The largest increase in dollars would go to Mathematical and Physical Sciences (MPS, $87.3 million). The other subaccounts would receive increases between 6.0% and 6.5%, except for International and Integrative Activities (IIA), which would receive a 2.9% increase. The FY2017 request includes an increase for the widely tracked RRA program Experimental Program to Stimulate Competitive Research (EPSCoR) from $160 million to $171 million (6.7%).

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.[62]

Education. The FY2017 request includes a $73 million (8.3%) increase for EHR, for a total of $953 million. Of that total, $54 million is requested as mandatory budget authority.

By program, the largest increase in the FY2017 EHR request is for EHR Core Research (ECR): STEM Learning, within the Division of Research on Learning in Formal and Informal Settings.[63] The FY2017 request for ECR: STEM Learning is $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 is $332 million, which is essentially the same as the FY2016 estimate. GRF funding would be split equally between RRA and EHR, which would each contribute $166 million. The FY2017 request for NRT is $59 million, a $4 million (8.3%) increase from FY2016. Funding for the NRT would be split between EHR and RRA, but not equally. The RRA contribution would be $21 million, $2 million below the FY2016 estimate. The EHR contribution would be $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 ($63 million requested, no change in total but $8 million is requested as mandatory funding); Science, Technology, Engineering, and Mathematics +

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

[63] 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).

Computing Partnerships ($52 million requested, no change in total but $31 million is 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).

***Construction*.** Other accounts that fund R&D at NSF include the MREFC account, which supports large construction projects and scientific instruments. The Administration seeks just over $193 million for MREFC in FY2017, $7 million less than the FY2016 estimate. In FY2017, MREFC funding would support 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).[64] Most of this request ($106 million) would fund the new Regional Class Research Vessels program to build two ships to support science in U.S. coastal waters.

Historically, the MREFC account has typically supported between four and six projects at a time. The FY2015-FY2017 requests for three projects are lower than the historical trend, which could indicate that some potentially scientifically valuable projects are being delayed or overlooked. On the other hand, when these large projects come online their operations costs must be shouldered by research accounts. For example, NSF has 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 represents 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*.** The Administration seeks $373 million for AOAM, a $43 million (13.0%) increase. A multi-year plan to relocate NSF headquarters accounts for $34 million of this increase. Funding for NSB ($4 million) and OIG ($15 million) would not change significantly between FY2016 and FY2017 under the request.

The FY2017 NSF budget request includes funding for three multiagency initiatives. The National Nanotechnology Initiative would receive $415 million, about the same as in FY2016. The Networking and Information Technology Research and Development would receive $1.254 billion, an increase of $59 million (4.9%). Most of this increase ($56 million) is requested as mandatory budget authority. The U.S. Global Change Research Program would receive $348 million, the same as in FY2016.

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

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**			
Biological Sciences (BIO)	744.2	790.5			
Discretionary	*744.2*	*745.7*			
Mandatory	*0*	*44.8*			
Computer and Information Science and Engineering (CISE)	935.8	994.8			
Discretionary	*935.8*	*938.4*			
Mandatory	*0*	*56.4*			
Engineering (ENG)	916.2	1,002.7			
Discretionary	*916.2*	*946.4*			
Mandatory	*0*	*56.3*			
Geosciences (GEO)	1,318.5	1,398.8			
Discretionary	*1,318.5*	*1,319.6*			
Mandatory	*0*	*79.3*			
Mathematical and Physical Sciences (MPS)	1,349.2	1,436.5			
Discretionary	*1,349.2*	*1,355.1*			
Mandatory	*0*	*81.4*			
Social, Behavioral, and Economic Sciences (SBE)	272.2	288.8			
Discretionary	*272.2*	*272.4*			
Mandatory	*0*	*16.4*			
Office of International Science and Engineering (OISE)	49.1	52.1			
Discretionary	*49.1*	*49.1*			
Mandatory	*0*	*3.0*			
International and Integrative Activities (IIA)	447.1	459.9			
Discretionary	*447.1*	*451.3*			
Mandatory	*0*	*8.6*			
U.S. Arctic Research Commission (USARC)	1.4	1.4			
Discretionary	*1.4*	*1.4*			
Mandatory	*0*	*0*			
RRA Subtotal	**6,033.7**	**6,425.4**			
Discretionary	*6,033.7*	*6,079.4*			
Mandatory	*0*	*346.0*			

Account	FY2016 Estimate	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Education and Human Resources (EHR)	**880.0**	**952.9**			
Discretionary	*880.0*	*898.9*			
Mandatory	*0*	*54.0*			
Major Research Equipment and Facilities Construction (MREFC)	**200.3**	**193.1**			
Agency Operations and Award Management (AOAM)	**330.0**	**373.0**			
National Science Board (NSB)	**4.4**	**4.4**			
Office of the Inspector General (OIG)	**15.2**	**15.2**			
NSF, Total	**7,463.5**	**7,964.0**			
Discretionary	*7,463.5*	*7,564.0*			
Mandatory	*0*	*400.0*			

Source: Data in the columns titled, "FY2016 Estimate" and "FY2017 Request" are from the FY2017 *NSF Budget Request to Congress*.

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.

Department of Agriculture[65]

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).[66]

For FY2017, the Administration requests $2.898 billion for the USDA research mission area, a decrease of $38 million (1.3%) from the enacted FY2016 total. The overall decrease is due to a smaller request for ARS buildings and facilities than was provided in FY2016, while most other research and extension activities are held constant or request modest increases. (See **Table 12**.)

[65] This section was written by (name redacted), Specialist in Agricultural Policy, CRS Resources, Science, and Industry Division.

[66] For background on agricultural research, see CRS Report R40819, *Agricultural Research: Background and Issues*, by (name redacted). For background on FY2016 agricultural appropriations, see CRS Report R44240, *Agriculture and Related Agencies: FY2016 Appropriations*, coordinated by (name redacted)

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 Administration requests $1.161 billion for ARS salaries and expenses, an increase of $17 million (1.5%) over FY2016. ARS intends to focus the increase on initiatives for avian influenza and antimicrobial resistance, agricultural water issues, and climate change resilience. It also proposes funding reductions or reprogramming for several existing programs.

For the ARS buildings and facilities account, the Administration requests $94.5 million, less than half of the unusually large $212 million provided in FY2016. As in recent years, the funding would follow priorities that are identified in the 2012 *USDA ARS Capital Investment Strategy*.[67] ARS' top facilities priorities for FY2017 would be completion of the Foreign Disease and Weed Science Research Unit in Fort Detrick, MD ($30.2 million) to research foreign plant pathogens that could threaten U.S. agriculture, and Phase I of the Agricultural Research Technology Center in Salinas, CA ($64.3 million) to research alternatives to methyl bromide and organic crop practices for weed, insect, and disease control.[68]

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.[69] Federal funds enhance capacity at universities and institutions by statutory formula funding, competitive awards, and grants.

For FY2017, the Administration requests $1.374 billion for NIFA, an increase of $47 million (3.6%) over FY2016. USDA proposes to merge NIFA's three primary accounts (Research and Education, Extension, and Integrated Activities) into a single NIFA-wide account. Congress rejected this proposed accounting change in FY2016 and continued funding the accounts separately.

USDA requests to "fully fund" the Agriculture and Food Research Initiative (AFRI)—USDA's flagship competitive grants program—at its authorized level of $700 million. This would be achieved through $375 million of discretionary funding (an increase of $25 million over FY2016), plus $325 million of new mandatory funding. Adding mandatory funding is not part of

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

[68] ARS buildings and facilities funding in FY2016 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).

[69] 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.

the regular appropriations process and procedurally more likely would be done through authorizing committee action, which for NIFA may not be considered until the next farm bill.

Formula-funded programs would be held constant, with the exception of Evans-Allen funding for historically black colleges and universities, which would receive a $3.8 million (7%) increase.

Extension programming would increase $21 million under the Administration's request, mostly for a new $20 million partnership with the Department of Health and Human Services for a program offering home visits to support maternal, child, and family health in remote rural areas and Indian reservations. Extension programming also would increase for the Federally Recognized Tribes Extension Program, and to assist military veterans entering farming.

The President's request again proposes to consolidate federal STEM education funding so that USDA would no longer provide Higher Education Challenge Grants, Graduate and Post-graduate Fellowship Grants, Higher Education Multicultural Scholars Program, Women and Minorities in STEM Program, Agriculture in the Classroom, and Secondary/Postsecondary Challenge Grants. For additional information on the President's efforts to reorganize and consolidate federal STEM education programs, see CRS In Focus IF10229, *The Changing Federal STEM Education Effort*, by (name redacted) .

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 Administration requests $177 million for NASS, an increase of $8 million (5%) over FY2016. NASS would expand its surveys to more thoroughly address beginning farmers' (including women's and veterans') use of various USDA programs, and to better study antimicrobial resistance.

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 to various stakeholders. For FY2017, the Administration requests $91 million for ERS, a $6 million (7%) increase over FY2016. ERS would expand its research on household food purchases, beginning farmers, 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			
Buildings and Facilities	212.1	94.5			
Subtotal, ARS	**1,355.9**	**1,255.8**			
National Institute of Food and Agriculture (NIFA)					
Research and Education					
AFRI (competitive grants)	*350.0*	*375.0*[a]			
Hatch Act (1862 institutions)	*243.7*	*243.7*			
Evans-Allen (1890 institutions)	*54.2*	*58.0*			
McIntire-Stennis (forestry)	*34.0*	*34.0*			
Other	*137.8*	*n/a*[b]			
Subtotal	**819.7**	n/a[b]			
Extension					
Smith-Lever (b) and (c)	*300.0*	*300.0*			
Smith-Lever (d)	*85.5*	*107.0*			
Other	*90.4*	*n/a*[b]			
Subtotal	**475.9**	**n/a**[b]			
Integrated Activities	**30.9**	**n/a**[b]			
Subtotal, NIFA	**1,326.5**	**1,374.0**			
National Agricultural Statistics Service (NASS)	**168.4**	**176.6**			
Economic Research Service (ERS)	**85.4**	**91.3**			
Total, USDA Research Mission Area	**2,936.2**	**2,897.7**			

Source: CRS, compiled from P.L. 114-113 (including tables in the joint explanatory statement), the OMB *FY2017 Budget Appendix*, and the USDA *FY2017 Budget Explanatory Notes*.

Notes: Components may not add to subtotals. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

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

b. The FY2017 USDA request would consolidate NIFA funding into a single account, rather than the separate Research, Extension, and Integrated Activities accounts. Therefore, certain subtotals are not available, even though various programs remain specified.

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[70]

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."[71] 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.[72]

The President is requesting $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, the President is requesting $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,[73] 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.[74]

The President's FY2017 discretionary request includes $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 increase 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.[75]

The President is requesting $189.0 million for the ITS account for FY2017, up $34.0 million (21.9%) from the FY2016 level. The ITS request includes $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%).[76] P.L. 114-113 provided NIST $25.0 million for the

[70] This section was written by (name redacted), Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

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

[72] 15 U.S.C. 272.

[73] For additional information on the NNMI, see CRS Report R44371, *The National Network for Manufacturing Innovation*, by (name redacted)

[74] 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.

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

[76] 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; the President's FY2017 request includes no separate funding for AMTech.[77]

The President is requesting $95.0 million for FY2017 for the NIST CRF account, down $24.0 million (20.2%) from the FY2016 level.[78] The President's mandatory funding request (discussed above) would, in part, provide supplementary funding for activities funded by this account.

Table 13. National Institute of Standards and Technology Funding

(budget authority, in millions of dollars)

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

Source: 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.

Notes: Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

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.

(...continued)

Program, by (name redacted)

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

[78] Ibid.

National Oceanic and Atmospheric Administration[79]

The National Oceanic and Atmospheric Administration (NOAA) conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; supplies information on the oceans and atmosphere; and manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[80] The reorganization was intended to unify elements of the nation's environmental activities and to provide a systematic approach for monitoring, analyzing, and protecting the environment. One of the agency's main challenges is related to its diverse mission of science, service, and stewardship. A review of research undertaken by NOAA found, "The major challenge for NOAA is connecting the pieces of its research program and ensuring research is linked to the broader science needs of the agency."[81]

NOAA's Research Council[82] has developed a five-year plan (2013-2017) to guide the agency's R&D efforts.[83] These R&D efforts are intended to support the long-term goals and enterprise objectives of NOAA's *Next Generation Strategic Plan*.[84] The strategic plan is organized into four categories of long-term goals including (1) climate adaptation and mitigation, (2) a weather-ready nation,[85] (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

[79] This section was written by (name redacted), Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

[80] "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.

[81] 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.

[82] 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.

[83] 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.

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

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

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, President Obama is requesting $814.8 million in R&D funding for NOAA, an increase of $8.4 million (1.0%) above the FY2016 enacted level of $806.4 million. R&D funding for FY2016 consists of $478.7 million for research (59.4% of total R&D funding), $81.3 million for development (10.1%), and $246.4 million for R&D equipment (30.5%).[86] The FY2017 request for R&D funding includes $522.6 million for research (64.1% of total R&D funding), $89.7 million for development (11.0%), and $202.5 million for R&D equipment (24.9%). R&D accounts for 13.9% of NOAA's total FY2017 discretionary budget request of $5,842.8 million, essentially the same share as in FY2016.

NOAA's administrative structure includes five line offices that reflect its diverse mission: the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite, Data, and Information Service (NESDIS); National Weather Service (NWS); and Office of Oceanic and Atmospheric Research (OAR). In addition to appropriations accounts for each of these five line offices, NOAA has accounts for the Office of Marine and Aviation Operations (OMAO) and for Mission Support (formerly Program Support). 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 administrative functions related to planning, information technology, human resources, and infrastructure.

Table 14 provides R&D funding levels for FY2016 and the Administration's FY2017 request.[87] 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.

The Office of Oceanic and Atmospheric Research is NOAA's primary R&D account. In FY2016, OAR R&D funding totals $441.4 million, which is 54.7% of NOAA's total R&D funding. The FY2017 request would provide OAR with $482.5 million for R&D, an increase of $41.1 million (9.3%) above the FY2016 enacted funding level.[88]

OAR conducts research in three major areas: weather and air chemistry; climate; and oceans, coasts, and the Great Lakes. These efforts are undertaken largely through partnerships between NOAA and cooperative research institutes and the National Sea Grant College Program. 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 provide $171.0 million in funding for the cooperative institutes, $3.0 million (1.8%) more than in FY2016.

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 provide the National Sea Grant College Program $68.9 million, $4.1 million (5.6%) less than in FY2016.

[86] Vicki Schwantes, NOAA Budget Office, email to CRS, February 10, 2016.

[87] Ibid.

[88] Ibid.

Table 14. National Oceanic and Atmospheric Administration R&D

(budget authority, in millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
National Ocean Service (NOS)	$75.0	$79.3			
National Marine Fisheries Service (NMFS)	70.9	74.8			
National Weather Service (NWS)	26.2	23.1			
National Environmental Satellite, Data, and Information Service (NESDIS)	26.0	33.4			
Office of Marine and Aviation Operations[a] (OMAO)	166.9	117.1			
Office of Oceanic and Atmospheric Research (OAR)	441.4	482.5			
Mission Support	n/a	4.6			
Total, R&D	**806.4**	**814.8**			
OAR Total, R&D and Non-R&D[b]	**482.0**	**519.8**			
NOAA Total, R&D and Non-R&D[b]	**5,765.6**	**5,842.8**			

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

Notes: n/a=not available. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

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.

Department of Veterans Affairs[89]

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.

The President is proposing $1.252 billion for VA R&D in FY2017, up $32 million (2.6%) from FY2016. The VA request for FY2017 includes $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.

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

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 fully fund 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, includes $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.

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."[90] 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	FY2017 Senate	FY2017 Enacted
Medical and Prosthetic Research	$631	$663	$663	$675	
Medical Services	589	589	n/a	n/a	
Veterans Affairs, Total	**$1,220**	**$1,252**	**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; and S. Rept. 114-237. n/a=not available. Figures for the column headed "FY2017 Enacted" will be added, if available, when action is completed.

[90] Ibid, p. VHA-308.

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
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[91]

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.[92]

The Administration is requesting $1.048 billion in DOI R&D funding for FY2017, $84.5 million (8.8%) above its FY2016 enacted level of $963.5 million.[93]

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.[94]

Of the President's FY2017 DOI R&D funding request, 5.7% is for basic research, 79.0% is for applied research, and 15.4% is for development. The U.S. Geological Survey (USGS) is the only DOI component that conducts basic research.[95]

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.

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.

The President's total FY2017 budget request for USGS is $1.168 billion. Of this amount, $736.3 million would be for R&D, an increase of $59.4 million (8.8%) over the FY2016 level of $676.9 billion. This total includes $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

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

[92] 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.

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

[94] 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.

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

million for Core Science Systems, up $4.3 million (5.1%); $0.5 million for Science Support, up $12,000 (2.5%).[96]

Other DOI Components

The President's FY2017 request also includes R&D funding for the following DOI components:[97]

- 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 the President's FY2017 R&D funding request for DOI components.

[96] Ibid.

[97] Ibid.

Table 17. Department of the Interior R&D

(budget authority, in millions of dollars)

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

Source: Email correspondence between the DOI and CRS on February 9, 2016.

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.

Department of Transportation[98]

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 has 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 Administration (FAA)—account for more than three-fourths of the department's R&D

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

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.[99]

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 is requesting $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 includes $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.

The President's FY2017 request includes $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[100] and Military Construction-Veterans Affairs appropriations bills.[101] The Senate-passed bill would provide $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.

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 is requesting $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 includes $200 million to initiate an autonomous vehicle development pilot. The agency anticipates $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 to test connected vehicle systems in designated corridors throughout the country; and

[99] 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.

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

[101] 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).

> work with industry to ensure a common multi-state interoperability framework for connected and autonomous vehicles.[102]

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

Federal Highway Administration

The President is requesting $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. The President's request would provide $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 has 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.

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

Source: DOT FY2017 department and agency budget justifications; email communication between DOT and CRS, February 12, 2016; H.R. 2577.

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[103]

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. In its FY2017 budget request, DHS has proposed incorporating DNDO, including its R&D responsibilities, into a new Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Office. Other components, such as the U.S. Coast Guard, conduct R&D relating to their specific missions.

The President has requested $654 million for FY2017 for DHS activities identified as R&D. This would be a reduction of 4.5% from the comparable amount for FY2016. The total includes $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 components. See **Table 19**.

[103] This section was written by (name redacted), Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

Directorate of Science and Technology (S&T)

The S&T Directorate is the primary DHS R&D organization.[104] 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 would be a decrease of 5.4% from the comparable FY2016 amount. Funding for some R&D topics would increase or decrease by substantially larger percentages. For example, R&D on border security technologies would increase by 71%, while R&D on detection of explosives and bioagents would decrease by 31% and 28% respectively. Funding for University Programs, which primarily funds the S&T Directorate's university centers of excellence, would decrease by 21%.

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

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.[105] 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

[104] For more information, see CRS Report R43064, *The DHS S&T Directorate: Selected Issues for Congress*, by (name redacted)

[105] 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.

department were ongoing though not yet complete.[106] 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."[107] 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.[108]

The act authorized DHS to establish a Common Appropriations Structure under which each DHS component would have a standardized set of appropriations accounts.[109] The FY2017 budget request implements this structure for all components except the Coast Guard. One of the standardized account titles is Research and Development. While the Common Appropriations Structure provides some new insight into the question of which DHS components conduct R&D and how much, it may give an incomplete picture of some R&D-related activities, especially the construction and operation of R&D facilities. For example, **Table 19** does not include funding for laboratory facility operations in the S&T Directorate ($134 million in the FY2017 request for the Operations and Support account) or for construction of the National Bio and Agro-Defense Facility ($300 million appropriated for FY2015 in the S&T Directorate Procurement, Construction, and Improvements account).

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)."[110] 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."[111] 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."[112] The provision did, however,

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

[107] 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.

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

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

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

[111] 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.

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

give DHS the authority to transfer funds for the establishment of such an office, if authorized. The FY2017 budget request assumes the establishment of this office, and appropriations as requested would effectively authorize its establishment.

Table 19. Department of Homeland Security R&D Accounts

(budget authority in $ millions)

	FY2015 Revised Enacted	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Science and Technology Directorate	$521	$497	$470			
Research, Development, and Innovation	480	455	437			
- 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	42	33			
CBRNE Office (proposed)	159	157	152			
Rad/Nuc Detection, Forensics, and Prevention	159	157	152			
- Nuclear Forensics	*22*	*21*	*21*			
- Transformational R&D	*70*	*68*	*65*			
- Detection Capability Assessments	*45*	*45*	*45*			
- Detection Capability Development	*22*	*23*	*22*			
U.S. Coast Guard	18	18	18			
Transportation Security Administration	5	5	5			
National Protection and Programs Directorate	4	6	4			
Office of the Under Secretary for Management	0	3	3			
U.S. Secret Service	<1	<1	3			
Total	**$707**	**$685**	**$654**			

Source: DHS FY2017 congressional budget justification.

Notes: Numbers are as presented in DHS budget documents. Some totals may not add because of rounding or other factors. 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. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

Environmental Protection Agency[113]

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 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 EPA allocates its appropriations to specific activities and reports those figures. The agency's Science and Technology (S&T) account funds much of EPA's scientific research activities. These activities include R&D conducted by the agency at its own laboratories and facilities, and R&D and other related scientific evaluations conducted by universities, foundations, and other non-federal entities that receive EPA grants. The S&T account receives a base appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account.[114] The transferred funds are for research on more effective methods to clean up contaminated sites.

The President's FY2017 budget requests $769.7 million for EPA's S&T account, including transfers from the Hazardous Substance Superfund account ($15.5 million).[115] This is $16.2 million (2.1%) above the $753.5 million (including the Superfund transfer) appropriated for FY2016 (P.L. 114-113).[116] As indicated in **Table 20** at the end of this section, the FY2017 requested total base (prior to transfers) for the S&T account is $754.2 million, $19.6 million (2.7%) above the FY2016 enacted level of $734.6 million. The FY2017 requested transfer of $15.5 million from the Superfund account is less than the $18.8 million transferred in FY2016.

Compared to the FY2016 enacted levels, the FY2017 requested base amount for the S&T account includes mostly increases for individual EPA program and activity line items below the account level (**Table 20**).[117]

Within the S&T account, the FY2017 request includes $101.2 million for Air, Climate and Energy (ACE) Research, a $9.3 million (10.1%) increase above the FY2016 enacted level, and $106.3 million for Safe and Sustainable Water (SSW) Resources, a $1.1 million (1.0%) decrease

[113] This section was written by (name redacted), Specialist in Environmental Policy, CRS Resources, Science, and Industry Division.

[114] 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.

[115] U.S. EPA, *Fiscal Year 2017 Justification of Appropriations Estimates for the Committee on Appropriations: Science and Technology*, February 2016, pp. 3-5, 87-200, and Table pp. 1093-1094, http://www.epa.gov/planandbudget/fy-2017-justification-appropriation-estimates-committee-appropriations.

[116] For an overview of the EPA FY2016 appropriations see CRS Report R44208, *Environmental Protection Agency (EPA): FY2016 Appropriations*, by (name redacted) and (name redacted) .

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

compared to the FY2016 enacted level.[118] Within this funding the FY2017 request proposes $1.5 million and $2.2 million increases under ACE and SSW, respectively, as part of EPA's overall research efforts to address additional questions regarding the safety of hydraulic fracturing.[119] Concerns regarding potential drinking water impacts associated with hydraulic fracturing are likely to continue as an area of considerable interest during the 114th Congress.[120]

The largest proposed decrease in dollar terms in the S&T account for FY2017 is for Research: Sustainable and Healthy Communities. The FY2017 request of $134.3 million is $5.7 million (4.1%) less than the $140.0 million FY2016 enacted appropriation.[121]

EPA's FY2017 congressional justification includes a proposal to eliminate $0.2 million within the S&T account appropriated in FY2016 to support radon testing.[122] The FY2016, FY2015, and FY2014 budget requests also proposed eliminating this funding.[123] For FY2016, Congress rejected the proposed elimination of radon activities and directed EPA to allocate funds consistent with FY2015.[124] The FY2017 budget request also proposes eliminating the indoor radon (categorical) state grants ($8.1 million) in the State and Tribal Assistance Grants (STAG) account,[125] the same as in the FY2016 request. Congress appropriated $8.1 million for the radon state grants in FY2016,[126] rejecting the Administration's proposed elimination of funding in the FY2016 request. In addition to the proposals in the S&T and STAG accounts, the FY2017 request proposes increased funding within the Environmental Program and Management (EPM) account to support continuance of the EPA's Federal Radon Action plan to reduce radon risks and improve the public's understanding related to the risks associated with radon.[127]

The FY2016 enacted appropriations (P.L. 114-113) included $14.1 million for Research: National Priorities, a $10.0 million increase compared to the $4.1 million FY2015 enacted level. Like the FY2015 funding, $4.1 million in funding was for competitively awarded extramural research grants to fund high-priority water quality and availability research by not-for-profit organizations.[128] The additional $10.0 million for FY2016 was to be distributed as specified in the explanatory statement:[129] $3.0 million (including $2.0 million for extramural funding) for further

[118] See footnote 115, pp. 158-164, and 166-174.

[119] See footnote 115, pp. 31, 163, and 174 for references to funding increases for hydraulic fracturing.

[120] For more information, see CRS Report R41760, *Hydraulic Fracturing and Safe Drinking Water Act Regulatory Issues*, by (name redacted) and (name redacted)

[121] See footnote 115, pp. 175-181, and footnote 117.

[122] See footnote 115, pp. 89, and 111.

[123] See EPA's *Fiscal Year 2016 Justification of Appropriations Estimates for the Committee on Appropriations*, pp. 39, 156-157, and 162-166, http://www2.epa.gov/sites/production/files/2015-02/documents/epa_fy_2016_congressional_justification.pdf, *FY2015 Justification of Appropriation Estimates for Committee on Appropriations* (FY2015 Congressional Justification), http://www2.epa.gov/planandbudget/fy2015, pp.101-102, and *FY2014 Justification of Appropriation Estimates for Committee on Appropriations* (FY2014 Congressional Justification), http://www2.epa.gov/planandbudget/archive, p. viii, p. 15, and pp. 99-100.

[124] See footnote 117, see discussion under the Science and Technology p. H10219, and the Environmental Programs and Management account on p. H10220.

[125] See footnote 115, pp. ix, 817-818.

[126] See footnote 117, table on p. H10262

[127] See footnote 115, pp. 23, and 573-574.

[128] 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 117.

[129] See footnote 117, p. H10219.

EPA research on oil and gas development in the Appalachian Basin;[130] and $7.0 million for certification and compliance activities related to vehicle and engine emissions. As in previous requests, the President's FY2017 budget request does not include funding for "Water Quality Research and Support Grants: Congressional Priorities."[131]

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.

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

(millions of dollars)

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Science and Technology Appropriations Account					
Clean Air and Climate	$116.5	$128.2			
Clean Air Allowance Trading Program	*NR*	*7.8*			
Climate Protection Program	*8.0*	*8.1*			
Federal Support for Air Quality Management	*NR*	*8.6*			
Federal Vehicle and Fuel Standards and Certification	*NR*	*103.6*			
Enforcement	13.7	14.6			
Homeland Security	37.1	37.2			
Indoor Air and Radiation	6.0	7.5			
Indoor Air: Radon	*NR*	*0.0*			
Radiation: Protection	*NR*	*3.1*			
Radiation: Response Preparedness	*NR*	*4.0*			
Reduce Risks from Indoor Air	*NR*	*0.4*			
Information Technology/Data Management/Security	3.1	3.1			
Operations and Administration	68.3	78.4			
Pesticide Licensing	6.0	5.3			
Research: Air, Climate and Energy	91.9	101.2			
Research: Chemical Safety and Sustainability	126.9	134.2			
Human Health Risk Assessment	*NR*	*39.3*			
Research: Computational Toxicology	*21.4*	*25.7*			

[130] The Explanatory Statement in the December 17, 2015, *Congressional Record* (see footnote 117), states that the funding is to be provided as specified in H.Rept. 114-170; see p. 50 of in H.Rept. 114-170.

[131] EPA refers also to these priorities as "Congressionally Directed Projects" in the FY2017 Budget Justification; see footnote 115, pp. 583 and 1103.

	FY2016 Enacted	FY2017 Request	FY2017 House	FY2017 Senate	FY2017 Enacted
Research: Endocrine Disruptor	*16.3*	*15.4*			
Research: Other Activities	*NR*	*53.8*			
Research: Safe and Sustainable Water Resources	107.4	106.3			
Research: Sustainable and Healthy Communities	140.0	134.3			
Water: Human Health Protection (Drinking Water Programs)	3.5	3.9			
Research: National [Congressional] Priorities (Water Quality and Availability)	14.1	0.0			
Subtotal S&T Account Base Appropriations	**734.6**	**754.2**			
Transfer in from Hazardous Substance Superfund Account	**18.8**	**15.5**			
EPA, Total (Science and Technology)	**753.5**	**769.7**			

Source: Prepared by CRS. The FY2016 enacted appropriations are as reported in the "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the House *Congressional Record*, vol. 161, no. 184-Book III (December 17, 2015), https://www.gpo.gov/fdsys/pkg/CREC-2015-12-17/pdf/CREC-2015-12-17-house-bk3.pdf. Under Division G, see discussion regarding EPA S&T account under "Title II—Environmental Protection Agency," p. H10219; and in the funding table, pp. H10256-H10263. 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.

Notes: NR (not reported) indicates those instances where the December 17, 2015, *Congressional Record*, did not specify funding amounts for these sub-program activities. Totals may differ from the sum of the components. Figures for the columns headed "FY2017 House," "FY 2017 Senate" and "FY2017 Enacted" will be added, if available, as each action is completed.

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

Author Contact Information

(name redacted), Coordinator
Specialist in Science and Technology Policy
[redacted]@crs.loc.gov, 7-....

(name redacted)
Specialist in Environmental Policy
[redacted]@crs.loc. gov, 7-....

(name redacted)
Specialist in Science and Technology Policy
[redacted]@crs.loc.gov, 7-....

(name redacted)
Specialist in Biomedical Policy
[redacted]@crs.loc.gov , 7-....

(name redacted)
Acting Section Research Manager
[redacted]@crs.loc.gov, 7-....

(name redacted)
Specialist in Science and Technology Policy
[redacted]@crs.loc.gov , 7-....

(name redacted)
Analyst in Natural Resources Policy
[redacted]@crs.loc.gov, 7-....