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Federal Research and Development Funding: FY2018

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Summary

President Trump's budget request for FY2018 includes $117.697 billion for research and development (R&D). This represents a $30.605 billion (20.6%) decrease from the FY2016 actual level of $148.302 billion (FY2017 enacted levels were not available at the time of publication). Adjusted for inflation, the President's FY2018 R&D request represents a constant dollar decrease of 23.6% from the FY2016 actual level.

However, in 2016 the Office of Management and Budget changed the definition used for "development" to "experimental development." This new definition was used in calculating R&D in the FY2018 budget, but no adjustments were made to data reported for FY2016 or FY2017 data to reflect the new definition. OMB asserts that the definitional change results in the exclusion of $33.547 billion from FY2018 requested R&D funding (DOD and NASA) that would have been included in previous years. According to OMB, these funds are being requested in the FY2018 budget, but no longer classified as R&D. Thus, applying the prior definition for R&D, aggregate federal R&D in the Trump Administration's budget for FY2018 would represent a $2.942 billion (2.0%) increase over FY2016; in constant dollars, federal R&D would be down $2.837 billion, or 1.9%. The DOD and VA would receive increased R&D funding for FY2018. The other major federal R&D funding agencies would see their R&D budgets reduced under the President's budget.

The request represents the President's R&D priorities; Congress may opt to agree with none, part, or all of the request, and it may express different priorities through the appropriations process. In particular, Congress will play a central role in determining the 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 Trump's FY2018 budget request, eight federal agencies would receive 96.5% of total federal R&D funding, with the Department of Defense (45.4%) and the Department of Health and Human Services (22.2%) combined accounting for more than two-thirds of all federal R&D funding.

President's Trump's FY2018 budget is largely silent on funding levels for a number of multiagency R&D initiatives in President Obama's FY2017 request, including 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. However, some activities supporting these initiatives are discussed in agency budget justifications and reported in the agency analyses in this report.

In recent years, Congress has completed the annual appropriations process after the start of the fiscal year. Failure to complete the process by the start of the fiscal year and the accompanying use of continuing resolutions can affect agencies' execution of their R&D budgets, including the delay or cancellation of planned R&D activities and the acquisition of R&D-related equipment.

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Introduction

The 115th Congress continues its 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 activities of each federal agency. There is no single, centralized source of R&D funds 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 activities 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. Other Members of Congress have expressed support for increased federal spending for R&D as an investment in the nation's future competitiveness. As Congress acts to complete the FY2018 appropriations process, it faces two overarching issues: the extent to which federal R&D investments can be made 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 President Trump's FY2018 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. **Appendix A** 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" (July 2016). This document provides guidance to agencies in the preparation of the President's annual budget and instructions on budget execution. As reflected in the July 2016 update, OMB has adopted a refinement to the categories of R&D, replacing "development" with "experimental development," which more narrowly defines the set of activities to be included, resulting in lower reported R&D by some agencies, including the Department of Defense and the National Aeronautics and Space Administration. This definition is used in the President's FY2018 budget, but the figures for earlier years have not been adjusted.

Conduct of Research. Research and experimental development (R&D) activities are defined as creative and systematic work undertaken in order to increase the stock of knowledge—including knowledge of people, culture, and society—and to devise new applications using available knowledge.

Basic Research. Basic research is defined as experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, but should exclude research directed towards a specific application or requirement.

Applied Research. Applied research is defined as original investigation undertaken in order to acquire new knowledge. Applied research is, however, directed primarily towards a specific practical aim or objective.

Experimental Development. Experimental development is creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes. Like research, experimental development will result in gaining additional knowledge.

R&D Equipment. R&D equipment includes amounts for major equipment for research and development. Includes acquisition, design, or production of major movable equipment, such as mass spectrometers, research vessels, DNA sequencers, and other major movable instruments for use in R&D activities. Includes programs of $1 million or more that are devoted to the purchase or construction of major R&D equipment

R&D Facilities. R&D facilities includes construction of facilities that are necessary for the execution of an R&D program. This may include land, major fixed equipment, and supporting infrastructure such as a sewer line or housing at a remote location.

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 FY2018 Budget Request

On May 23, 2017, President Trump released his proposed FY2018 budget. This report provides government-wide, multiagency, and individual agency analyses of the President's FY2018 request as it relates to R&D and related activities. Additional information and analysis will be included as the House and Senate act on the President's budget request through appropriations bills that provide funding for R&D and related activities.

For FY2018, the Trump Administration is using a new definition for development ("experimental development"), drawn up in 2016 by the Obama Administration (see box entitled "Caveats With Respect to Analysis of the FY2018 Budget Request" for a more detailed explanation) in its R&D calculations. The new definition excludes some activities previously characterized as development in previous budgets. The Trump Administration did not, however, provide adjustments to its FY2016 R&D data based on this new definition. For purposes of this section of the report, CRS is providing additional lines in **Table 1**, **Table 2**, and **Table 3** that adjust the FY2018 Department of Defense (DOD), National Aeronautics and Space Administration (NASA), and development and total R&D figures by the amounts the Office of Management and Budget has stated were excluded under the new definition ($31.036 billion and $2.511 billion respectively) to allow for a more accurate comparison between years.[1]

Under the new definition, President Trump is proposing $117.697 billion for R&D. Adjusting this figure to include an additional $33.547 billion of development funding that is being requested for DOD and NASA but not counted in the President's budget under the experimental development definition, the President's request is $151.244 billion, an increase of $2.942 billion (2.0%) over the comparable FY2016 level.[2] Adjusted for inflation, the President's FY2018 adjusted R&D request represents a constant dollar decrease of 1.9% from the FY2016 actual 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."

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] Email correspondence from OMB to CRS on May 26, 2017.

[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 FY2017 and FY2018 in Table 10.1, "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2022," *Budget of the United States Government, Fiscal Year 2018*, https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/budget/fy2018/hist10z1.xls.

Caveats with Respect to Analysis of the FY2018 Budget Request

A number of factors complicate the analysis of changes in R&D funding for FY2018, both in aggregate and for selected agencies. For example:

- For FY2018, OMB replaced the R&D category "development" with a subset referred to as "experimental development" in an effort that OMB asserts would better align its data with the data collected by the National Science Foundation on its multiple R&D surveys, and to be consistent with international standards. According to OMB, this change reduces reported R&D funding by approximately $33.5 billion in FY2018 (of which $31.036 billion is attributable to DOD, and $2.511 billion is attributable to NASA); while these funds are being requested as part of the FY2018 budget, they are not characterized as R&D. OMB opted not to apply the category revision to earlier fiscal years in the FY2018 budget so there is no comparable data for FY2016 or FY2017. Relevant changes in agency guidance were embodied in a July 2016 update to OMB Circular No. A-11, as discussed earlier (see box titled, "Definitions Associated with Federal Research and Development Funding").
- Several large NASA Human Exploration and Space Operations programs will transition from the development phase to operations in FY 2018, and will no longer be counted as part of NASA's R&D funding.
- Due to the late completion of the FY2017 appropriations process, FY2017 enacted budget authority was not available at the time the FY2018 budget was prepared. Accordingly, OMB included FY2017 annualized continuing resolution (CR) R&D funding levels in place of FY2017 enacted budget authority. However, enactment of the Consolidated Appropriations Act, 2017 in May 2017, rendered the FY2017 annualized CR levels obsolete. Where FY2017 enacted levels were available, this report compares FY2018 request levels to FY2017 enacted levels. Where FY2017 enacted levels were not available, this report compares FY2018 request levels to FY2016 actual levels; in those cases, as FY2017 enacted levels become available, the agency analyses in this report will be updated.
- In President Obama's FY2017 budget, 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."

In addition, inconsistency among agencies in the reporting of R&D and the inclusion of R&D activities in accounts with non-R&D activities may result in different figures being reported by OMB and the White House Office of Science and Technology Policy (OSTP), including those shown in Table 1, and those in agency budget analyses that appear later in this report.

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 FY2016 (actual) and FY2018 (request).[4] Data for FY2017 (enacted) were not included in the president's FY2018 budget due to the late completion of the FY2017 budget process in May 2017.

Under President Trump's FY2018 budget request, eight federal agencies would receive more than 96% of total federal R&D funding: the Department of Defense (DOD), 45.4%; Department of Health and Human Services (HHS) (primarily the National Institutes of Health [NIH]), 22.2%; Department of Energy (DOE), 11.4%; National Aeronautics and Space Administration (NASA), 8.8%; National Science Foundation (NSF), 4.6%; Department of Agriculture (USDA), 1.7%; Department of Commerce (DOC), 1.3%; and Veterans Affairs (VA), 1.2%. 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), and Environmental Protection Agency (EPA).

Setting aside the aforementioned caveats, nearly every federal agency would see its R&D funding decrease under the President's FY2018 request compared to their FY2016 levels. The only

[4] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018,* May 23, 2017, pp. 203-205, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

agencies with increased R&D funding in FY2018 would be the Department of Veterans Affairs (up $135 million, 11.0%), the Patient-Centered Outcomes Research Trust Fund (up $64 million, 13.6%), and the Smithsonian Institution (up $53 million, 21.1%). However, applying the previous definition of R&D to the FY2018 data (to allow for comparability to FY2016 data), DOD R&D funding would receive the largest dollar increase, rising by $13.011 billion (18.2%).[5]

The largest declines (as measured in dollars) would occur in the budgets of HHS (down $6.099 billion, 18.9%), DOE (down $1.809 billion, 11.9%), USDA (down $666 million, 25.1%), NSF (down $639 million, 10.6%), and the EPA (down $239 million, 46.3%). Applying the previous definition of R&D to the FY2018 data (to allow for comparability to FY2016 data), NASA R&D would decline by $415 million (3.1%).[6]

Table 1. Federal Research and Development Funding by Agency, FY2016-FY2018

(*Please note definitional difference in FY2016 and FY2018 data as described in the table notes*)

(budget authority, dollar amounts in millions)

			Change, FY2016-FY2018	
Department/Agency	**FY2016 Actual**	**FY2018 Request**	**Dollar**	**Percent**
Department of Defense	$71,421	$53,396	n/a	n/a
Department of Defense (adjusted)		*$84,432*	*$13,011*	*18.2*
Dept. of Health and Human Services	32,243	26,144	-6,099	-18.9
Department of Energy	15,217	13,408	-1,809	-11.9
NASA	13,253	10,327	n/a	n/a
NASA (adjusted)		*12,838*	*-415*	*-3.1*
National Science Foundation	6,010	5,371	-639	-10.6
Department of Agriculture	2,657	1,991	-666	-25.1
Department of Commerce	1,681	1,567	-114	-6.8
Department of Veterans Affairs	1,222	1,357	135	11.0
Department of Transportation	927	923	-4	-0.4
Department of the Interior	973	818	-155	-15.9
Department of Homeland Security	582	564	-18	-3.1
Environmental Protection Agency	516	277	-239	-46.3
Other	1,600	1,554	-46	-2.9
Total	**$148,302**	**$117,697**	**n/a**	**n/a**
Total (adjusted)	***$148,302***	***$151,244***	***$2,942***	***2.0***

Source: CRS analysis of data from Executive Office of the President (EOP), Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018,* May 23, 2017, pp. 203-205, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Notes: Amounts in this table may differ from amounts reported in the agency chapters of this report due to a variety of factors.

[5] DOD R&D would be $31.036 billion higher for FY2018 using the FY2016 definition of R&D than reported by OMB for FY2018 using the new definition. Email correspondence from OMB to CRS on May 26, 2017.

[6] NASA R&D would be $2.511 billion higher for FY2018 using the FY2016 definition of R&D than reported by OMB for FY2018 using the new definition. Email correspondence from OMB to CRS on May 26, 2017.

Figures shown in italics have been adjusted to include certain development work at DOD and NASA that is being requested in the FY2018 budget, but not counted by the Office of Management and Budget as R&D under the new definition of development that OMB adopted in 2016 (discussed earlier) and has applied to its reported FY2018 data; this adjustment provides greater comparability to the FY2016 data.

n/a = not applicable; FY2018 unadjusted DOD and NASA R&D figures are not comparable to FY2016 data.

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 Trump's FY2018 request includes $28.936 billion for basic research, down $3.977 billion (12.1%) from FY2016; $33.485 billion for applied research, down $3.562 billion (9.6%); $53.194 billion for (experimental) development (data not comparable to FY2016); and $2.082 billion for facilities and equipment, down $500 million (19.4%). Using the FY2016 definition for development, President Trump's budget includes $86.741 billion in development funding for FY2018, an increase of $10.981 billion (14.5%) above the FY2016 level. The $33.5 billion difference in funding between the new and old definitions of development is being requested in the FY2018 budget, but is not being reported as R&D.

Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2016-FY2018

(*Please note definitional difference in FY2016 and FY2018 data as described in the table notes*)

(budget authority, dollar amounts in millions)

			Change, FY2016-FY2018	
	FY2016 Actual	**FY2018 Request**	**Dollar**	**Percent**
Basic research	$32,913	$28,936	-$3,977	-12.1
Applied research	37,047	33,485	-3,562	-9.6
Development	75,760	53,194	n/a	n/a
Development (adjusted)		*86,741*	*10,981*	*14.5*
Facilities and Equipment	2,582	2,082	-500	-19.4
Total	**$148,302**	**$117,697**	**n/a**	**n/a**
Total (adjusted)		***$151,244***	***$2,942***	***2.0%***

Source: CRS analysis of data from Executive Office of the President (EOP), Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018,* May 23, 2017, pp. 203-205, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Notes: Figures shown in italics have been adjusted to include certain development work at DOD and NASA that is being requested in the FY2018 budget, but not counted by the Office of Management and Budget as R&D under the new definition of development that OMB adopted in 2016 (discussed earlier) and has applied to its reported FY2018 data; this adjustment provides greater comparability to the FY2016 data.

n/a = not applicable; FY2018 unadjusted DOD and NASA R&D figures are not comparable to FY2016 data.

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 45.4% of U.S. basic research in 2014.[7] Business funded 27.4% of U.S. basic research in 2014, with state governments, universities, and other non-profit organizations funding the remaining 27.2%.[8]

In contrast to basic research, business is the primary funder of applied research in the United States, accounting for an estimated 51.7% in 2014, while the federal government accounted for an estimated 36.0%.[9]

Business also provides the vast majority of funding for development. Business accounted for 82.4% of development in 2014, while the federal government provided 16.0%.[10]

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 FY2018 budget request, the Department of Health and Human Services, primarily NIH, would account for nearly half (44.3%) of all federal funding for basic research. HHS would also be the largest federal funder of applied research, accounting for about 39.3% of all federally funded applied research in the President's FY2018 budget request. DOD would be the primary federal funder of development, accounting for 86.6% of total federal development funding in the President's FY2018 budget request.[11]

[7] CRS analysis of data from the National Science Foundation, *National Patterns of R&D Resources: 2014–15 Data Update*, March 14, 2017. More recent data regarding business and other R&D funding are not yet available.

[8] Ibid.

[9] Ibid.

[10] Ibid.

[11] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018*, May 23, 2017, pp. 203-205, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Table 3. Top R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2016-FY2018

(*Please note definitional difference in FY2016 and FY2018 data as described in the table notes*)

(budget authority, dollar amounts in millions)

	FY2016 Actual	FY2018 Request	Change, FY2016-FY2018	
			Dollar	Percent
Basic Research				
Dept. of Health and Human Services	$15,630	12,816	-2,814	-18.0
National Science Foundation	4,841	4,280	-561	-11.6
Dept. of Energy	4,609	3,978	-631	-13.7
Applied Research				
Dept. of Health and Human Services	16,422	13,158	-3,264	-19.9
Dept. of Energy	6,469	6749	280	4.3
Dept. of Defense	5,058	5,097	39	0.8
Development				
Dept. of Defense	64,011	46,047	n/a	n/a
Dept. of Defense (adjusted)		*77,083*	*13,072*	*20.4*
NASA	7,194	3,955	n/a	n/a
NASA (adjusted)		*6,466*	*-728*	*-10.1*
Dept. of Energy	2,981	1,705	-1,276	-42.8
Facilities and Equipment				
Dept. of Energy	1,158	976	-182	-15.7
National Science Foundation	409	420	11	2.7
Dept. of Commerce	314	376	62	19.7

Source: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018,* May 23, 2017, pp. 206-207, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

Notes: The top three funding agencies in each category, based on the FY2018 request, are listed.

Figures shown in italics have been adjusted to include certain development work at DOD and NASA that is being requested in the FY2018 budget, but not counted by the Office of Management and Budget as R&D under the new definition of development that OMB adopted in 2016 (discussed earlier) and has applied to its reported FY2018 data; this adjustment provides greater comparability to the FY2016 data.

n/a = not applicable; FY2018 unadjusted DOD and NASA R&D figures are not comparable to FY2016 data.

Multiagency R&D Initiatives

For many years, presidential budgets have reported on multiagency R&D initiatives and often provided various levels of detail with respect to agency funding. Some of these efforts have a statutory basis—for example, Networking and Information Technology Research and Development (NITRD) program, the National Nanotechnology Initiative (NNI), and the U.S. Global Change Research Program. These programs generally produce annual budget supplements identifying objectives, activities, funding levels, and other information, usually published shortly after the presidential budget release. Other multiagency R&D initiatives have operated at the

discretion of the President without such a basis and may be eliminated at the discretion of the President. President Trump's FY2018 budget is largely silent on funding levels for these efforts and whether some or all of the non-statutory initiatives will continue. Some activities related to these initiatives are discussed in agency budget justifications and may be included in the agencies' analyses in this report. This section provides available information on these initiatives and will be updated as additional information becomes available.

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. In FY2017, 21 agencies were NITRD members; non-member agencies also participate in NITRD activities. NITRD efforts are coordinated by the National Science and Technology Council (NSTC) Subcommittee on Networking and Information Technology Research and Development. Additional NITRD information can be obtained at https://www.nitrd.gov. This section will be updated when the NITRD subcommittee publishes its updated budget information.

U.S. Global Change Research Program[13]

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."[14] In FY2017, 13 departments and agencies participated in the USGCRP. USGCRP efforts are coordinated by the NSTC Subcommittee on Global Change Research. Additional USGCRP information can be obtained at http://www.globalchange.gov. This section will be updated when the USGCRP updates its budget information.

National Nanotechnology Initiative[15]

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.[16] In 2003,

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

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

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

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

[16] 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.

Congress enacted the 21st Century Nanotechnology Research and Development Act (P.L. 108-153), providing a legislative foundation for some of the activities of the NNI. In FY2017, the NNI included 11 federal departments and independent agencies and commissions with budgets dedicated to nanotechnology R&D, as well as nine other federal departments and independent agencies and commissions with responsibilities for health, safety, and environmental regulation; trade; education; training; intellectual property; international relations; and other areas that might affect or be affected by nanotechnology. NNI efforts are coordinated by the NSTC Subcommittee on Nanoscale Science, Engineering, and Technology (NSET). Additional NNI information can be obtained at http://www.nano.gov. This section will be updated when the NSET subcommittee publishes its updated budget information.

Other Initiatives

Presidential initiatives without statutory foundations in operation at the end of the Obama Administration, but not explicitly addressed in President Trump's FY2018 budget, include: the Advanced Manufacturing Partnership (including the National Robotics Initiative [NRI] and the National Network for Manufacturing Innovation [NNMI]), the Cancer Moonshot, the BRAIN Initiative, the Precision Medicine Initiative, the Materials Genome Initiative, and an effort to doubling federal funding for clean energy R&D. Some of the activities of these initiatives are discussed in agency budget justifications and the agency analyses in this report.

FY2018 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. Where FY2017 enacted levels were available, agency analyses in this report compare FY2018 request levels to FY2017 enacted levels. Where FY2017 enacted levels were not available, agency analyses compare FY2018 request levels to FY2016 actual levels; in those cases, as FY2017 enacted levels become available, the agency analyses in this report will be updated.

Annual appropriations for these agencies are provided through 9 of the 12 regular appropriations bills. For each agency covered in this report, **Table 4** shows the corresponding regular appropriations bill that provides primary funding for the agency, including its R&D activities.

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 in the president's budget or otherwise provided by OMB.

Funding for R&D is often included in appropriations line items that also include non-R&D activities; therefore, in such cases, it may not be possible to identify precisely how much of the funding provided in appropriations laws is allocated to R&D specifically. In general, R&D funding levels are known only after departments and agencies allocate their appropriations to specific activities and report those figures.

As of the start of the 2018 fiscal year on October 1, 2017, the House had completed action on each of the 12 regular appropriations bills; the Senate had completed action on none. On September 8, 2017, Congress enacted the Continuing Appropriations Act, 2018 and Supplemental Appropriations for Disaster Relief Requirements Act, 2017 (P.L. 115-56), providing continuing appropriations through December 8, 2018, "until the enactment into law of an appropriation for any project or activity provided for in this Act," or until "the enactment into law of the applicable appropriations Act for fiscal year 2018 without any provision for such projector activity,"

whichever comes first. Subsequently, three additional continuing resolutions (CRs) were passed providing appropriations through December 22, 2017 (P.L. 115-90), January 19, 2018 (P.L. 115-96), and February 8, 2018 (H.R. 195). The fourth CR followed a three-day government shutdown. This report will be updated as Congress takes additional actions to complete the FY2018 appropriations process.

In addition to this report, CRS produces individual reports on each of the appropriations bills. These reports can be accessed by congressional clients via the CRS website at http://www.crs.gov/iap/appropriations. Also, the status of each appropriations bill is available to congressional clients on the CRS web page, *Status Table of Appropriations*, available at http://www.crs.gov/AppropriationsStatusTable/Index.

Table 4. 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 Health and Human Services - National Institutes of Health	Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act
	Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Energy	Energy and Water Development and Related Agencies Appropriations Act
National Aeronautics and Space Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
National Science Foundation	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 Commerce - National Institute of Standards and Technology - National Oceanic and Atmospheric Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Veterans Affairs	Military Construction and Veterans Affairs, and Related Agencies Appropriations Act
Department of the Interior	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 Homeland Security	Department of Homeland Security Appropriations Act
Environmental Protection Agency	Department of the Interior, Environment, and Related Agencies Appropriations Act

Source: CRS Report R40858, *Locate an Agency or Program Within Appropriations Bills*, by Justin Murray.

Department of Defense[17]

The mission of the Department of Defense (DOD) is "to provide the military forces needed to deter war and to protect the security of our country."[18] Congress supports research and development activities at DOD primarily through the department's Research, Development, Test, and Evaluation (RDT&E) funding. The appropriation supports the development of the nation's future military hardware and software and the science and 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 5**.) 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 associated with 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 George W. Bush Administration termed the Global War on Terror (GWOT), and what the Obama Administration referred to as Overseas Contingency Operations (OCO). In appropriations bills, the term Overseas Contingency Operations/Global War on Terror (OCO/GWOT) has been used; President Trump's FY2018 budget uses the term Overseas Contingency Operations. Typically, the RDT&E funds appropriated for OCO/GWOT activities go to specified Program Elements (PEs) in Title IV.

In addition, OCO/GWOT-related requests/appropriations have included 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 has made a single appropriation into each of these funds and

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

[18] Department of Defense, https://www.defense.gov/.

authorized 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 FY2018, the Trump Administration is requesting $83.328 billion for DOD's Title IV RDT&E PEs (base and OCO/GWOT), $9.547 billion (12.9%) above the enacted FY2017 level. On July 27, 2017, the House passed a "minibus" bill that included four of the regular appropriations acts (Defense, Military Construction-Veterans Affairs, Legislative Branch, Energy and Water Development) reported by the House appropriations committee. Defense appropriations were included as Division A of the bill, H.R. 3219 (Defense, Military Construction, Veterans Affairs, Legislative Branch, and Energy and Water Development National Security Appropriations Act, 2018). The bill includes $82.685 billion for Title IV base RDT&E funding and $1.621 billion in OCO/GWOT base RDT&E funding for a total of $84.306 billion.[19] This represents an increase of $10.525 billion (14.3%) over the FY2017 enacted Title IV RDT&E funding level (base and OCO/GWOT), and an increase of $978 million (1.2%) above the request level. The House bill includes $1.000 billion in RDT&E funding in both base and OCO funding ($2.000 billion in total) under a new account entitled National Defense Restoration Fund. The funds in this account are allocated by organization, but not by budget activity (see discussion about budget activities below).

In addition to the Title IV RDT&E request, the Administration's FY2018 request includes $673 million in RDT&E through the Defense Health Program (DHP; down $1.429 billion, 68.0%, from FY2017), $839 million in RDT&E through the Chemical Agents and Munitions Destruction program (up $323 million, 62.6%, from FY2017), and $19 million in RDT&E funding for the National Defense Sealift Fund, which received no funding in FY2017.

The House level for DHP is $1.340 billion, a decrease of $762 million (36.3%) from the FY2017 enacted level and an increase of $667 million (99.1%) above the FY2018 request; for the Chemical Agents and Munitions Destruction program is $839 million, up $323 million (62.7%) from the FY2017 level and equal to the request; for the National Defense Sealift Fund is zero, equal to the FY2017 enacted level and $19 million below the FY2018 request; and for the Inspector General for RDT&E is $3 million, equal to the FY2017 enacted level and the FY2018 request.

RDT&E funding can be analyzed in different ways. RDT&E funding can be characterized organizationally. 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.[20]

[19] OCO/GWOT is included in Title IX of the Department of Defense Appropriations Act, 2018, but supports the PEs in Title IV.

[20] For additional information on the structure of Defense RDT&E, see CRS Report R44711, *Department of Defense Research, Development, Test, and Evaluation (RDT&E): Appropriations Structure*, by John F. Sargent Jr.

Many congressional policymakers are particularly interested in DOD S&T program 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 FY2018 request for Title IV S&T funding (base and OCO/GWOT) is $13.224 billion, $804 million (5.7%) below the FY2017 enacted level.[21] The House level for Title IV S&T funding (base and OCO/GWOT) is $13.8 billion, down $203 million (1.4%) from the FY2017 enacted level and $601 million (4.5%) higher than the request.

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 Trump Administration is requesting $2.229 billion for DOD basic research for FY2018. This is $47 million (2.1%) less than the FY2017 enacted level. The House would provide $2.280 billion in 6.1 funding, up $4 million (0.2%) from the FY2017 enacted level and $51 million (2.3%) higher than the request.[22]

Table 5. Department of Defense RDT&E

(obligational authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request		FY2018 House		FY2018 Senate		FY2018 Enacted	
Budget Account	**Base + OCO**	**Base**	**OCO**	**Base**	**OCO**	**Base**	**OCO**	**Base**	**OCO**
Army	8,675	9,425	119	9,701	125				
Navy	17,541	17,675	130	17,239	125				
Air Force	28,154	34,914	135	33,896	145				
Defensewide	19,221	20,491	226	20,638	226				
Dir., Operational Test &	190	211	0	211					
Nat'l Defense Restoration				1,000	1,000				
Total Title IV—By Account	**73,781**	**82,717**	**611**	**82,685**	**1,621**				
Budget Activity									
6.1 Basic Research	2,276	2,229	0	2,280	0				
6.2 Applied Research	5,296	4,973	0	5,243	0				
6.3 Advanced Dev.	6,456	5,997	25	6,277	25				
6.4 Advanced Component	15,376	17,451	59	17,079	53				
6.5 Systems Dev. And	12,781	14,671	58	14,172	58				
6.6 Management Support[a]	4,575	6,085	0	6,159	0				
6.7 Op. Systems	26,987	31,311	469	30,560	479				

[21] For this calculation, CRS allocated the $50 million undistributed reduction in FY2017 DARPA funding to DOD S&T since most DARPA funding (more than 94% in FY2016) supports DOD S&T. An amendment to the committee-reported bill added $6 million for the U.S. Army Tank Automotive Research, Development and Engineering Center; these funds have not been distributed by account activity.

[22] The budget activity levels discussed in this paragraph do not account for increases and decreases that may result from undistributed amounts identified in **Table 5**.

Budget Account	FY2017 Enacted	FY2018 Request		FY2018 House		FY2018 Senate		FY2018 Enacted	
	Base + OCO	Base	OCO	Base	OCO	Base	OCO	Base	OCO
Undistributed									
DARPA Reduction	-50			-100					
Management Costs				-15					
Nat'l Defense				1,000	1,000				
OCO Funding	82								
House Floor				30	6				
Total Title IV—by Budget Activity	**73,781**	**82,717**	**611**	**82,685**	**1,621**				
Title V—Revolving and Management Funds									
National Defense Sealift Fund	0	19	0	0	0				
Title VI—Other Defense Programs									
Defense Health Program	2,102	673	0	1,340	0				
Chemical Agents and Munitions Destruction	516	839	0	839	0				
Inspector General	3	3	0	3	0				
Grand Total	**76,401**	**84,251**	**611**	**84,867**	**1,621**				

Source: CRS analysis of: *Department of Defense Budget, Fiscal Year 2018, RDT&E Programs (R-1)*, May 2017; explanatory statement accompanying P.L. 115-31, as published in the Congressional Record, May 3, 2017, Book II, H3391-H3703; Division B, P.L. 114-254; H.R. 3219; and H.Rept. 115-219.

Notes: Figures for the columns headed "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as each action is completed. Totals may differ from the sum of the components due to rounding. The House version of H.R. 3219 does not provide a breakout of RDT&E funding by budget activity; funding by budget activity shown in the FY2018 House column is based on the House committee-reported version of H.R. 3219 and H.Rept. 115-219, with the net effect of House floor amendments accounted for on a separate line as undistributed. n/s = not specified

a. Includes funding for Director of Test and Evaluation.

b. Includes funding for Classified Programs.

Department of Health and Human Services

The mission of the Department of Health and Human Services (HHS) is "to enhance and protect the health and well-being of all Americans ... by providing for effective health and human services and fostering advances in medicine, public health, and social services." [23] 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.[24] Other HHS agencies that provide

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

[24] CRS analysis of data presented in the Office of Management and Budget's *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2018,* May 23, 2017, pp. 203-205, https://www.whitehouse.gov/omb/budget/Analytical_Perspectives.

funding for R&D include the Centers for Disease Control and Prevention (CDC), the Centers for Medicare and Medicaid Services (CMS), 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).[25]

National Institutes of Health[26]

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

The OD sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The ICs focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with OD. As shown in **Table 6**, separate appropriations are provided to 24 of the 27 ICs, to OD, and to an intramural Buildings and Facilities account. The other three centers, which perform centralized support services, are funded through assessments on the IC appropriations.

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 10% of the NIH budget supports intramural research projects conducted by the nearly 6,000 NIH scientists, most of whom are located on the NIH campus in Bethesda, Maryland. More than 80% of NIH's budget goes out to the extramural research community in the form of grants, contracts, and other awards. This funding supports research performed by more than 300,000 nonfederal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions.[28]

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

President Trump's FY2018 budget requests an NIH program level total of $26.92 billion, a decrease of $7.4 billion (-21.5%) compared with the FY2017 enacted amount (see **Table 6**). Under President Trump's FY2018 budget request, each of the ICs would receive a decrease

[25] Ibid.

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

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

[28] Department of Health and Human Services, *Fiscal Year 2018 Budget in Brief*, Washington, DC, May 2017, p. 38, https://www.hhs.gov/sites/default/files/Consolidated%20BIB_ONLINE_remediated.pdf.

compared to FY2017. The Trump budget proposes the elimination of the Fogarty International Center but retains in OD $25 million for international research and related activities.[29] The Trump budget also proposes the consolidation of the Agency for Healthcare Research and Quality (AHRQ) with NIH, forming a new Institute, the National Institute for Research on Safety and Quality (NIRSQ). The FY2018 budget proposal includes $272 million in budget authority for NIRSQ "to preserve key research activities previously carried out by AHRQ."[30] For example, NIRSQ would provide administrative support for the U.S. Preventive Services Task Force (USPSTF); requested funding for this activity in the FY2018 Trump budget is $7 million.[31] "In addition, NIRSQ is projected to receive $107 million in mandatory resources from the Patient-Centered Outcomes Research Trust Fund to continue the targeted dissemination of study results and workforce development efforts in research designed to help patients and providers make better informed health care decisions."[32]

The FY2018 program level request for NIH includes $60 million for Superfund-related research, and $150 million in mandatory funding for research on type 1 diabetes.[33] The FY2018 program level request proposes $780 million in funding transferred to NIH by the PHS Program Evaluation Set-Aside, also called the evaluation tap. NIH and other HHS agencies and programs authorized under the PHS Act are subject to a budget assessment found in Section 241 of the PHS Act (42 U.S.C. §238j). This provision authorizes the Secretary to use a portion of eligible appropriations to study the effectiveness of federal health programs and to identify improvements. Although the PHS Act limits the tap to no more than 1% of eligible appropriations, in recent years, the annual LHHS appropriations act has specified a higher amount (2.5% in FY2017) and has also typically directed specific amounts of funding from the tap for transfer to a number of HHS programs. The set-aside has the effect of redistributing appropriated funds for specific purposes among PHS and other HHS agencies. NIH, with the largest budget among the PHS agencies, has historically been the largest "donor" of program evaluation funds; until recently, it had been a relatively minor recipient.[34]

The main funding mechanism NIH uses to support extramural research is research project grants (RPGs), which are competitive, peer-reviewed, and largely investigator-initiated. The FY2018

[29] The NIH website states that Fogarty "is dedicated to advancing the mission of [NIH] by supporting and facilitating global health research conducted by U.S. and international investigators, building partnerships between health research institutions in the U.S. and abroad, and training the next generation of scientists to address global health needs." https://www.fic.nih.gov/About/Pages/mission-vision.aspx.

[30] Department of Health and Human Services, *Fiscal Year 2018 Budget in Brief*, Washington, DC, May 2017, p. 37, https://www.hhs.gov/sites/default/files/Consolidated%20BIB_ONLINE_remediated.pdf.

[31] Ibid., p. 41. This is a reduction of $4 million below AHRQ's FY2017 Continuing Resolution level of administrative support for the USPSTF.

[32] NIH, *FY2018 Justification of Estimates for Appropriations Committees, Vol. I, Overview*, "Overview of Budget Request, Introduction" p. 3. The Affordable Care Act (ACA, P.L. 111-148) created the Patient-Centered Outcomes Research Trust Fund (PCORTF) to help build the national capacity and infrastructure needed to conduct patient-centered outcomes research (PCOR), and to enable PCOR findings to be integrated into clinical practice. See https://aspe.hhs.gov/patient-centered-outcomes-research-trust-fund.

[33] The Superfund amount is provided in the Department of the Interior, Environment, and Related Agencies Appropriations Acts. Mandatory funds of $150 million per fiscal year for type 1 diabetes research (under PHS Act §330B) were provided by P.L. 114-10 for FY2016 and FY2017; $37,500,000 were provided for the first two quarters of FY2018 by Section 3102 of P.L. 115-96.

[34] For more information, see the "PHS Evaluation Set-Aside" section of CRS Report R44505, *Public Health Service Agencies: Overview and Funding (FY2015-FY2017)*, coordinated by C. Stephen Redhead and Agata Dabrowska. By convention, budget tables such as **Table 6** do not subtract the amount of the evaluation tap from the donor agencies' appropriations.

Trump budget requests a total of $14.2 billion in funding for RPGs, representing about 53% of NIH's proposed budget.[35] The FY2018 budget request would cap the indirect cost rate for NIH grants at 10%. Over the last 10 years, NIH data indicates that direct costs (project-specific expenses) have averaged about 72% of the total grant award, while indirect costs (overhead—facilities and administrative, or F&A, costs) have averaged about 28%.[36] The Trump FY2018 NIH budget request would decrease the average annual cost of an RPG award by about 20%, to $389,000.[37]

Except for the mandatory type 1 diabetes funding, Congress has not usually specified amounts for particular diseases or research areas. Generally, specific amounts are appropriated to each IC; NIH and its scientific advisory panels allocate funding to different research areas. This allows maximum flexibility for NIH to pursue scientific opportunities that are important to public health.[38] Some bills may propose authorizations for designated research purposes, but funding generally has remained subject to the NIH peer review process as well as the overall discretionary appropriation to the agency. This pattern has changed in recent years, most notably in FY2016 with Alzheimer's disease research[39] and in FY2017 with the NIH Innovation account established by the 21st Century Cures Act (see text box below).

The FY2018 NIH budget request includes $496 million for the NIH Innovation account. Amounts specified for FY2018 by the 21st Century Cures Act for the NIH Innovation Projects are as follows: the Precision Medicine Initiative ($100 million), the BRAIN Initiative ($86 million), cancer research ($300 million), and regenerative medicine using adult stem cells ($10 million).

The House Appropriations Committee-reported version of the FY2018 LHHS appropriations bill (H.R. 3358) recommends a total of $35.184 billion for NIH, including $824 million provided by the evaluation tap and $496 million from the NIH Innovation account. Adding to this total the amounts for Superfund related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would bring the NIH program level to $35.411 billion. H.R. 3358 would provide NIH with a $1.1 billion (3.2%) increase over the FY2017 enacted amount and $8.58 billion (32.3%) more than the FY2018 Trump budget request for NIH.

The report accompanying H.R. 3358 (H.Rept. 115-244) stated that the Trump Administration's proposed cap on indirect (F&A) costs was "misguided and would have a devastating impact on

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[35] Department of Health and Human Services, *Fiscal Year 2018 Budget in Brief*, Washington, DC, May 2017, p. 37 and p. 43, https://www.hhs.gov/sites/default/files/Consolidated%20BIB_ONLINE_remediated.pdf.

[36] NIH, *FY2018 Justification of Estimates for Appropriations Committees, Vol. I, Overview*, "Statistical Data: Direct and Indirect Cost Awarded," p. 95.

[37] Ibid, p. 96.

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

[39] For example, in the year before this new pattern developed, the explanatory statement accompanying the FY2015 omnibus stated the following:

> In keeping with longstanding practice, the agreement does not recommend a specific amount of NIH funding for this purpose or for any other individual disease. Doing so would establish a dangerous precedent that could politicize the NIH peer review system. Nevertheless, in recognition that Alzheimer's disease poses a serious threat to the Nation's long-term health and economic stability, the agreement expects that a significant portion of the recommended increase for NIA should be directed to research on Alzheimer's. The exact amount should be determined by scientific opportunity of additional research on this disease and the quality of grant applications that are submitted for Alzheimer's relative to those submitted for other diseases.

See *Congressional Record*, daily edition, vol. 160, no. 151, Book II (December 11, 2014), p. H9832, https://www.gpo.gov/fdsys/pkg/CREC-2014-12-11/pdf/CREC-2014-12-11-pt2-PgH9307-2.pdf.

biomedical research across the country."[40] The House Appropriations Committee directs NIH to continue reimbursing institutions for indirect costs according to current rules and procedures via a new general provision in the bill (§228) that "also prohibits funds in this Act from being used to implement any further caps on F&A cost reimbursements."[41] The House Appropriations Committee provides an increase in funding for the Fogarty International Center rather than the elimination proposed by the Trump Administration. The House Appropriations Committee did not adopt the Trump Administration's proposed consolidation of NIH and AHRQ. Lastly, H.Rept. 115-244 states that "the Committee recommends an increase of $400 million within NIA [National Institute on Aging] to support a total of at least $1.791 billion on Alzheimer's disease research."[42]

[40] U.S. Congress, House Committee on Appropriations, *Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2018*, report to accompany H.R. 3358, 115th Cong., 1st sess., July 24, 2017, H.Rept. 115-244 (Washington: GPO, 2017), p. 50.

[41] Ibid.

[42] Ibid., pp. 59-60.

The Senate Appropriations Committee-reported version of the FY2018 LHHS appropriations bill (S. 1771) recommends a total of $36.084 billion for NIH, including $1.074 billion provided by the evaluation tap and $496 million from the NIH Innovation account. Adding to this total the amounts for Superfund related activities ($77 million) and the mandatory type 1 diabetes program ($150 million) would bring the NIH program level to $36.311 billion. S. 1771 would provide NIH with a $2 billion (5.92%) increase over the FY2017 enacted amount and $9.48 billion (35.6%) more than the FY2018 Trump budget request for NIH.

The report accompanying S. 1771 (S.Rept. 115-150) states that the Committee "rejects the administration's proposals to: cap Facilities and Administrative costs; eliminate the John E. Fogarty International Center; and create the National Institute for Research on Safety and Quality" by merging AHRQ with NIH. It also provides an increase in funding for Alzheimer's disease research of $414 million for a total of $1.828 billion in FY2018.

The overview below outlines the four priority themes highlighted by NIH in the FY2018 budget request; dollar amounts for these research activities were not provided by the agency. Selected responses from congressional report language are also provided.

The 21st Century Cures Act and the NIH Innovation Account

The 21st Century Cures Act (P.L. 114-255) created the NIH Innovation account and specified that funds in the account must be appropriated in order to be available for expenditure. The first round of funding was provided by Section 194 of the Further Continuing and Security Assistance Appropriations Act, 2017 (CR, P.L. 114-254). The CR appropriated $352 million in the NIH Innovation account for necessary expenses to carry out the four NIH Innovation Projects as described in Section 1001(b)(4) of the Cures Act. The four projects authorized by the Cures Act are the Precision Medicine Initiative (FY2017, $40 million; FY2018, $100 million), the BRAIN Initiative (FY2017, $10 million; FY2018, $86 million), cancer research (FY2017, $300 million; FY2018, $300 million), and regenerative medicine using adult stem cells (FY2017, $2 million; FY2018, $10 million). (The $352 million that was appropriated for FY2017 is available until expended.)The NIH Director may transfer these amounts from the NIH Innovation account to other NIH accounts but only for the purposes specified in the Cures Act. If the NIH Director determines that the funds for any of the four Innovation Projects are not necessary, the amounts may be transferred back to the NIH Innovation account. This transfer authority is in addition to other transfer authorities provided by law.

For further information, see CRS Report R44720, *The 21st Century Cures Act (Division A of P.L. 114-255)*, coordinated by Amanda K. Sarata, and CRS Report R44723, *Overview of Further Continuing Appropriations for FY2017 (H.R. 2028)*, coordinated by James V. Saturno.

1. Fundamental Science Enhanced by Technological Advances. More than half of the proposed NIH budget is targeted for basic research, which "provides the foundation for translational and clinical studies that can lead to major medical advances, such as cancer-fighting drugs, vaccines, and medical devices."[43] One example of basic research is the BRAIN Initiative, a collaborative effort of ten ICs with the National Science Foundation, Defense Advanced Research Projects Agency, and Food and Drug Administration. The BRAIN Initiative develops and applies new tools for the study of complex brain functions. Insights into brain circuitry and activity gained via the BRAIN Initiative are expected to help reveal the underlying problems in brain disorders and may help provide new treatments or prevention approaches. The House recommends an increase for the BRAIN Initiative to the level authorized in the 21st Century Cures Act ($86 million); the Senate would provide $400 million.

Another example is the NIH Common Fund's Single Cell Analysis Program (SCAP).[44] According to NIH, "Understanding more about how single cells function could help researchers identify rare

[43] NIH *FY2018 Justification of Estimates for Appropriations Committees, Vol. I, Overview*, p. 4.

[44] The NIH Common Fund is part of OD; it supports large complex research efforts that involve the collaboration of

cells in a group (e.g., ones that could become cancerous), cells infected latently with a virus, or cells that develop drug resistance."[45] A third example is the National Cancer Institute's efforts using cryo-electron microscopy to observe key molecules in cancer cells almost at the atomic level; this may help in the development of more effective and targeted therapies.

2. Treatments and Cures. NIH-supported scientists are using a novel research method in an effort to correct the genetic mutations causing sickle cell disease. Although more work would be necessary before this approach could be used in patients, the lessons learned may pave the way for new treatments to improve human health. Addressing the opioid epidemic is another high priority topic. NIH is supporting research efforts to combat opioid addiction and the treatment of overdoses. NIH is responding to the growing public health threat posed by antimicrobial resistance bacteria by various mechanisms. These include support for the Antibacterial Resistance Leadership Group and participation in a multi-agency effort focused on advancing antimicrobial resistance research. The House would provide an increase of $30 million for combating antibiotic-resistant bacteria; the Senate would provide an increase of $50 million. Cancer immunotherapy is yet another high priority area of research and is at the core of work supported by the "Cancer Moonshot," funded by the 21st Century Cures Act. The House would direct NIH to transfer $300 million from the NIH Innovation Account to the National Cancer Institute (NCI) to support the Cancer Moonshot, the same level as authorized in the 21st Century Cures Act. The Senate report states that the total amount provided for NCI includes $300 million from the NIH Innovation Account.

3. Health Promotion and Disease Prevention. As part of the Precision Medicine Initiative (PMI), NIH would continue to establish a group of 1 million or more volunteers—called the *All of Us* Research Program—whose health, genetic, environmental, and other data would be collected and used in research studies to identify novel therapeutics and prevention strategies. The House would provide an increase of $80 million for *All of Us;* the Senate would provide an increase of $60 million.

Vaccination is another important prevention strategy. NIH is engaged in vaccine research to prevent many different diseases, including emerging diseases such as the Zika virus. NIH is also involved in developing a "universal" influenza vaccine that produces a strong long-lasting immune response to elements that are shared among all strains of the flu virus.

4. Enhancing Stewardship. NIH states that it recognizes that to earn and maintain the public's trust it is essential to be "an efficient and effective steward of taxpayer funds" and to "allocate its resources with sufficient transparency to allow taxpayers to see how their money is invested."[46] The agency continues to "streamline administrative processes that can take investigators' time away from their research."[47] One key way NIH is focused on strengthening stewardship is through the release and implementation of a new policy designed to enhance reproducibility of scientific research through increased rigor and transparency in reporting.[48] According to NIH, another means of investing in the long-term health of the nation is "by strengthening and sustaining a diverse, world-class research workforce."[49] The agency has crafted funding

two or more research ICs.

[45] NIH, *FY2018 Justification of Estimates for Appropriations Committees, Vol. I, Overview*, p. 5.

[46] Ibid., p. 10.

[47] Ibid.

[48] NIH, Rigor and Reproducibility, at https://grants.nih.gov/reproducibility/index.htm.

[49] NIH, *FY2018 Justification of Estimates for Appropriations Committees, Vol. I, Overview*, p. 10.

opportunities directed at new investigators as well as created procedures to normalize success-in-grant-receipt rates between early and more experienced scientists.

Table 6. National Institutes of Health Funding

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S.Cmte.	FY2018
Cancer Institute (NCI)	$5,389	$4,174	$5,471	$5,558	
Heart, Lung, and Blood Institute (NHLBI)	3,207	2,535	3,257	3,323	
Dental/Craniofacial Research (NIDCR)	426	321	432	440	
Diabetes/Digestive/Kidney (NIDDK)[a]	1,871	1,450	1,900	1,936	
Neurological Disorders/Stroke (NINDS)	1,784	1,313	1,810	1,862	
Allergy/Infectious Diseases (NIAID)	4,907	3,783	5,006	5,128	
General Medical Sciences (NIGMS)[b]	1,826	1,405	1,889	1,813	
Child Health/Human Development (NICHD)	1,380	1,032	1,402	1,426	
National Eye Institute (NEI)	733	550	744	759	
Environmental Health Sciences (NIEHS)[c]	714	534	725	738	
National Institute on Aging (NIA)	2,049	1,304	2,459	2,536	
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	558	418	567	576	
Deafness/Communication Disorders (NIDCD)	437	326	444	452	
National Institute of Mental Health (NIMH)	1,602	1,202	1,625	1,682	
National Institute on Drug Abuse (NIDA)	1,091	865	1,107	1,113	
Alcohol Abuse/Alcoholism (NIAAA)	483	361	491	500	
Nursing Research (NINR)	150	114	153	155	
Human Genome Research Institute (NHGRI)	529	400	537	547	
Biomedical Imaging/Bioengineering (NIBIB)	357	283	363	371	
Minority Health/Health Disparities (NIMHD)	289	215	294	298	
Complementary/Integrative Health (NCCIH)	135	102	137	140	
Advancing Translational Sciences (NCATS)	706	557	719	729	
Fogarty International Center (FIC)	72	—	73	74	
National Library of Medicine (NLM)	408	373	414	421	
Natl Institute for Research on Safety and Quality (NIRSQ)[d]	—	272	—	—	
Office of Director (OD)	1,678	1,342	1,718	1,810	
NIH Innovation Account	352	496	496	496	
Buildings & Facilities (B&F)	129	99	129	129	
PHS Program Evaluation	824	780	824	1,074	
Subtotal, NIH	**34,084**	**26,604**	**35,184**	**36,084**	
Mandatory type 1 diabetes funds[e]	150	150	150	150	
Superfund (Interior approp. to NIEHS)[f]	77	60	77	77	

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S.Cmte.	FY2018
Patient-Centered Outcomes Research Trust Fund	—	107	—	—	
Total, NIH Program Level	**34,311**	**26,920**	**35,411**	**36,311**	

Source: H.Rept. 115-244, July 24, 2017, pp. 214-216, and S.Rept. 115-150, September 7, 2017, pp. 230-231.

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 2** do not subtract the amount of transfers, such as the evaluation tap, from the agencies' appropriation. Figures for the column headed "FY2018 Enacted" will be added, if available, as 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. Amounts for National Institute of Environmental Health Sciences (NIEHS) do not include Interior Appropriation for Superfund research (see note f).

d. FY2017 enacted total for the Agency for Healthcare Research and Quality was $324 million; amount proposed in H.R. 3358 for AHRQ in FY2018 is $300 million and amount proposed in S. 1771 is $324 million.

e. Mandatory funds available to NIDDK for type 1 diabetes research under PHS Act §330B (provided by P.L. 114-10 for FY2017; $37,500,000 was provided for the first two quarters of FY2018 by P.L. 115-96).

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

Department of Energy[50]

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

The Administration's FY2018 budget request for DOE includes $10.172 billion for R&D and related activities, including programs in three broad categories: science, national security, and energy. This request is 22.6% less than the enacted FY2017 amount of $13.140 billion. The House bill (H.R. 3219 as passed by the House, together with H.Rept. 115-230 on H.R. 3266) would provide $12.033 billion. The Senate committee recommendation (based on S. 1609 as reported and S.Rept. 115-132) is $13.075 billion. (See **Table 7** for details.)

The request for the DOE Office of Science is $4.473 billion, a decrease of 17.1% from the FY2017 appropriation of $5.392 billion. The House bill would provide $5.393 billion. The Senate bill would provide $5.550 billion. There is no authorized funding level for the Office of Science for FY2018. The most recent authorization of appropriations (in the America COMPETES Reauthorization Act of 2010, P.L. 111-358) was through FY2013.

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

The Office of Science includes six major research programs. The request for the largest program, Basic Energy Sciences (BES), is $1.555 billion, a decrease of 16.9% from $1.872 billion in FY2017. Within BES, most research areas and facilities would receive reduced funding, and funds would be eliminated for the Experimental Program to Stimulate Competitive Research (EPSCoR, $15 million in FY2017); the Energy Innovation Hub on Batteries and Energy Storage ($24 million in FY2017); and the Energy Innovation Hub on Fuels from Sunlight ($15 million in FY2017). The BES program's five synchrotron light sources would receive $428 million for operations, down from $494 million in FY2017. This reduction would result in reduced operating hours (about 85% of optimal, as calculated by DOE) and operation of the Stanford Synchrotron Radiation Lightsource for only the first quarter of the year. The House bill would provide $1.872 billion for BES, including $15 million for EPSCoR, no funding for the two hubs, and $489 million for operations at the light sources. The Senate bill would provide $1.980 billion, including $20 million for EPSCoR, the same amounts as in FY2017 for the two hubs, and $496 million for operations at the light sources.

The request for High Energy Physics is $673 million, a decrease of 18.5% from $825 million in FY2017. This total includes $44 million for ongoing construction of the Muon to Electron Conversion Experiment (Mu2E), as previously planned, and $55 million for ongoing construction of the Long Baseline Neutrino Facility/Deep Underground Neutrino Experiment (LBNF/DUNE), up from $50 million in FY2017. Most other research areas and facilities would receive reduced funding. The House bill would provide $825 million, including the requested amount for Mu2E and $80 million for LBNF/DUNE. The Senate bill would provide $860 million, including the requested amount for Mu2E and $82 million for LBNF/DUNE.

The request for Biological and Environmental Research (BER) is $349 million, a decrease of 43.0% from $612 million in FY2017. This program has historically consisted of two roughly equal parts: Biological Systems Science and Climate and Environmental Sciences. The request would rename the latter program as Earth and Environmental Systems Sciences and decrease its share of the reduced BER total to about one-third. Within Earth and Environmental Systems Sciences, funding for Earth and Environmental Systems Modeling (formerly Climate and Earth System Modeling) would decrease to $27 million from $99 million in FY2016 (the FY2017 amount is not available). Climate Model Development and Validation would receive no funding. The House bill would provide $582 million. The House report does not directly address the balance between Biological Systems Science and Earth and Environmental Systems Sciences. The Senate bill would provide $633 million, roughly evenly divided as in past years between Biological Systems Science ($322 million) and Earth and Environmental Systems Sciences ($311 million).

The request for Nuclear Physics is $503 million, a decrease of 19.2% from $622 million in FY2017. The proposed reduction is spread across most research areas and facilities. The request includes $80 million for ongoing construction of the Facility for Rare Isotope Beams (FRIB), down from $100 million in FY2017 and $17 million less than previously projected for FY2018. It includes no further funding for construction of the Continuous Electron Beam Accelerator Facility (CEBAF) upgrade, which is to be completed in FY2017. Reduced funding for facility operations would support operation of CEBAF at about 29% utilization and the Relativistic Heavy Ion Collider (RHIC) at about 67% utilization. The House bill would provide $619 million, including $97 million for FRIB construction. House report language encourages DOE to fund optimal operations at CEBAF and RHIC "within available funds." The Senate bill would provide $639 million, including $97 million for FRIB construction, $10 million more than the request for operations at RHIC, and optimal operations at CEBAF.

The request for Advanced Scientific Computing Research is $722 million, an increase of 11.6% from $647 million in FY2017. Of this total, $347 million would contribute to the DOE-wide Exascale Computing Initiative: $197 million, up from $164 million in FY2017, for the Office of Science Exascale Computing Project (SC-ECP), and $150 million for upgrades at the two Leadership Computing Facilities, located at Oak Ridge and Argonne National Laboratories. The House bill would provide $694 million, including $170 million for the SC-ECP. The Senate bill would provide $763 million, including $184 million for the SC-ECP.

The request for Fusion Energy Sciences is $310 million, a decrease of 18.4% from $380 million in FY2017. Included is $63 million for U.S. contributions to the construction of the International Thermonuclear Experimental Reactor (ITER), up from $50 million in FY2017 but down from a peak of $200 million in FY2014. The DOE budget justification cites U.S. concerns about the cost and schedule of the ITER project, which is currently under construction in France. The estimated total U.S. cost range for ITER was updated in January 2017 and is now $4.7 to $6.5 billion (the low end of the range was previously $4.0 billion). The House bill would provide $395 million for Fusion Energy Sciences, including the requested amount for U.S. contributions to ITER. The Senate bill would provide $232 million, including no funding for ITER. The Senate report states that funding for ITER "would come at the expense of other Office of Science priorities."

The request for DOE national security R&D is $3.982 billion, an increase of 5.9% from $3.760 billion in FY2017. The bulk of the increase would be in the Weapons Activities account, including $51 million for a newly consolidated subprogram on Enhanced Capabilities for Subcritical Experiments, $40 million to initiate a Stockpile Responsiveness program, and $25 million in new construction funding for exascale computing facilities at Los Alamos and Lawrence Livermore National Laboratories. Funding for Naval Reactors would increase by $60 million. The DOE budget justification describes most of the proposed changes within Naval Reactors as consistent with prior plans for ongoing projects. The House bill would provide $4.036 billion, including $78 million more than requested for Nuclear Nonproliferation R&D to support development of low-enriched uranium fuels for research reactors. The Senate bill would provide $3.865 billion, including no funds for the proposed Stockpile Responsiveness program.

The FY2018 request for DOE energy R&D is $1.717 billion, a decrease of 56.9% from $3.988 billion in FY2017. Funding for energy efficiency and renewable energy R&D would decrease by 64.9%, with reductions in all major research areas and a shift in emphasis toward early-stage R&D rather than later-stage development and deployment.[51] Funding for fossil energy R&D would decrease by 58.1%, with reductions focused particularly on coal carbon capture and storage ($31 million, down from $196 million in FY2017) and natural gas technologies ($6 million, down from $43 million in FY2017). Funding for nuclear energy would decrease by 30.8%, with no funding requested for small modular reactor licensing technical support ($95 million in FY2017), the Integrated University Program ($5 million in FY2017), or the Supercritical Transformational Electric Power (STEP) R&D initiative ($5 million in FY2017), and $89 million for fuel cycle R&D (down from $208 million in FY2017). The Advanced Research Projects Agency–Energy (ARPA-E) ARPA-E, which is intended to advance high-impact energy technologies that have too much technical and financial uncertainty to attract near-term private-sector investment, would be terminated, with requested FY2018 funds used only to close out the program.

[51] For more detailed information about energy efficiency and renewable energy funding, see CRS In Focus IF10661, *DOE Office of Energy Efficiency and Renewable Energy: FY2017 Appropriations and the FY2018 Budget Request*, by Kelsi Bracmort and Corrie E. Clark.

The House bill would provide $2.620 billion for DOE energy R&D. Relative to FY2017, it would decrease funding for energy efficiency and renewable energy by 55.4% and nuclear energy by 4.7%, with funding at the FY2017 level for the Integrated University Program and STEP R&D, but no funding for small modular reactor licensing technical support. A floor amendment restored funding for fossil energy R&D to the FY2017 level. The House bill would provide no funding for ARPA-E.

The Senate bill would provide $3.660 billion for DOE energy R&D. Relative to FY2017, it would decrease funding for energy efficiency and renewable energy by 7.7%, fossil energy R&D by 14.3%, and nuclear energy by 9.1%, including funding at the FY2017 level for the Integrated University Program but no funding for STEP R&D or small modular reactor licensing technical support. For ARPA-E, the Senate bill would provide $330 million, $24 million more than the FY2017 appropriation.

Table 7. Department of Energy R&D and Related Activities

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S. Cmte.	FY2018 Enacted
Science	**$5,392**	**$4,473**	**$5,393**	**$5,550**	
Basic Energy Sciences	1,872	1,555	1,872	1,980	
High Energy Physics	825	673	825	860	
Biological and Environmental Research	612	349	582	633	
Nuclear Physics	622	503	619	639	
Advanced Scientific Computing Research	647	722	694	763	
Fusion Energy Sciences	380	310	395	232	
Other	435	362	406	443	
National Security	**3,760**	**3,982**	**4,036**	**3,865**	
Weapons Activities RDT&E	1,842	2,028	2,004	1,964	
Naval Reactors	1,420	1,480	1,486	1,437	
Defense Nuclear Nonproliferation R&D	470	446	524	436	
Defense Environmental Cleanup Technol. Devel.	28	28	23	28	
Energy	**3,988**	**1,717**	**2,620**	**3,660**	
Energy Efficiency and Renewable Energy[a]	1,812	636	808	1,672	
Fossil Energy R&D	668[b]	280	668	573	
Nuclear Energy	1,017	703	969	917	
Electricity Delivery and Energy Reliability R&D	185	78	175	168	
Advanced Research Projects Agency–Energy	306	20	0	330	
DOE, Total	**13,140**	**10,172**	**12,049**	**13,075**	

Source: FY2017 enacted from P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017. FY2018 request from DOE FY2018 congressional budget justification, https://energy.gov/cfo/downloads/fy-2018-budget-justification. FY2018 House from H.R. 3219 as passed by the House and H.Rept. 115-230 (on H.R. 3266). FY2018 Senate committee from S. 1609 as reported and S.Rept. 115-132. Figures for the column headed "FY2018 Enacted" will be added, if available, as action is completed.

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

a. Excluding Weatherization and Intergovernmental Activities.
b. Does not include rescission of $240 million in prior-year balances.

National Aeronautics and Space Administration[52]

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

The Administration is requesting about $15.950 billion for NASA R&D in FY2018. This is 4.2% less than the FY2017 level of about $16.657 billion. The House committee recommendation (based on H.R. 3627 as reported and H.Rept. 115-231) is $16.737 billion. The Senate committee recommendation (based on S. 1662 as reported and S.Rept. 115-139) is $16.324 billion. For a breakdown of these amounts, see **Table 8**. NASA R&D funding comes through five accounts: Science, Aeronautics, Space Technology, Exploration, and the ISS and Commercial Crew portions of Space Operations.

The FY2018 request for Science is $5.712 billion, a decrease of 0.9%. Within this total, funding for Earth Science would decrease by $167 million (8.7%); funding for the James Webb Space Telescope would decrease by $36 million (6.3%) in line with previous plans; and funding for Planetary Science and Astrophysics would increase. The bulk of the proposed reduction for Earth Science would result from the elimination of four items in the Earth Systematic Missions program: the Pre-Aerosol, Clouds, and ocean Ecosystem (PACE) mission, the Radiation Budget Instrument (RBI), the Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder mission, and the NASA-provided instruments on the Deep Space Climate Observatory (DSCOVR) mission. In Planetary Science, funding for an orbiter mission to Jupiter's moon Europa (with no accompanying lander) would increase from $275 million in FY2017 to $425 million in the FY2018 request; NASA expects this mission to advance to Phase C (final design and fabrication) at the beginning of FY2019. The House committee bill would provide $5.859 billion for Science, including $50 million less than the request for Earth Science and $191 million more than the request for Planetary Science. The House committee report does not mention PACE, RBI, CLARREO Pathfinder, or DSCOVR. It recommends $495 million for Europa orbiter and lander missions. The Senate committee bill would provide $5.572 billion for Science, including $167 million more than the request for Earth Science and $318 million less than the request for Planetary Science. The Senate committee report includes funds for PACE, CLARREO Pathfinder, and DSCOVR. It directs NASA to provide a report on the cost and schedule progress of RBI, and to fund it from within the Earth Science appropriation if the report is favorable. It does not mention the Europa mission.

The FY2018 request for Aeronautics is $624 million, a decrease of 5.5%. The request includes $79 million for a low-boom supersonic flight demonstrator, first proposed in the FY2017 budget. The House committee bill would provide $660 million, the same as in FY2017. The Senate committee bill would provide $650 million. Both committee recommendations include the requested amount for the low-boom flight demonstrator.

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

The FY2018 request for Space Technology is $679 million, a decrease of 1.2%. This is the first year since FY2011, when Space Technology was first established as a separate account, that the Administration has not proposed to increase Space Technology funding. The request includes no funding for the Restore-L satellite servicing mission. According to the FY2018 congressional budget justification, NASA will "transition the Restore-L project to reduce its cost and better position it to support a nascent commercial satellite servicing industry" and "pursue collaborations with the Defense Advanced Research Projects Agency [DARPA] and industry to most effectively advance satellite servicing technologies and ensure broad commercial application." The House committee bill would provide $687 million, the same as in FY2017. The committee report states that "The Committee strongly supports Restore-L and expects NASA to continue developing satellite servicing capabilities in collaboration with its public and private sector and academic partners." The Senate committee bill would provide $700 million, including $130 million for Restore-L "to maintain a schedule that targets a launch in calendar year 2019." The committee report states that Restore-L is complementary to DARPA's activities and encourages NASA to "share expertise and lessons learned with DARPA and to accept any financial contributions from DARPA."

The FY2018 request for Exploration is $3.934 billion, a decrease of 9.0%. 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 launch readiness date for the first test flight of SLS carrying Orion but no crew (known as EM-1) was previously planned for FY2018 but is expected to slip to 2019.[53] The launch readiness date for the first flight of Orion and the SLS with a crew on board (known as EM-2) continues to be FY2023. The House committee bill would provide $4.550 billion for Exploration. The committee report expresses concern about schedule slips and directs NASA to submit a report identifying the schedule milestones that must be met for EM-1 and EM-2. The Senate committee bill would provide $4.395 billion. The committee report states that the recommended funding level is "to ensure the earliest possible crewed launch, as well as prepare for future crewed launches."

In the Space Operations account, the request for Commercial Crew is $732 million, a decrease of 38.2%, and the request for the ISS is $1.491 billion (an increase of 3.8% from FY2016; the FY2017 act did not specify an allocation for the ISS). The reduction in Commercial Crew funding is in line with previous plans and reflects the expected transition of commercial crew activities from development to operations. A domestic commercial capability to transport crews to the ISS is expected to become available in September 2018. The House committee bill would provide $64 million (1.4%) less than the request for Space Operations as a whole; it does not specify how much of the total should be allocated to the ISS and Commercial Crew programs. The Senate committee bill would provide $11 million more than the request for Space Operations; its recommendation includes the requested amount for Commercial Crew but does not specify an allocation for the ISS.

[53] See NASA comments in Government Accountability Office, *NASA Human Space Exploration: Delay Likely for First Exploration Mission*, GAO-17-414, April 2017, http://www.gao.gov/assets/690/684360.pdf, p. 18.

Table 8. National Aeronautics and Space Administration R&D

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 H. Cmte.	FY2018 S. Cmte.	FY2018 Enacted
Science	**5,765**	**5,712**	**5,859**	**5,572**	
Earth Science	1,921	1,754	1,704	1,921	
Planetary Science	1,846	1,930	2,121	1,612	
Astrophysics	750	817	822	817	
James Webb Space Telescope	569	534	534	534	
Heliophysics	679	678	678	689	
Aeronautics	**660**	**624**	**660**	**650**	
Space Technology	**687**	**679**	**687**	**700**	
Exploration	**4,324**	**3,934**	**4,550**	**4,395**	
Exploration Systems Development	3,929	3,584	4,100	4,045	
Exploration R&D	395	350	450	350	
International Space Station	**n/s[a]**	**1,491**	**n/s[a]**	**n/s[a]**	
Commercial Crew	**1,185**	**732**	**n/s[a]**	**732**	
Subtotal R&D	**14,005**	**13,171**	**13,947**	**13,546**	
Non-R&D Programs[b]	2,519	2,595	2,612	2,660	
Safety, Security, and Mission Services	2,769	2,830	2,826	2,827	
Associated with R&D[c]	*2,347*	*2,364*	*2,380*	*2,363*	
Construction & Environmental C&R	361[d]	496	486	496	
Associated with R&D[c]	*306*	*414*	*409*	*415*	
NASA, Total (R&D)	**16,657**	**15,950**	**16,737**	**16,324**	
NASA, Total	**19,653[d]**	**19,092**	**19,872**	**19,529**	

Sources: FY2017 enacted from P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017, pp. H3374-H3375. FY2018 request from NASA FY2018 congressional budget justification, http://www.nasa.gov/news/budget/. FY2018 House committee from H.R. 3627 as reported and H.Rept. 115-231. FY2018 Senate committee from S. 1662 as reported and S.Rept. 115-139. Figures for the column headed "FY2018 Enacted" will be added, if available, as action is completed.

Notes: Totals may differ from the sum of the components due to rounding. C&R = Compliance and Remediation.

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

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

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

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

National Science Foundation[54]

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."[55] 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.[56]

NSF has six 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). Appropriations are generally provided at the account level, while program-specific direction may be included in appropriations acts, or accompanying conference reports or explanatory statements.

For FY2017, P.L. 115-31 provided appropriations at the account level, and Congress directed funding for a subset of programs within the RRA, EHR, and MREFC accounts in the accompanying explanatory statement.[57] Because NSF reports that FY2017 amounts were not available when the FY2018 budget request was prepared, requested funding at the subaccount level is generally compared to FY2016 actual funding. Therefore, this section of the report compares account funding (and program-specific funding, where directed by Congress) to FY2017 enacted funding; subaccount and R&D funding amounts are compared to FY2016 actual levels.[58]

Funding for R&D is included in the RRA, EHR, and MREFC accounts, which also include non-R&D funding. Together, these three accounts comprise 95% of the total requested funding for NSF. Actual R&D obligations for each account are known after NSF allocates funding appropriations to specific activities and reports those figures.[59] The budget request specifies R&D funding for the conduct of research, including basic and applied research, and for physical assets, including R&D facilities and major equipment. Funding amounts for FY2016 actual, FY2017 enacted, and FY2018 requested levels are reported by account, including amounts for R&D conduct and physical assets where applicable, in **Table 9**.

Overall. The Trump Administration is requesting $6.653 billion for the NSF in FY2018, an $819 million (11%) decrease from the FY2017 enacted amount of $7.472 billion. The request would

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

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

[56] For more information about NSF and the agency's funding history, see CRS Report R45009, *The National Science Foundation: FY2018 Appropriations and Funding History*, by Laurie A. Harris.

[57] Explanatory Statement, Consolidated Appropriations Act, 2017, Division B (Commerce, Justice, Science, and Related Agencies Appropriations Act, 2017), *Congressional Record*, vol. 163, no. 76—Book II (May 3, 2017), p. H3375.

[58] Long-term, multi-year construction projects supported through the MREFC account are an exception, as NSF is able to provide FY2017 estimated funding amounts for these projects.

[59] R&D prior year (FY2016) and requested (FY2018) amounts are reported in the "Quantitative Data Tables" section of the FY2018 *NSF Budget Request to Congress*, May 23, 2017, pp. QDT-1–QDT-7.

decrease budget authority primarily in three accounts relative to the FY2017 enacted level: RRA by $672 million (11%), EHR by $119 million (14%), and MREFC by $26 million (12%). The request would provide slight decreases to the AOAM (0.5%, $1.5 million), and OIG (1.3%, $200,000) accounts, and no change for the NSB account. Overall, NSF estimates that, under the FY2018 request, funding for research grant awards would decrease from 21% to 19%, resulting in 800 fewer grants awarded, compared to FY2016.

As a proportion of NSF's total funding, R&D activities account for approximately 81%. For FY2018, $5.370 billion is requested for R&D activities, a 10.8% decrease from FY2016 actual funding for R&D of $6.022 million. The total request includes $4.950 billion (92%) for the conduct of R&D, and $420 million (8%) for R&D facilities and major equipment. Of funding requested for the conduct of R&D, 86% is requested for basic research, and 14% for applied research. Overall funding for R&D facilities and major equipment supports not only the construction and acquisition phases, funded through MREFC ($183 million requested), but also the planning, design, and post-construction operations and maintenance, funded through RRA ($237 million requested).

As passed by the House on September 14, 2017, the Interior and Environment, Agriculture and Rural Development, Commerce, Justice, Science, Financial Services and General Government, Homeland Security, Labor, Health and Human Services, Education, State and Foreign Operations, Transportation, Housing and Urban Development, Defense, Military Construction and Veterans Affairs, Legislative Branch, and Energy and Water Development Appropriations Act, 2018, (H.R. 3354),[60] would provide a total of $7.340 billion for NSF in FY2018, a $132.7 million (1.8%) decrease from the FY2017 enacted level and $687 million (10.3%) more than the FY2018 request. As reported by the Senate Committee on Appropriations, the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018 (S. 1662), would provide a total of $7.311 billion for NSF in FY2018, a $161.1 million (2.2%) decrease from the FY2017 enacted level and $658.2 million (9.9%) more than the FY2018 request. These amounts include both R&D and non-R&D funding.

NSF's budget justification identifies seven ongoing agency-wide investments that aim to bring researchers from different fields of science and engineering together to address cross-disciplinary questions. Compared to the FY2016 actual amounts, a slight increase in funding is requested for one of these initiatives—the Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (INCLUDES, 6.5%, $1 million increase). Decreases of between 12% and 70% are requested for the remaining six investments. These include Cyber-Enabled Materials, Manufacturing, and Smart Systems (CEMMSS, $222 million requested, 18% decrease); Innovations at the Nexus of Food, Energy, and Water Systems (INFEWS, $24 million requested, 70% decrease); Innovation Corps (I-Corps, $26 million requested, 12% decrease); Risk and Resilience ($31 million requested, 27% decrease); Secure and Trustworthy Cyberspace (SaTC, $114 million requested, 12% decrease); and Understanding the Brain (UtB), $134 million requested, 22% decrease). The committee report to accompany S. 1662 (S.Rept. 115-139) recommends no less than the FY2017 level for I-Corps.

Research. The Trump Administration seeks a $627 million (11%) decrease in funding for RRA in FY2018 compared to FY2017 enacted funding, for a total of $5.362 billion. Compared to the FY2016 actual levels, the FY2018 request includes decreases for all ten of the RRA subaccounts except for the U.S. Arctic Research Commission (USARC), which would not change. The largest

[60] Language from the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018 (H.R. 3267), originally reported by the House Committee on Appropriations on July 17, 2017, was incorporated as Division C of H.R. 3354.

percentage decrease would go to Integrative Activities (26%, $111 million decrease). The largest decrease in dollars would go to Mathematical and Physical Sciences (MPS, $129 million, 9.6%). The other subaccounts would receive decreases between 7.1% and 10.6%. The FY2018 request also includes $100 million for the RRA program Established Program to Stimulate Competitive Research (EPSCoR), which has drawn congressional interest, a decrease of 37.5% from the $160 million directed in the explanatory statement for FY2017 enacted funding.

In recent years, policymakers have debated congressional funding directives at the subaccount level within RRA. Some assert that legislators have a role in establishing funding priorities by scientific field, as part of the legislative oversight function and in order to assure accountability for taxpayer funds. Others 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, though it did limit the budget authority for Social, Behavioral and Economic Sciences to its FY2015 level.[61] For FY2017, P.L. 115-31 did not specify allocations for RRA subaccounts, but did specify that $544 million remain available for polar research and operations support, including activities for the U.S. Antarctic program.

Within the RRA account, the FY2018 request includes $4.839 billion for R&D, a decrease of $537 million (10%) compared to the FY2016 actual amount. Of this amount, the majority ($4.602 billion, 95%) is requested for the conduct of research, including $4.160 billion for basic research and $443 million for applied research.

As passed by the House, H.R. 3354 would provide a total of $6.034 billion for RRA, equal to the FY2017 enacted level. As reported by the Senate Committee on Appropriations, S. 1662 would provide a total of $5.918 billion for RRA, $115.8 million (1.9%) below the FY2017 enacted level.

For EPSCoR, the Senate committee report recommends no less than $160 million for EPSCoR, equal to the FY2017 level but does not specify funding amounts for RRA subaccounts.

Education. The FY2018 request includes a $119 million (13.6%) decrease for EHR, for a total of $761 million. This represents the largest percentage reduction requested among NSF's appropriations accounts. In FY2017, P.L. 115-31 provided $880 million for EHR and the accompanying explanatory statement directed funding levels for a number of EHR programs. As passed by the House, H.R. 3354 would provide $880 billion for EHR, equal to the FY2017 enacted level and $119.4 million (16%) above the FY2018 request. As reported by the Senate Committee on Appropriations, S. 1662 would provide $862.4 million for EHR, $17.6 million (2%) below the FY2017 enacted level and $101.8 million (13.4%) above the FY2018 request.

By program division, the largest decrease in the FY2018 request is for the Division of Graduate Education (20.5%, $57 million decrease), which would receive $221 million. The divisions on human resource development, formal and informal learning, and undergraduate education would receive decreases of 9.4% ($200 million requested), 11% ($135 million requested), and 12% ($204 million requested), respectively.

EHR programs of particular interest to congressional policymakers include the Graduate Research Fellowship (GRF) and National Research Traineeship (NRT) programs. The FY2018 request for GRF is $246 million, a reduction of $86 million (26%) from the FY2016 actual level. The requested amount would support 1,000 new fellows, a reduction from the 2,000 new fellows supported through the GRF each year since 2011; in addition, funding will continue for an

[61] Explanatory statement accompanying P.L. 114-113.

estimated 5,000 active fellows. The FY2018 request for NRT is $40 million, a $16 million (28%) decrease from FY2016.

Proposed funding for FY2018 for other EHR programs of particular congressional interest include CyberCorps: Scholarships for Service ($40 million requested, 27.0% below the FY2017 directed level);[62] Advancing Informal STEM Learning ($63 million requested, no change); Science, Technology, Engineering, and Mathematics + Computing Partnerships ($20 million requested, 61% decrease); Historically Black Colleges and Universities Undergraduate Program (HBCU-UP, $35 million requested, no change); Tribal Colleges and University Programs (TCUP, $13 million requested, 7.1% decrease); and the Louis Stokes Alliance for Minority Participation (LSAMP, $41 million requested, 10.9% decrease). Funding for the Hispanic Serving Institutions program (HSI), established in FY2017 per congressional direction, is requested at the FY2017 enacted level of $15 million. The Senate committee report recommends no less than $35 million for the HBCU-UP program, $14 million for the TCUP program, $46 million for the LSAMP program, and $15 million for the HSI program. The Senate committee report also recommends no less than the FY2017 enacted amounts for the GRF program and $55 million for CyberCorps.

Within EHR, requested funding for R&D is $348 million, which accounts for approximately (6.5%) of the agency's total R&D request. The requested amount is a $57 million (14%) decrease from the FY2016 actual amount of $405 million. The vast majority of the requested funding would support the conduct of R&D, including $120 million for basic research and $228 million for applied research.

Construction. The MREFC account supports large construction projects and scientific instruments, with nearly all of the funding directed for R&D facilities. The Trump Administration is seeking just over $183 million for MREFC in FY2018, $26 million (12.5%) less than the FY2017 enacted amount.

Requested MREFC funding would support three main projects, including continued construction of the Large Synoptic Survey Telescope (LSST, $58 million requested, 13.6% decrease from the FY2017 estimate) and the Daniel K. Inouye Solar Telescope (DKIST, $20 million requested, no change). Most of the request ($105 million) would fund the Regional Class Research Vessels (RCRV) program to build ships to support science in U.S. coastal waters. The FY2018 request—prepared in advance of final FY2017 appropriations action by Congress—included support for two ships. Subsequently, Congress directed NSF to provide $122 million to build three RCRVs. This amounts to $41 million per ship, compared to the FY2018 request of $52.5 million per ship. The budget request notes that the direction from Congress for three RCRVs will impact current and future funding requirements at unspecified amounts.

As passed by the House, H.R. 3354 would provide a total of $77.8 million for MREFC in FY2018, $131 million (63%) below the FY2017 enacted level, and $105 million (57%) below the FY2018 request. This amount would provide $57.8 million for LSST and $20 million for DKIST but no funding for RCRVs. As reported by the Senate Committee on Appropriations, S. 1662 would provide a total of $182.8 million for MREFC in FY2018, $26.2 million (12.5%) below the FY2017 enacted level, and equal to the FY2018 request. The recommended amount includes funding at the requested levels for DKIST, LSST, and three RCRVs.

Other initiatives. The FY2018 NSF budget request includes funding for three multiagency initiatives. This funding is included in the six NSF appropriations accounts and not separately provided. The National Nanotechnology Initiative would receive $389 million, $122 million

[62] The explanatory statement further directed, of the $55 million provided for CyberCorps in FY2017, "no less than $7.5 million for qualified community colleges as directed by the Senate."

(24%) less than in FY2016. The Networking and Information Technology Research and Development program would receive $1.062 billion, a decrease of $157 million (12.9%). The U.S. Global Change Research Program would receive $264 million, $85 million (25.6%) less than in FY2016. P.L. 115-31 did not specify NSF funding for these initiatives. Similarly, H.R. 3354, S. 1662, and Senate committee report do not specify funding for the initiatives.

Table 9. National Science Foundation Funding

(budget authority in millions of dollars)

Account	FY2016 Actual	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S.Cmte.	FY2018 Enacted
Research and Related Activities (RRA)	**$5,998.1**	**$6,033.6**	**$5,361.6**	**$6,033.6**	**$5,917.8**	
R&D, RRA Total	5,375.8	n/s	4,839.0	n/s	**n/s**	
Conduct of R&D	*5,184.6*	*n/s*	*4,602.3*	*n/s*	***n/s***	
R&D Facilities and Major Equipment	*191.2*	*n/s*	*236.7*	*n/s*	***n/s***	
Education and Human Resources (EHR)	**884.1**	**880.0**	**760.6**	**880.0**	**862.4**	
R&D, EHR Total	405.0	n/s	348.2	n/s	**n/s**	
Conduct of R&D	*404.8*	*n/s*	*348.0*	*n/s*	***n/s***	
R&D Facilities and Major Equipment	*0.2*	*n/s*	*0.2*	*n/s*	***n/s***	
Major Research Equipment and Facilities Construction (MREFC)	**241.5**	**209.0**	**182.8**	**77.8**	**182.8**	
R&D, MREFC Total	241.5	n/s	182.8	n/s	**n/s**	
Conduct of R&D	*–*	*n/s*	*–*	*n/s*	***n/s***	
R&D Facilities and Major Equipment	*241.5*	*n/s*	*182.8*	*n/s*	***n/s***	
Agency Operations and Award Management (AOAM)[a]	**351.1**	**330.0**	**328.5**	**328.5**	**328.5**	
National Science Board (NSB)[a]	**4.3**	**4.4**	**4.4**	**4.4**	**4.4**	
Office of the Inspector General (OIG)[a]	**14.8**	**15.2**	**15.0**	**15.2**	**15.2**	
NSF, Total	**$7,493.9**	**$7,472.2**	**$6,652.9**	**$7,339.5**	**$7,311.1**	
R&D, NSF Total	6,022.3	n/s	5,369.9	n/s	**n/s**	
Total, Conduct of R&D	*5,589.4*	*n/s*	*4,950.3*	*n/s*	***n/s***	
Total, R&D Facilities & Major Equipment	*432.8*	*n/s*	*419.6*	*n/s*	***n/s***	

Source: Data in the columns titled, "FY2016 Actual" and "FY2018 Request" are from the FY2018 *NSF Budget Request to Congress*. Data in the column headed "FY2017 Enacted" are from the Consolidated Appropriations Act, 2017 (P.L. 115-31) and the accompanying Division B Explanatory Statement. Funding amounts in the column "FY2018 House-passed" are from the Division C—Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018 of H.R. 3354, as passed by the House on September 14, 2017. Funding amounts in the column "FY2018 S.Cmte. Reported" are from the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018 (S. 1662), as reported by the Senate Committee on Appropriations on July 27, 2017, and S.Rept. 115-139.

Notes: Appropriations accounts are in bold. NSF total may differ from the sum of the accounts due to rounding. Non-bold R&D funding amounts are a subset of funding for the specified accounts. The term "n/s" means "not specified."

a. The AOAM, NSB, and OIG accounts have no reported R&D funding.

Department of Agriculture[63]

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 involved are the Agricultural Research Service (ARS), National Institute of Food and Agriculture (NIFA), National Agricultural Statistics Service (NASS), and Economic Research Service (ERS).

For FY2018, the House-passed bill (H.R. 3354, as amended from committee-reported H.R. 3268) would provide $2.793 billion for USDA's four research agencies, a reduction of $98 million (-3.4%) from the enacted FY2017 appropriation (P.L. 115-31). The Senate-reported bill (S. 1603) would provide $2.834 billion ($41 million more than the House bill, and a reduction of 2% from FY2017). The Administration's budget request was for $2.508 billion, a reduction of $382 million (-13.2%) from FY2017. (See **Table 10**.)

In addition to discretionary appropriations, agricultural research is also funded by state matching contributions and private donations or grants, as well as mandatory funding from the farm bill.[64] USDA's discretionary appropriations are profiled below.

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 FY2018, the House-passed bill would provide $1.134 billion for ARS salaries and expenses, and $60 million for ARS buildings and facilities; each component is nearly $40 million less than comparable FY2017 levels (**Table 10**). The Senate-reported bill would provide $50 million more than the House bill for salaries and expenses, $1.182 billion, but nothing for buildings and facilities. The Administration requested $993 million for ARS salaries and expenses, a reduction of $177 million (-15.1%) from the enacted FY2017 appropriation, and nothing for buildings and facilities.

[63] This section was written by Tadlock Cowan and Jim Monke, Specialists in Agricultural Policy, CRS Resources, Science, and Industry Division.

[64] For background on agricultural research, see CRS Report R40819, *Agricultural Research: Background and Issues*, by Jim Monke. For background on agricultural appropriations, see CRS Insight IN10710, *The President's FY2018 Budget Request for Agriculture Appropriations and the Farm Bill*, by Jim Monke, and CRS Report R44588, *Agriculture and Related Agencies: FY2017 Appropriations*, coordinated by Jim Monke.

To achieve its requested reduction, the Administration proposed budgetary decreases across all ARS programmatic areas, and specifically reducing or eliminating several dozen prioritized research projects. The programmatic reduction was coupled with proposals to close 5 laboratories at ongoing locations, and close another 12 laboratory locations entirely. Both the House and Senate bills reject these closures and project terminations, though the House bill encourages ARS to reallocate resources as projects mature and goals are achieved. Previous years' budgets and administrations have proposed similar laboratory closures and realignments that were expressly rejected in enacted appropriations.

For the ARS buildings and facilities account, the Senate-reported bill concurs with the Administration's request for no appropriation. The House-passed bill would provide $60 million. This follows buildings and facilities appropriations of $99.6 million in FY2017 and $212 million in FY2016. The House report language mirrors past appropriations that have directed ARS to follow funding priorities identified in the 2012 "USDA ARS Capital Investment Strategy."[65]

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

For FY2018, the House-passed bill would provide $1.344 billion for NIFA, a reduction of $19 million from FY2017 (-1.4%). The Senate-reported bill would provide $1.373 billion, an increase of $10 million above FY2017. The Administration had requested $1.253 billion, a decrease of $110 million from FY2017 (-8.1%; **Table 10**).

The Agriculture and Food Research Initiative (AFRI)—USDA's flagship competitive grants program with 25% of NIFA's total budget—would remain at $375 million in both the House-passed and Senate-reported bills, the same as provided in FY2017.

The Administration had proposed to eliminate or reduce funding for several other specific organic, pest management, and crop-specific research programs. The House bill is generally more generous to these programs than the Administration's request, though it concurs with eliminating funding for some programs while maintaining it for others. The Senate-reported bill generally has a slight increase over FY2017 levels for these other smaller research programs.

Formula-funded programs in both research and extension are held constant under both the House-passed and Senate-reported bills. This is similar to the Administration's request, though the

[65] USDA-ARS, *The USDA Agricultural Research Service Capital Investment Strategy*, April 2012, http://www.ars.usda.gov/sp2UserFiles/Subsite/ARSLegisAffrs/USDA_ARS_Capital_Investment_Strategy_FINAL_eeo.pdf. In FY2016, funding went to construction of a biocontainment laboratory at the ARS poultry research facility in Athens, GA ($145 million); a foreign disease-weed science facility in Frederick, MD ($70 million); and an animal science, human nutrition, and bee research center in Beltsville, MD ($33 million). The priorities funded in FY2017 include completion of the Foreign Disease and Weed Science Research Unit in Fort Detrick, MD ($30.2 million) and Phase I of the Agricultural Research Technology Center in Salinas, CA ($64.3 million).

[66] 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.

Administration proposed a 15% reduction to McIntire-Stennis cooperative forestry research funding.

The President's request proposes to eliminate funding for several programs, including several federal science, technology, engineering, and mathematics education programs at USDA (Higher Education Challenge Grants, Graduate and Post-graduate Fellowship Grants, the Higher Education Multicultural Scholars Program, the Women and Minorities in STEM Program, Agriculture in the Classroom, and Secondary/Postsecondary Challenge Grants). Previous years' budget requests have proposed moving these programs away from USDA and consolidating STEM programming across the government, but enacted appropriations have continued to maintain the programs at USDA. Both the House-reported and Senate-reported bills maintain these programs at USDA and at FY2017 levels.

As in past years, the House-passed and Senate-reported bills continue to direct that at least 15% of NIFA's competitive grant funding be available for research enhancement awards such as USDA-EPSCoR.

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 FY2018, the House-passed bill would provide $178 million and the Senate-reported bill would provide $192 million. Both are increases over the FY2017 appropriation of $171 million. The FY2018 request by the Administration of $186 million reflects additional expenses for conducting the Agricultural Census.

For the core NASS Agricultural Estimates program, the Administration had requested a $7.3 million reduction (-5.6%), and the House-passed bill would decrease it an even larger amount, -14.2%. The Senate-reported bill basically maintains the core statistical program at FY2017 levels, with only a -0.5% reduction. The Administration proposed to achieve at least some of this reduction by reducing the sample size of 12 specific surveys and producing fewer estimates (including by reducing the number of published states by commodity).[67]

Economic Research Service

The Economic Research Service supports economic and social science analysis about agriculture, rural development, food, commodity markets, and the environment. It collects and disseminates data concerning USDA programs and policies.

For FY2018, the House-reported bill follows the Administration request for $77 million, a decrease of $10 million (-11.5%) from the enacted FY2017 appropriation. The Senate-reported bill would maintain the FY2018 appropriation at the FY2017 level of $87 million.

The Administration's budget proposed to reduce activities in many areas of research, including drought resilience, international agriculture, bioenergy, and consumer food purchases.

[67] USDA, Office of Budget and Program Analysis, *FY2018 Congressional Budget Justification for the National Agricultural Statistics Service*, p. 8.

Table 10. U.S. Department of Agriculture R&D

(budget authority, in millions of dollars)

Agency or Major Program	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S.Cmte.	FY2018 Enacted
Agricultural Research Service (ARS)	1,170.2	993.1	1,134.1	1,182.4	
Buildings and Facilities	99.6	0.0	60.0	0.0	
Subtotal, ARS	**1,269.8**	**993.1**	**1,194.1**	**1,182.4**	
National Institute of Food and Agriculture (NIFA)					
Research and Education					
AFRI (competitive grants)	375.0	349.3	*375.0*	*375.0*	
Hatch Act (1862 institutions)	243.7	243.2	*243.7*	*243.7*	
Evans-Allen (1890 institutions)	54.2	54.1	*54.2*	*54.2*	
McIntire-Stennis (forestry)	34.0	28.9	*34.0*	*34.0*	
Other	142.7	94.1	*126.1*	*148.0*	
Subtotal	**849.5**	**769.6**	**832.9**	**854.9**	
Extension					
Smith-Lever (b) and (c)	300.0	299.4	*300.0*	*300.0*	
Smith-Lever (d)	85.5	79.2	*85.5*	*85.5*	
Other	91.9	84.3	*90.3*	*95.8*	
Subtotal	**477.4**	**462.9**	**475.9**	**481.4**	
Integrated Activities	**36.0**	**20.3**	**35.0**	**37.0**	
Subtotal, NIFA	**1,362.9**	**1,252.8**	**1,343.8**	**1,373.2**	
National Agricultural Statistics Service (NASS)	**171.2**	**185.7**	**178.2**	**191.7**	
Economic Research Service (ERS)	**86.8**	**76.7**	**76.8**	**86.8**	
Total, USDA Research Mission Area	**2,890.7**	**2,508.3**	**2,792.9**	**2,834.2**	

Source: CRS, compiled P.L. 115-31 (including tables in the joint explanatory statement), H.R. 3354, H.R. 3268, H.Rept. 115-232, S. 1603, and S.Rept. 115-131.

Notes: Components may not add to subtotals or total due to rounding. Figures for "FY 2018 Senate," and "FY2018 Enacted" will be added, if available, as Congress completes each action.

Department of Commerce

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

National Institute of Standards and Technology[68]

The mission of the National Institute of Standards and Technology 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."[69] 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.[70]

The President is requesting $725.0 billion in funding for NIST in FY2018, a decrease of $229.0 million (24.0%) from the FY2017 enacted appropriation of $954.0 million. (See **Table 11**.) 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). The House passed the Commerce, Justice, Science, and Related Agencies Appropriations Bill, 2018 as Division C of H.R. 3354,[71] on September 14, 2017. The House-passed bill includes $870.0 million in funding for NIST, down $84.0 million (8.8%) from the FY2017 enacted level and up $145.0 million (20.0%) from the request. The Senate Committee on Appropriation reported the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2018 (S. 1662) on July 27, 2017. The Senate committee-reported bill includes $944.0 million for NIST, down $10.0 million (1.0%) from the FY2017 enacted level, up $219.0 million (30.2%) from the request, and up $74.0 million (8.5%) from the House-passed bill.

The President's FY2018 request includes $600.0 million for R&D, standards coordination, and related services in the STRS account, a decrease of $90.0 million (13.0%) from the FY2017 level.[72] The House-passed bill includes $660.0 million in funding for the STRS account, down $30.0 million (4.3%) from the FY2017 enacted level and up $60.0 million (10.0%) from the request. Specific areas the House committee report identified for NIST attention include disaster resiliency, textile research, football helmet safety, Internet of Things (IoT) security, cybersecurity, and nanostructured metals. The Senate committee-reported bill includes $695.0 million for the STRS, up $5.0 million (0.7%) from the FY2017 enacted level, up $95.0 million (15.8%) from the request, and up $35.0 million (5.3%) from the House level. Among the specific areas the Senate committee identified for NIST attention are cybersecurity, the National Cybersecurity Center of Excellence, the IoT, forensic sciences, disaster resilient buildings, helmet safety, metals-based additive manufacturing, plastics and polymeric materials, pyrrhotite in concrete aggregate, regenerative medicine standards, a challenge prize focused on spectrum efficiency, and NIST's Urban Dome program. The Senate committee also recommends support for the NIST Baldrige

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

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

[70] 15 U.S.C. 272.

[71] H.R. 3354 is titled the "Interior and Environment, Agriculture and Rural Development, Commerce, Justice, Science, Financial Services and General Government, Homeland Security, Labor, Health and Human Services, Education, State and Foreign Operations, Transportation, Housing and Urban Development, Defense, Military Construction and Veterans Affairs, Legislative Branch, and Energy and Water Development Appropriations Act, 2018."

[72] U.S. Department of Commerce, *Department of Commerce, Budget in Brief, Fiscal Year 2018*, http://www.osec.doc.gov/bmi/budget/FY18BIB/All508.pdf.

Performance Excellence program in the amount of $2.2 million, but emphasizes the need for the program to become self-sustaining through fundraising and private sector support.

The President is requesting $21.0 million for the ITS account for FY2018, down $134.0 million (86.5%) from the FY2017 enacted level. The ITS request includes $6.0 million "for the orderly wind down" of the Manufacturing Extension Partnership (MEP) program, and $15.0 million for the National Network for Manufacturing Innovation (NNMI, also referred to as Manufacturing USA), a $10.0 million (40.0%) reduction from the FY2017 enacted level.[73] The $15.0 million provided for the NNMI includes $10.0 million for continued support of the NIST-sponsored National Institute for Innovation in Manufacturing Biopharmaceuticals and $5.0 million to support NIST's role in coordination of the network. The House-passed bill includes $110.0 million in funding for the ITS account, down $45.0 million (29.0%) from the FY2017 enacted level and up $89.0 million (423.8%) from the request. Within the ITS account, the bill would provide $105.0 million for the MEP program, down $25.0 million (19.2%) from the FY2017 enacted level and up $99.0 million from the request, and would provide $5.0 million for the NNMI, down $20.0 million (80.0%) from the FY2017 enacted level and down $10.0 million (66.7%) from the request. The Senate committee-reported bill includes $145.0 million for the ITS account, down $10.0 million (6.5%) from the FY2017 enacted level, up $124.0 million (590.5%) from the request, and up $35.0 million (31.8%) from the House-passed bill. In doing so, the Senate committee rejected the Administration's proposed elimination of the MEP program and funds it at the FY2017 level of $130.0 million, $25.0 million more than the House passed bill. The Senate committee-reported bill would provide $15 million for the NNMI, $10 million below the FY2017 level, equal to the Administration's request, and $10 million more than the House-passed bill. Of these funds, up to $5.0 million may be used for network coordination activities.

The President is requesting $104.0 million for FY2018 for the NIST CRF account, down $5.0 million (4.6%) from the FY2017 enacted level.[74] The House-passed bill includes $100.0 million in funding for the CRF account, down $9 million (8.3%) from the FY2017 enacted level and down $4.0 million (3.8%) from the request. The Senate committee-reported bill includes $104.0 million for the CRF account, down $5.0 million (4.6%) from the FY2017 enacted level, equal to the request, and up $4.0 million (4.0%) from the House-passed bill.

Table 11. National Institute of Standards and Technology Funding

(budget authority, in millions of dollars)

Budget Account	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S. Cmte.	FY2018 Enacted
Scientific and Technical Research and Services	$690.0	$600.0	$660.0	$695.0	
Industrial Technology Services	155.0	21.0	110.0	145.0	
Manufacturing Extension Partnership	*130.0*	*6.0*	*105.0*	*130.0*	
Network for Manufacturing Innovation	*25.0*	*15.0*	*5.0*	*15.0*	
Construction of Research Facilities	109.0	104.0	100.0	104.0	
NIST, Total[a]	**$954.0**	**$725.0**	**$870.0**	**$944.0**	

[73] Ibid. For additional information on the MEP program, see CRS Report R44308, *The Manufacturing Extension Partnership Program*, by John F. Sargent Jr.

[74] U.S. Department of Commerce, *Department of Commerce, Budget in Brief, Fiscal Year 2018*.

Source: P.L. 115-31; explanatory statement accompanying P.L. 115-31, as published in the *Congressional Record*, May 3, 2017, Book II, H3365; U.S. Department of Commerce, *National Institute of Standards and Technology/National Technical Information Service Fiscal Year 2018 Budget Submission to Congress*, NIST-4; H.R. 3267; H.Rept. 115-231; and H.R. 3354.

Notes: Figures for the columns headed "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as Congress completes each action.

a. NIST stated that it would continue to execute mandatory resources in FY2017 (not include in the table figures) provided in FY2017 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 mandatory funds for NIST from spectrum auction proceeds 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. The act provided NIST a total of $300 million, though rescissions have reduced this amount to $285 million.

National Oceanic and Atmospheric Administration[75]

The National Oceanic and Atmospheric Administration conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; collects and provides data on the oceans and atmosphere; and manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[76] The reorganization was intended to unify elements of the nation's environmental programs and to provide a systematic approach for monitoring, analyzing, and protecting the environment. One of the agency's main challenges relates 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."[77]

NOAA's Research Council[78] developed a five-year plan (2013-2017) to guide the agency's R&D efforts.[79] R&D efforts support the long-term goals and enterprise objectives of NOAA's *Next Generation Strategic Plan*.[80] The strategic plan is organized into four categories of long-term goals including (1) climate adaptation and mitigation, (2) a weather-ready nation,[81] (3) healthy oceans, and (4) resilient coastal communities and economies; and three groups of enterprise

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

[76] "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.

[77] 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.

[78] 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.

[79] 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.

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

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

objectives including (1) stakeholder engagement, (2) data and observations, and (3) integrated environmental modeling. To achieve the strategic plan's goals and objectives, NOAA has identified gaps in knowledge and capabilities. NOAA's R&D plan attempts to address these gaps by asking key questions. Key questions are used in the plan to frame and organize R&D objectives and to identify tasks associated with achieving these objectives.

One of the main challenges identified in the NOAA R&D plan is the need to integrate the diverse perspectives and professional expertise required by the agency's mission. The plan states that "holistically understanding the earth system is not only understanding its individual components, but understanding and interpreting the way each of the components interact and behave as an integrated composite that is more than the sum of its parts."

For FY2018, President Trump requested $671.6 million in R&D funding for NOAA, a decrease of $176.4 million (20.8%) below the FY2017 enacted level of $848.0 million. R&D funding for FY2017 consists of $497.8 million for research (58.7% of total R&D funding), $86.9 million for development (10.3%), and $263.3 million for R&D equipment (31.0%).[82] In FY2017, R&D is 14.9% of NOAA's total discretionary budget of $5,675.4 million. The FY2018 request for R&D funding includes $365.8 million for research (54.4% of total R&D funding), $64.2 million for development (9.6%), and $241.6 million for R&D equipment (36.0%). The President's request for R&D is 14.1% of NOAA's total discretionary budget request of $4,770.7 million.

NOAA's administrative structure is organized by five line offices that reflect its diverse mission: the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite, Data, and Information Service (NESDIS); National Weather Service (NWS); and Office of Oceanic and Atmospheric Research (OAR). In addition to NOAA's five line offices, two major funding categories include Mission Support (formerly Program Support) and the Office of Marine and Aviation Operations (OMAO). Mission support is a cross-cutting budget activity, which provides administrative functions related to planning, information technology, human resources, and infrastructure. OMAO is responsible for the agency's ships and aircraft that collect data in support of NOAA's environmental and scientific missions.[83]

Table 12 provides R&D funding levels for FY2017 enacted and the Administration's FY2018 request for each NOAA office.[84] 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.

Most of NOAA's R&D activities are conducted by OAR and in most years OAR accounts for over half of NOAA's R&D funding. The FY2018 request would provide OAR with $350.0 million for R&D, a decrease of $130.1 million (27.1%) below the FY2017 enacted funding level of $480.1 million.[85]

OAR conducts research in three major areas: weather and air chemistry; climate; and oceans, coasts, and the Great Lakes. A significant portion of these efforts is implemented through partnerships between NOAA and cooperative research institutes. NOAA supports 16 cooperative research institutes that work with seven NOAA laboratories in all three of the main OAR research

[82] NOAA Budget Office, email to CRS, June 14, 2017.

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

[84] Ibid.

[85] Ibid.

areas. The President's FY2018 request would fund the cooperative institutes with a total of $150.5 million, $21.5 million (12.5%) less than the FY2017 enacted funding level of $172.0 million. The House-passed bill would fund laboratories and cooperative institutes with a total of $169.2 million, $18.7 million (12.4%) more than the FY2018 request, and $2.8 million (1.6%) less than the FY2017 enacted funding level. The Senate committee-reported bill would fund laboratories and cooperative institutes with a total of $171.0 million, $1.8 million (1.1%) more than the House-passed bill, $20.5 million (13.6%) more than the FY2018 request, and $1.0 million (0.6%) less than the FY2017 enacted funding level.

The President's FY2018 request would also reduce OAR R&D funding for the National Sea Grant Program and Climate Research. 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 FY2018 request would terminate federal support of the National Sea Grant College Program and Sea Grant Marine Aquaculture Research. In FY2017, the National Sea Grant College Program was funded at $63.0 million and marine aquaculture research was funded at $9.5 million. The House-passed bill would fund the National Sea Grant Program at $63.0 million and marine aquaculture research at $7.0 million, The Senate committee-reported bill would fund the National Sea Grant Program at $65.0 million and marine aquaculture research at $11.5 million.

Climate research includes funding for laboratories and cooperative institutes, regional climate data and information, and competitive research. The President's FY2018 request would provide climate research with $128.0 million, $30.0 million (19.0%) less than the FY2017 enacted funding level of $158.0 million.[86] The House-passed bill would fund climate research with a total of $128.0 million, an amount equal to the FY2018 request and $30.0 million (19.0%) less than the FY2017 enacted funding level. The Senate committee-reported bill would fund climate research with a total of $158 million, $30 million (23.4%) more than the House-passed bill, $30.0 million (23.4%) more than the FY2018 request, and equal to the FY2017 enacted funding level.

[86] Approximately one-third of climate research funding is provided for laboratories and cooperative institutes (e.g., $60.0 million in FY2017).

Table 12. National Oceanic and Atmospheric Administration R&D

(budget authority in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S.Cmte.	FY2018 Enacted
National Ocean Service (NOS)	75.2	59.2	n/a	n/a	
National Marine Fisheries Service (NMFS)	70.9	55.5	n/a	n/a	
National Weather Service (NWS)	23.1	13.2	n/a	n/a	
National Environmental Satellite, Data, and Information Service (NESDIS)	31.0	29.4	n/a	n/a	
Office of Marine and Aviation Operations (OMAO)[a]	163.1	164.3	n/a	n/a	
Office of Oceanic and Atmospheric Research (OAR)	480.1	350.0	n/a	n/a	
Mission Support	4.6	0	n/a	n/a	
Total R&D	**848.0**	**671.6**	**n/a**	**n/a**	
OAR, Total R&D and Non-R&D[0]	514.1	350.0	474.8	518.7	
NOAA, Total R&D and Non-R&D[0]	5,675.4	4,770.7	4,973.7	5,590.3	

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

Notes: n/a=not available. R&D funding levels for the columns headed "FY2018 House" and "FY2018 S.Cmte." are not reported by the House or Senate committee.

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

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

Department of Veterans Affairs[87]

The Department of Veterans Affairs (VA) operates and maintains a national health care delivery system to provide eligible veterans with medical care, benefits, and social support. As part of the agency's mission, it seeks to advance medical R&D in areas most relevant to the diseases and conditions that affect the health care needs of veterans.

The President is proposing $1.184 billion for VA R&D in FY2018, a decrease of $61.7 million (5.2%) from the FY2017 enacted level. (See **Table 13**.) VA R&D represents 1.4% of the agency's overall FY2018 budget request and is funded through two accounts—the Medical and Prosthetic Research account and the Medical Care Support account. The Medical Care Support account also includes non-R&D funding. How much of the funding provided in appropriations legislation will be allocated to R&D is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels from the Medical Care Support account are only known after the VA allocates its appropriations to specific activities and reports those figures. The FY2018 request includes $640 million for VA's Medical and Prosthetic Research account, a decrease of $33.4 million (5.2%), and $544 million in funding for research supported by the agency's Medical Care Support account, a decrease of $28.4 million (5.2%).

[87] This section was written by Marcy E. Gallo, Analyst in Science and Technology Policy, CRS Resources, Science, and Industry Division.

According to the President's request, VA R&D priorities for FY2018 include efforts to treat veterans at risk of suicide; research to address pain management, opioid addiction, and Gulf War Veterans Illness; and the use of the Million Veteran Program—a genomic research program that is collecting genetic samples and detailed health information from 1 million veterans—to advance precision medicine.[88]

The Medical and Prosthetics R&D program is an intramural program managed by the Veteran Health Administration's Office of Research and Development (ORD) and conducted at VA Medical Centers and VA-approved sites nationwide. The mission of VA R&D is "to improve Veterans' health and well-being via basic, translational, clinical, health services, and rehabilitative research and to apply scientific knowledge to develop effective individualized care solutions for Veterans."[89] ORD consists of four main research services each headed by a director:

- Biomedical Laboratory R&D conducts preclinical and clinical research to understand life processes at the molecular, genomic, and physiological levels.
- Clinical Science R&D supports research, including human subjects research, to determine the feasibility and effectiveness of new treatments such as drugs, therapies, or devices.
- Health Services R&D conducts studies to identify and promote effective and efficient strategies to improve the quality and accessibility of the VA health system and patient outcomes, and to minimize health care costs.
- Rehabilitation R&D develops novel approaches to improving the quality of life of impaired and disabled veterans suffering from traumatic amputation, central nervous system injuries, loss of sight or hearing, or other physical and cognitive impairments.

In addition to intramural support, VA researchers are eligible to obtain funding for their research from extramural sources, including other federal agencies, private foundations and health organizations, and commercial entities. However, unlike federal agencies such as the National Institutes of Health or the Department of Defense, VA does not have the authority to support extramural R&D by providing research grants to colleges, universities, or other non-VA entities.

On July 13, 2017, the Senate Appropriations Committee reported out the Military Construction, Veterans Affairs, and Related Agencies Appropriations Act, 2018, S. 1557, which would provide $722.3 million for the VA's Medical and Prosthetic Research account, an increase of $82.3 million or 11.4% above the President's FY2018 request.

On July 27, 2017, the House passed H.R. 3219, the Make America Secure Appropriations Act, 2018. H.R. 3219 would provide $698.2 million in funding for the Medical and Prosthetic Research account, an increase of $58.2 million, or 8.3%, above the FY2018 request.

Table 13 summarizes R&D program funding for VA in the Medical and Prosthetic Research and the Medical Care Support accounts. **Table 14** details 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

[88] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY 2018 Funding and FY 2019 Advance Appropriations*, pp. VHA-419–VHA-459, https://www.va.gov/budget/docs/summary/fy2018VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

[89] https://www.research.va.gov/about/default.cfm.

[90] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs,*

DRAs; thus, the amounts in **Table 14** total to more than the appropriation or request for the VA Medical and Prosthetic Research account.

Table 13. Department of Veterans Affairs R&D

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 S. Cmte.	FY2018 Enacted
Medical and Prosthetic Research	673.4	640.0	698.2	722.3	
Medical Care Support	572.4	544.0	____[a]	____[a]	
Veterans Affairs, Total[b]	**$1,245.7**	**$1,184.0**	____[a]	____[a]	

Source: Department of Veterans Affairs, Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY 2018 Funding and FY 2019 Advance Appropriations, p. VHA-422, https://www.va.gov/budget/docs/summary/fy2018VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf; H.R. 2998; and S. 1557.

Notes: Figures for the columns headed "FY2018 House," "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as Congress completes each action.

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

b. VA researchers also receive grants from other federal and nonfederal resources including, the National Institutes of Health, the Department of Defense, and the Centers for Disease Control and Prevention. According to VA, these resources are estimated at $595 million in FY2017 and $570 million in FY2018 increasing the total amount of R&D performed at VA to $1.84 billion in FY2017 and $1.75 billion in FY2018.

Table 14. Department of Veterans Affairs Amounts by Designated Research Areas

(in millions of dollars)

Designated Research Area	FY2017 Estimate	FY2018 Request
Acute and Traumatic Injury	25.3	25.1
Aging	150.3	148.7
Autoimmune, Allergic, and Hematopoietic Disorders	28.4	28.0
Cancer	59.5	59.0
Central Nervous System Injury and Associated Disorders	105.4	104.3
Degenerative Diseases of Bones and Joints	36.6	36.0
Dementia and Neuronal Degeneration	31.2	30.7
Diabetes and Major Complications	35.8	35.3
Digestive Diseases	21.2	20.8
Emerging Pathogens/Bio-Terrorism	1.0	1.0
Gulf War Veterans Illness	12.2	12.2
Health Systems	70.8	69.9
Heart Disease/Cardiovascular Health	70.5	69.9
Infectious Disease	33.8	33.4

Congressional Submission, FY 2018 Funding and FY 2019 Advance Appropriations, p. VHA-454, https://www.va.gov/budget/docs/summary/fy2018VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Designated Research Area	FY2017 Estimate	FY2018 Request
Kidney Disorders	21.4	21.2
Lung Disorders	27.6	27.2
Mental Illness	115.8	115.8
Military Occupations and Environmental Exposures	16.2	15.6
Other Chronic Diseases	5.0	4.7
Prosthetics	15.4	15.2
Sensory Loss	17.5	17.3
Special Populations	24.4	24.1
Substance Abuse	30.1	30.1

Source: Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY 2018 Funding and FY 2019 Advance Appropriations*, p. VHA-455, https://www.va.gov/budget/docs/summary/fy2018VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Notes: Projects that span multiple areas may be included in several Designated Research Areas (DRAs); therefore, the amounts depicted in this table total to more than the FY2017 enacted amount and the FY2018 request for Medical and Prosthetic Research. Columns for "FY2018 House, "FY2018 Senate," and "FY2018 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.

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 has a wide range of responsibilities including, among other things, mapping, geological, hydrological, and biological science; migratory bird, wildlife, and endangered species conservation; surface-mined lands protection and restoration; and historic preservation.[92]

The Administration is requesting $11.7 billion in net discretionary funding for DOI in FY2018.[93] Of that amount, $816.4 million is requested for R&D funding, $176.0 million (17.7%) below its FY2017 enacted level of $992.4 million.[94] Of the President's FY2018 DOI R&D funding request, 5.3% is for basic research, 77.5% is for applied research, and 17.1% 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. How much of the funding provided in appropriations legislation is allocated to R&D specifically is unclear unless funding is provided at the precise level of the request. In

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

[92] Department of the Interior, *Strategic Plan for Fiscal Years 2014-2018*, https://www.doi.gov/pmb/ppp/upload/DOI-Strategic-Plan-for-FY-2014-2018-POSTED-ON-WEBSITE-4.pdf.

[93] Department of the Interior, *Fiscal Year 2018: The Interior Budget in Brief*, May 2017, p. DH-5. DOI also proposes transferring $124 million from the Department of Defense "for commitments to the Republic of Palau, which would increase DOI's total FY2018 budget request to $11.9 billion in current budget authority."

[94] Email correspondence between the DOI and CRS on July 5, 2017.

[95] Email correspondence between the DOI and CRS on July 5, 2017.

general, R&D funding levels are known only after DOI components allocate their appropriations to specific activities and report those figures.

As passed by the House on September 14, 2017, the Interior and Environment, Agriculture and Rural Development, Commerce, Justice, Science, Financial Services and General Government, Homeland Security, Labor, Health and Human Services, Education, State and Foreign Operations, Transportation, Housing and Urban Development, Defense, Military Construction and Veterans Affairs, Legislative Branch, and Energy and Water Development Appropriations Act, 2018 (H.R. 3354) would provide $11.9 billion for DOI, a $200 million increase over the FY2017 enacted amount.[96] This amount includes both R&D and non-R&D funding.

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 FY2018 budget request for USGS is $922.2 million. Of this amount, $560.9 million would be for R&D, a decrease of $126.6 million (18.4%) over the FY2017 enacted level of $687.6 million. This total includes $132.1 million for Ecosystems, down $27.6 million (17.3%); $72.5 million for Climate and Land Use Change, down $31.3 million (30.2%); $91.5 million for Energy, Minerals, and Environmental Health, down $2.8 million (3.0%); $98.2 million for Natural Hazards, down $19.8 million (16.8%); $94.5 million for Water Resources, down $28.3 million (23.0%); $71.7 million for Core Science Systems, down $16.8 million (19.0%); and $0.4 million for Science Support, down $73,000 (15.4%).[97]

The FY2018 budget request would eliminate funding for biological carbon sequestration research, the Geomagnetism Program, and the Water Resources Research Act grant program. DOI states that these are programs "more appropriately funded by USGS partners and those that have reached milestones allowing research to continue without further USGS support."[98] Funding would be maintained for the development of the Landsat 9 satellite and includes a $22.4 million increase to continue development of ground systems in preparation for a launch date in FY2021.[99]

As passed by the House, H.R. 3354 would provide $1.039 billion for USGS, a $46 million (4%) decrease from the FY2017 enacted amount and $117 million (12.7%) more than the FY2018 request. This amount includes both R&D and non-R&D funding.

Other DOI Components

The President's FY2018 request also includes R&D funding for the following DOI components:[100]

[96] Originally the Department of the Interior, Environment, and Related Agencies Appropriations Act, 2018, H.R. 3354 was amended to include additional appropriations acts, as specified in the title. In the House-passed version of H.R. 3354, DOI funding language is included as Title II of Division L.

[97] Ibid.

[98] Department of the Interior, *Fiscal Year 2018: The Interior Budget in Brief*, May 2017, p. BH-50.

[99] Department of the Interior, *Fiscal Year 2018: The Interior Budget in Brief*, May 2017, p. BH-51.

[100] Ibid.

- Bureau of Reclamation (BOR): $79.8 million in applied research and development funding for FY2018, down $27.0 million (25.3%) from FY2017.
- Bureau of Ocean Energy Management (BOEM): $77.8 million in applied research and development funding for FY2018, up $5.8 million (8.0%) from FY2017.
- Fish and Wildlife Service (FWS): $15.5 million in applied research for FY2018, down $17.0 million (52.4%) from FY2017.
- Bureau of Land Management (BLM): $24.3 million in applied research and development for FY2018, unchanged from the FY2017 level.
- National Park Service (NPS): $25.5 million in applied research and development for FY2018, down $1.5 million (5.4%) from FY2017.
- Bureau of Safety and Environmental Enforcement (BSEE): $24.5 million in applied research for FY2018, down $2.2 million (8.1%) from FY2017.
- Bureau of Indian Affairs (BIA): $5.0 million in applied research for FY2018, down $4.5 million (47.4%) from FY2017.
- Wildland Fire Management (WFM): $3.0 million in applied research for FY2018, down $3.0 million (50.0%) from FY2017.
- Office of Surface Mining Reclamation and Enforcement (OSMRE): $5.0 million in applied research was requested in FY2017, though no funding was enacted; the office has not requested any R&D funding in FY2018.

Table 15 summarizes FY2017 enacted R&D funding and the President's FY2018 R&D funding request for DOI components.

Table 15. Department of the Interior R&D

(budget authority in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 Senate	FY2018 Enacted
U.S. Geological Survey (USGS)	687.6	560.9	n/s		
Bureau of Reclamation (BOR)	106.8	79.8	n/s		
Bureau of Ocean Energy Management (BOEM)	72.0	77.8	n/s		
Fish and Wildlife Service (FWS)	32.5	15.5	n/s		
Bureau of Land Management (BLM)	24.3	24.3	n/s		
National Park Service (NPS)	27.0	25.5	n/s		
Bureau of Safety and Environmental Enforcement (BSEE)	26.7	24.5	n/s		
Bureau of Indian Affairs (BIA)	9.5	5.0	n/s		
Wildland Fire Management (WFM)	6.0	3.0	n/s		
Office of Surface Mining Reclamation and Enforcement (OSMRE)	—	—	n/s		
Department of the Interior, Total	**992.4**	**816.4**	**n/s**		

Source: Email correspondence between the DOI and CRS on July 5, 2017; H.R. 3354 as passed by the House on September 14, 2017.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns headed "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as each action is completed. The term "n/s" means "not specified."

Department of Transportation[101]

The primary purposes of the research and development activities of the Department of Transportation (DOT) as defined by Section 6019 of the Fixing America's Surface Transportation Act (P.L. 114-94) are improving mobility of people and goods; reducing congestion; promoting safety; improving the durability and extending the life of transportation infrastructure; preserving the environment; and preserving the existing transportation system.

Funding for DOT R&D is generally included in appropriations line items that also include non-R&D activities. How much of the funding provided by appropriations legislation is allocated to R&D is unclear 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.

The Administration is requesting $898.8 million for DOT R&D activities and facilities in FY2018, a decrease of $10.5 million (1.2%) from the FY2017 enacted level. (See **Table 16**.)

[101] This section was written by Marcy E. Gallo, Analyst in Science and Technology Policy, CRS Resources, Science, and Industry Division.

Three DOT agencies—the Federal Aviation Administration (FAA), the Federal Highway Administration (FHWA), and the National Highway Traffic Safety Administration (NHTSA)—would account for 87% of DOT R&D under the FY2018 request.

On July 17, 2017, the House Appropriations Committee reported out a committee print providing appropriations for the Department of Transportation, Department of Housing and Urban Development, and related agencies in FY2018.

On July 27, 2017, the Senate Appropriations Committee reported S. 1655 providing appropriations for the Department of Transportation, Department of Housing and Urban Development, and related agencies in FY2018.

Federal Aviation Administration

FAA's R&D activities focus on improving the capacity and safety of the national airspace systems and reducing environmental impacts.

The President's FY2018 request of $361.5 million for R&D activities and facilities at FAA would be a decrease of $25 million (6.9%) from the FY2017 level. The request includes $150 million for the agency's Research, Engineering, and Development (RE&D) account, a reduction of $26.5 million (17.7%) from the FY2017 level. Funding within the RE&D account seeks to improve aircraft safety through research in fields such as fire safety, advanced materials, propulsion systems, aircraft icing, and continued airworthiness. The FY2018 request for RE&D would also include funds for research on the safe integration of unmanned aircraft systems and commercial space operations into the national airspace system.

The House committee print would provide $170 million for FAA's RE&D account, an increase of $20 million or 11.8% above the FY2018 request.

S. 1655 as reported by the Senate Appropriations Committee would provide $179 million for FAA's RE&D account, an increase of $2.5 million or 1.4% above the FY2017 enacted level, $29 million or 19.3% above the FY2018 request, and $9 million or 5.3% above the House-reported level.

Federal Highway Administration

According to DOT, the primary goal of the R&D programs at FHWA is "to sustain a research agenda for federal policymakers and highway stakeholders that focuses on critical knowledge gaps, collaboration methods, and accelerated innovation to meet current and future highway transportation needs."[102]

The President's request of $333 million for R&D activities and facilities at FHWA would be an increase of $15.3 million (4.6%) from the FY2017 enacted level. The request includes $85 million for FHWA's Highway Research and Development program which seeks to improve safety, enhance the transportation infrastructure, and reduce congestion. The program supports highway research in such areas as innovative materials, new construction techniques, durability and resilience, and the factors that contribute to death and injury related to roadway design, construction, and maintenance. The request also includes $79 million for research to facilitate the

[102] U.S. Department of Transportation, *Research, Development, and Technology Strategic Plan FY2017-2021*, January 2017, p. 23, https://www.transportation.gov/administrations/assistant-secretary-research-and-technology/dot-five-year-rdt-strategic-plan.

development of a connected, integrated, and automated transportation system under the agency's Intelligent Transportation Systems program.

National Highway Traffic Safety Administration

The President is requesting $85.6 million in R&D and R&D facilities funding in FY2018 for NHTSA, $4.5 million (5.2%) below the FY2017 enacted level. NHTSA R&D focuses on automation, advanced vehicle safety technology, ways of improving vehicle crashworthiness and crash avoidance, reducing unsafe driving behaviors, and alternative fuels vehicle safety.

Other DOT Components

R&D activities are also supported by several other DOT components or agencies. (See **Table 16**.) The President's FY2018 request includes DOT R&D and R&D facilities funding for

- the Federal Railroad Administration (FRA), totaling $43.6 million, $900,000 (2%) below the FY2017 enacted level of $44.5 million;
- the Federal Transit Administration (FTA), totaling $28 million, the same amount as the FY2017 enacted level;
- the Pipeline and Hazardous Materials Safety Administration (PHMSA), totaling $21.4 million, slightly below the FY2017 enacted level of $21.5 million;
- the Office of the Secretary (OST), totaling $16.6 million, $4.6 million (27.5%) above the FY2017 enacted level of $12 million; and
- the Federal Motor Carrier Safety Administration (FMCSA), totaling $9.1 million, the same amount as the FY2017 enacted level.

Table 16. Department of Transportation R&D Activities and Facilities

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 H. Cmte.	FY2018 S.Cmte.	FY2018 Enacted
Federal Aviation Administration	386.5	361.5	____[a]	____[a]	
Research, Engineering, and Development	*176.5*	*150.0*	*170.0*	*179.0*	
Federal Highway Administration	321.4	333.0	____[a]	____[a]	
Highway Research and Development	*78.9*	*85.0*	____[a]	____[a]	
Intelligent Transportation Systems	*73.3*	*79.0*	____[a]	____[a]	
National Highway Traffic Safety Administration	90.0	85.6	____[a]	____[a]	
Federal Railroad Administration	44.5	43.6	____[a]	____[a]	
Railroad Research and Development	*40.1*	*39.1*	*40.1*	*40.1*	
Federal Transit Administration	28.0	28.0	____[a]	____[a]	
Pipeline and Hazardous Materials Safety Administration	21.5	21.4	____[a]	____[a]	
Office of the Secretary	12.0	16.6	____[a]	____[a]	
Federal Motor Carrier Safety Administration	9.1	9.1	____[a]	____[a]	

	FY2017 Enacted	FY2018 Request	FY2018 H. Cmte.	FY2018 S.Cmte.	FY2018 Enacted
DOT, R&D Total	**$909.3**	**$898.8**	____[a]	____[a]	

Sources: U.S. Department of Transportation, *Fiscal Year 2018 Budget Estimates*, https://www.transportation.gov/mission/budget/fy-2018-budget-estimates; email communication between CRS and Department of Transportation, June 20, 2017; H.R. 3353; H.Rept. 115-237; S. 1655; and S.Rept. 115-138.

Notes: Amounts include R&D and R&D facilities. Components may not add to total 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 "FY2018 House," "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as Congress completes each action.

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

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 achieving all these goals. The Directorate of Science and Technology (S&T) has primary responsibility for establishing, administering, and coordinating DHS R&D activities. The Domestic Nuclear Detection Office (DNDO) is responsible for R&D relating to nuclear and radiological threats. Other components, such as the U.S. Coast Guard and the Transportation Security Administration, conduct R&D relating to their specific missions.

The President's FY2018 budget request for DHS includes $570 million for activities identified as R&D. This would be a reduction of 16.0% from $678 million in FY2017. The total includes $373 million for the S&T Directorate, $144 million for DNDO, and smaller amounts for five other DHS components. The House committee recommendation (based on H.R. 3355 as reported and H.Rept. 115-239) is $580 million, including $11 million more than the request for the S&T Directorate. See **Table 17**.

Directorate of Science and Technology (S&T)

The S&T Directorate is the primary DHS R&D organization. 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 Department of Energy 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 FY2018 request of $373 million for the S&T Directorate R&D account is a decrease of 20.8% from $471 million in FY2017. All six thrust areas within Research, Development, and Innovation would decrease, by amounts ranging from 8.6% (Chemical, Biological, and Explosive Defense) to 32.9% (Apex program). Funding for University Programs, which primarily funds the S&T Directorate's university centers of excellence, would decrease by 26.6%. The House bill would provide the requested amount for Research, Development, and Innovation and $11 million more than the request for University Programs "to ensure S&T's

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

ability to maintain 10 Centers of Excellence." The House report gives no guidance regarding the allocation of Research, Development, and Innovation funding to particular thrust areas.

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 Obama Administration's FY2017 budget proposed to incorporate DNDO and certain other activities into a new Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Office. The FY2018 budget does not repeat this proposal.

The Administration's FY2018 request for DNDO includes $144 million for the R&D account, a decrease of 7.0% from $155 million in FY2017. The House bill would provide the requested amount, allocated as requested.

Table 17. Department of Homeland Security R&D Accounts

(budget authority, in millions of dollars)

	FY2017 Enacted	FY2018 Request	FY2018 H.Cte.	FY2018 Senate	FY2018 Enacted
Science and Technology Directorate	**$471**	**$373**	**383**		
Research, Development, and Innovation	430	343	343		
Apex	*79*[a]	*53*	—		
Border Security	*57*[a]	*48*	—		
Chemical, Biological, and Explosive Defense	*58*[a]	*53*	—		
Counter Terrorist	*100*[a]	*81*	—		
Cyber Security/Information Analytics	*66*[a]	*46*	—		
First Responder/Disaster Resilience	*73*[a]	*61*	—		
University Programs	41	30	41		
Domestic Nuclear Detection Office	**155**	**144**	**144**		
Architecture Planning and Analysis	15	16	16		
Transformational R&D	62	61	61		
Detection Capability Development	20	15	15		
Detection Capability Assessments	39	34	34		
Nuclear Forensics	19	18	18		
Transportation Security Administration	**5**	**20**	**20**		
U.S. Coast Guard	**36**	**19**	**19**		
National Protection and Programs Directorate	**6**	**11**	**11**		
Office of the Under Secretary for Management	**3**	**3**	**3**		
U.S. Secret Service	**3**	**<1**	**<1**		
Total	**678**	**570**	**580**		

Sources: FY2017 enacted from P.L. 115-31 and explanatory statement, *Congressional Record*, May 3, 2017. FY2018 request from FY2018 DHS congressional budget justification. FY2018 House Committee from H.R. 3355 as reported and H.Rept. 115-239.

Notes: Table includes accounts titled "Research and Development" in each DHS component ("Research, Development, Test, and Evaluation" in the case of the U.S. Coast Guard). Some other accounts may also fund

R&D-related activities. Some totals may not add because of rounding. Figures for the columns headed "FY2018 Senate" and "FY2018 Enacted" will be added, if available, as Congress completes each action.

a. FY2017 amounts for thrust areas within Research, Development, and Innovation are not specified in P.L. 115-31 or the explanatory statement. The "FY2017 Enacted" column for these amounts is based on DHS plans under the FY2017 continuing resolution, as shown in the FY2018 budget justification.

Environmental Protection Agency[104]

The U.S. Environmental Protection Agency (EPA), the federal regulatory agency responsible for administering 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. Since FY2006, Congress has funded EPA through the Interior, Environment, and Related Agencies appropriations act.

Appropriations for EPA R&D are generally included in line-items that also include non-R&D activities. Annual appropriations bills and the accompanying committee reports do not identify precisely how much funding provided in appropriations bills is allocated to EPA R&D alone. EPA determines its R&D funding levels in operation through allocating its appropriations to specific activities and reporting those amounts.

The agency's Science and Technology (S&T) account funds much of EPA's scientific research activities.[105] These activities include R&D conducted by the agency at its own laboratories and facilities, and R&D and other related scientific research conducted by universities, foundations, and other nonfederal entities that receive EPA grants. The S&T account receives a base appropriation and a transfer from the Hazardous Substance Superfund (Superfund) appropriations account. The transferred funds are authorized for research on more effective methods to clean up contaminated sites.

The EPA's Office of Research and Development (ORD) is the primary manager of R&D at EPA headquarters and laboratories around the nation, 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.

On September 14, 2017, the House passed the Make America Secure and Prosperous Appropriations Act, 2018 (H.R. 3354) encompassing all 12 appropriations bills for FY2018. As reported by the House Committee on Appropriations on July 21, 2017, H.R. 3354 (H.Rept. 115-238) initially included only Interior, Environment, and Related Agencies. The House expanded the scope of the bill to serve as an omnibus bill for FY2018. The Senate Committee on Appropriations released a draft Chairman's "mark" of the FY2018 Interior, Environment, and Related Agencies appropriations bill on November 20, 2017 (hereinafter referred to as the Senate draft).[106]

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

[105] The EPA S&T account established by Congress beginning in FY1996, 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. Because of the differences in the scope of the activities included in the accounts, comparisons before and after FY1996 are not readily available.

[106] The Senate Chairman's mark and accompanying explanatory statement are available on the Senate Committee on Appropriations, Subcommittee on the Department of Interior, Environment and Related agencies website

As passed in the House, Title II of Division A of H.R. 3354 would provide a total of $7.39 billion (after rescissions) for EPA in FY2018. Title II of the Senate draft would provide a total of $7.91 billion for EPA (after rescissions). Both the House-passed bill and Senate draft would be an increase above the President's request of $5.65 billion (after rescissions), but less than the FY2017 enacted appropriations of $8.06 billion in Title II of Division G of the Consolidated Appropriations Act, 2017 (P.L. 115-31), enacted May 5, 2017.

The House-passed bill, Senate draft, and President's request would rescind unobligated balances of prior-year EPA appropriations in varying amounts: $128.0 million in the House-passed bill, $132.0 million in the Senate draft, and $369.0 million in the President's FY2018 request. P.L. 115-31 rescinded $90.3 million of prior-year funds in FY2017. The House-passed bill, Senate draft and FY2017 enacted appropriations specified proportions of the total rescission to be allocated from EPA's S&T account (see end of **Table 18**), as well as the Environmental Programs and Management (EPM) and the State and Tribal Assistance Grants (STAG) account. The President's FY2018 request only proposed the total rescission amount and did not specify a rescission within the S&T or other accounts.

The House-passed bill and the Senate draft also would increase the S&T base appropriations by $15.5 million transferred from the Superfund account, the same as transferred in the FY2017 enacted appropriations. The President's FY2018 request proposed a reduced transfer amount of $12.4 million.

For purposes of direct comparison the following discussion regarding proposed funding for EPA's S&T account includes the transfers from the Superfund account but does not reflect the rescissions. The total $639.4 million for the S&T account (including transfers prior to rescissions) for FY2018 proposed in House-passed H.R. 3354 would be $104.3 million (12.3%) less than the FY2017 enacted appropriations (P.L. 115-31) of $722.0 million.[107] The amount proposed for S&T in the House-passed bill would be a $176.2 million (38.0%) increase above the President's FY2018 budget request of $463.2 million for the account.[108] The total $676.5 million proposed for the S&T account (including transfers prior to rescissions) included in the Senate draft would be a $52.8 million (7.2%) decrease below the FY2017 enacted level but a $213.3 million (46.0%) increase above the FY2018 request. The President's FY2018 requested level was $258.8 million (35.8%) less than the FY2017 enacted amount for the S&T account.

During the House and Senate Committees on Appropriations hearings regarding the President's FY2018 budget request for EPA,[109] some Members expressed concerns regarding a number of

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https://www.appropriations.senate.gov/news/majority/fy2018-interior-environment-appropriations-bill-released. The following are the direct links to the documents: https://www.appropriations.senate.gov/imo/media/doc/FY2018-INT-CHAIRMEN-MARK-BILL.PDF, and https://www.appropriations.senate.gov/imo/media/doc/FY2018-INT-CHAIRMEN-MARK-EXPLANATORY-STM.PDF.

[107] Title II of Division G of the Consolidated Appropriations Act, 2017 (P.L. 115-31). See also "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the *Congressional Record*, vol. 163, no. 76-Book II (May 3, 2017), p. H3883, https://www.gpo.gov/fdsys/pkg/CREC-2017-05-03/pdf/CREC-2017-05-03-bk2.pdf.

[108] U.S. EPA, *Fiscal Year 2018 Justification of Appropriations Estimates for the Committee on Appropriations*, May 2017, pp. 3-5, 29-108, https://www.epa.gov/planandbudget/fy-2018-justification-appropriation-estimates-committee-appropriations. Note that the FY2018 President's budget request was prepared prior to the enactment of P.L. 115-31; thus, funding comparisons in the request and supporting documents are based on estimated FY2017 "annualized" levels associated with the continuing resolutions in effect at the time. These annualized estimates are not presented in this CRS report.

[109] House Committee on Appropriations, Subcommittee on Interior, Environment, and Related Agencies, *FY 2018 Budget Hearing: Environmental Protection Agency*, June 15, 2017, https://appropriations.house.gov/calendar/

proposed reductions and eliminations of funding for EPA, including those proposed for scientific research programs. The reductions proposed in the FY2018 budget request were distributed across EPA operational functions and activities as well as grants for states, tribes, and local governments. The FY2018 budget request proposed to reduce funding below FY2017 enacted levels for nine of the ten EPA appropriations accounts,[110] including the S&T account, although funding for some program areas within all the accounts would have increased or remained constant.[111]

Table 18 at the end of this section presents a comparison of the appropriations levels proposed for the S&T account in House-passed H.R. 3354, the Senate draft, the President's FY2018 budget request for program areas and activities within EPA's S&T account as presented in EPA's FY2018 Congressional budget justification,[112] and the FY2017 enacted appropriations.

Information is not readily available from House-passed H.R. 3354, the Senate draft and the accompanying reports and explanatory statements, or from the FY2017 enacted appropriations that allow for direct comparisons with all S&T program areas and activities as requested for FY2018 and presented in EPA's congressional justification. Certain program areas as presented in the President's FY2018 budget request are broken down differently than the congressional committee presentations. While funding comparisons can be made for most of the broader program areas, comparisons for many program activities below the program area are not available and are denoted in **Table 18** as "NR."

Additionally, the President's FY2018 request modified the titles for some of the program areas relative to previous Administrations' requests and Congressional committee reports as noted in **Table 18**. The House and Senate Appropriations Committees adopted the modified program area titles for FY2018.

As shown in **Table 18**, with one exception the FY2018 base amount for the S&T account proposed by the House and Senate Committees on Appropriations for individual EPA program area and activity line items would be less than or the same as the FY2017 enacted appropriations. House-passed H.R. 3354 and the Senate draft would provide $79.3 million for Operations and Administration, the same as requested for FY2018, an $11.0 million (16.1%) increase compared to the FY2017 enacted level. The $11.0 million increase proposed for FY2018 would support a new activity, "Workforce Reshaping," described in the EPA's FY2018 budget justification[113] as agency-wide organizational restructuring, "reprioritization of agency activities," and reallocation of resources. According to the EPA justification, the funding for this program area would include support for voluntary early-out retirement authority, voluntary separation incentive pay, and costs for relocation of staff associated with realignment of work assignments.

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eventsingle.aspx?EventID=394902; Senate Committee on Appropriations, Subcommittee on Interior, Environment, and Related Agencies, *Review of the FY2018 Budget Request for the Environmental Protection Agency*, https://www.appropriations.senate.gov/hearings/review-of-the-fy2018-budget-request-for-the-environmental-protection-agency.

[110] The FY2018 budget request included $39.6 million for EPA's Building and Facilities appropriations account, an increase of $5.1 million compared to the $34.5 million FY2017 enacted appropriations. See footnote 108, pp. 323-333.

[111] For an overview of the President's FY2018 budget request and Congressional action on FY2018 appropriations for EPA see CRS In Focus IF10665, *U.S. Environmental Protection Agency (EPA): FY2018 President's Budget Request*, by Robert Esworthy and David M. Bearden, and CRS In Focus IF10717, *U.S. Environmental Protection Agency (EPA) FY2018 Appropriations: Congressional Action*, by Robert Esworthy and David M. Bearden.

[112] See footnote 108.

[113] See footnote 108, pp. 70-71.

For those program areas presented in **Table 18** the largest dollar amount decreases within the S&T account in both the House-passed bill and the Senate draft would be for funding for "Research: Chemical Safety and Sustainability"; "Research: Sustainable and Healthy Communities"; and "Clean Air." The majority of proposed reductions would be no more than 15% below the FY2017 enacted levels. The reductions would not be as significant as those proposed in the FY2018 budget request. For example, the proposed $80.1 million (59.7%) reduction in funding for Research: Sustainable and Healthy Communities for FY2018 included in the President's FY2018 budget request reflected the largest dollar amount decrease within the S&T account[114] ($54.2 million requested compared to the FY2017 enacted amount of $134.3 million). As described in the EPA FY2018 budget justification, the reductions for this program area were primarily associated with the proposed elimination of funding for the Science to Achieve Results (STAR) program[115] and the streamlining of several research activities.[116] Both the House-passed bill and Senate draft would not eliminate funding for the STAR program, and proposed reductions in funding for other activities within this program are would be less than those proposed in the FY2018 request.

Title II of Division A of House-passed H.R. 3354 and Title II of the Senate draft proposed the allocation of $4.1 million within the S&T account for FY2018 for "Research: National Priorities," the same as enacted for FY2017. These funds would be used for competitively awarded extramural research grants to fund "high-priority water quality and availability research by not-for-profit organizations." These grants are to be independent of the STAR grant program and subject to a 25% matching funds requirement. As in previous administrations' requests, the President's FY2018 budget request did not include funding for "Congressional Priorities" in the S&T or other EPA appropriations accounts.[117]

House-passed H.R. 3354 and the Senate draft contain a number of administrative and general provisions. Several of these provisions would restrict or prohibit the use of FY2018 funds by EPA for implementing or proceeding with a number of regulatory actions, including in some instances conducting research to support these actions.

[114] For a description of the activities included under this program area within EPA's S&T account in EPA's FY2018 budget justification see footnote 108, pp. 91-94.

[115] Funding for these competitive grants and graduate fellowships has historically been allocated from enacted appropriations within multiple program areas within the S&T account. Specific funding levels for STAR have not been requested or appropriated recently in the annual fiscal year appropriations. For discussion of the STAR program in the EPA FY2018 budget justification see footnote 108, pp. 83-85, 90, 94, 98, 690, and 732.

[116] See discussion under the heading *FY 2018 Change from FY 2017 Annualized Continuing Resolution (Dollars in Thousands)* within this program area in EPA's FY2018 budget justification, footnote 108, p. 94.

[117] Referred to as "Congressional Priorities" in the FY2018 Budget Justification; not requesting funding for this program is consistent with previous Administrations fiscal year budget requests, see footnote 108, pp. 107-108.

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

(budget authority, in millions of dollars)

S&T Program Areas/Activities	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 Senate Draft	FY2018 Enacted
Clean Air [and Climate][a]	116.5	85.7	99.1	104.9	
Clean Air Allowance Trading Program	*NR*	*5.7*	*NR*	*NR*	
GHG (greenhouse gas) Reporting Program [Climate Protection Program][a]	*8.0*	*0.0*	*6.8*	*7.2*	
Federal Support for Air Quality Management	*NR*	*4.0*	*NR*	*NR*	
Federal Vehicle and Fuel Standards and Certification	*NR*	*76.0*	*NR*	*NR*	
Enforcement	13.7	10.4	11.6	10.4	
Homeland Security	33.1	23.1	28.2	33.1	
Critical Infrastructure	*NR*	*0.0*	*NR*	*NR*	
Preparedness, Response, and Recovery	*NR*	*22.6*	*NR*	*NR*	
Protection of EPA Personnel and Infrastructure	*NR*	*0.5*	*NR*	*NR*	
Indoor Air and Radiation	6.0	3.3	5.1	6.0	
Indoor Air: Radon Program	*NR*	*0.0*	*NR*	*NR*	
Radiation: Protection	*NR*	*0.0*	*NR*	*NR*	
Radiation: Response Preparedness	*NR*	*3.3*	*NR*	*NR*	
Reduce Risks from Indoor Air	*NR*	*0.0*	*NR*	*NR*	
Information Technology/Data Management/Security	3.1	2.7	2.7	2.7	
Operations and Administration	68.3	79.3	79.3	79.3	
Facilities Infrastructure and Operations	*NR*	*68.3*	*NR*	*NR*	
Workforce Reshaping[b]	*NR*	*11.0*	*NR*	*NR*	
Pesticide Licensing	6.0	5.0	5.1	6.0	
Research: Air [Climate] and Energy[a]	91.9	30.6	78.1	82.7	
Research: Chemical Safety and Sustainability	126.9	84.2	107.9	111.6	
Human Health Risk Assessment	*NR*	*22.5*	*NR*	*NR*	
Research: Computational Toxicology	*21.4*	*17.2*	*21.4*	*21.4*	
Research: Endocrine Disruptor	*16.3*	*10.1*	*16.3*	*16.3*	
Research: Other Activities	*NR*	*34.4*	*NR*	*NR*	
Research: Safe and Sustainable Water Resources	106.3	68.5	90.3	95.6	
Research: Sustainable and Healthy Communities	134.3	54.2	114.2	120.9	
Water: Human Health Protection (Drinking Water Programs)	3.5	3.7	3.5	3,5	

S&T Program Areas/Activities	FY2017 Enacted	FY2018 Request	FY2018 House	FY2018 Senate Draft	FY2018 Enacted
Research: National [Congressional] Priorities (Water Quality and Support Grants)[c]	4.1	0.0	4.1	4.1	
General Reduction	NA	NA	(5.3)	NA	
Subtotal Base Appropriations	**713.8**	**450.8**	**623.9**	**661.0**	
Transfer in from Hazardous Substance Superfund Account	**15.5**	**12.4**	**15.5**	**15.5**	
Total Appropriations Prior to Rescissions	**729.3**	**463.2**	**639.4**	**676.5**	
S&T Account Specific Rescission	**(7.3)**[d]	**NR**[e]	**(27.0)**[f]	**(27.0)**[f]	
Total (Net Appropriations)	**722.0**	**463.2**[e]	**612.4**	**649.5**	

Source: Prepared by CRS using information from the *Congressional Record*; House, Senate, and conference committee reports; House-passed H.R. 3354, Senate draft, and EPA's *Fiscal Year 2018 Justification of Appropriations Estimates for the Committee on Appropriations*, May 2017. Amounts for "FY2018 Enacted" will be added, when available.

Notes: NR (not reported) indicates those instances where funding or rescission amounts were not specified. NA = not applicable.

a. Brackets [ ] denotes title language as presented in previous Administrations EPA budget justifications and congressional reports/explanatory statements.

b. This program activity is included in multiple EPA accounts in the FY2018 budget request and has not been included in previous EPA budget justifications.

c. Referred to as "Congressional Priorities" in the FY2018 and previous Administrations budget justifications.

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

e. The President's FY2018 request included a $369.0 million rescission of unobligated balances of prior-year EPA appropriations, but did not specify a proportional allocation of the rescission by EPA accounts.

f. Rescission of unobligated balances of prior fiscal years appropriations within the S&T account.

Appendix A. Acronyms and Abbreviations

Glossary

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
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
BER	Biological and Environmental Research
BES	Basic Energy Sciences
BIA	Bureau of Indian Affairs
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
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosives
CDC	Centers for Disease Control and Prevention
CEBAF	Continuous Electron Beam Accelerator Facility
CEMMSS	Cyber-enabled Materials, Manufacturing, and Smart Systems
CLARREO	Climate Absolute Radiance and Refractivity Observatory
CMS	Centers for Medicare and Medicaid Services
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
DSCOVR	Deep Space Climate Observatory
EHR	Education and Human Resources
EPA	Environmental Protection Agency
EPM	Environmental Programs and Management
EPSCoR	Experimental Program to Stimulate Competitive Research –or– Established 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
GDP	Gross Domestic Product
GRF	Graduate Research Fellowship
GWOT	Global War on Terror
HBCU	Historically Black Colleges and Universities
HHS	Department of Health and Human Services
HRSA	Health Resources and Services Administration
HIA	Health Impact Assessment
ICs	Institutes and Centers
I-Corps	Innovation Corps
IFF	Iraqi Freedom Fund
INCLUDES	Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
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
LHHS	Labor, HHS, and Education appropriations act
MEP	Manufacturing Extension Partnership
MGI	Materials Genome Initiative
MPS	Mathematical and Physical Sciences
MREFC	Major Research Equipment and Facilities Construction
Mu2E	Muon to Electron Conversion Experiment
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service
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
NIRSQ	National Institute for Research on Safety and Quality
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
NRI	National Robotics Initiative
NRT	NSF Research Traineeships
NSB	National Science Board
NSET	Nanoscale Science, Engineering, and Technology (NSTC Subcommittee)
NSF	National Science Foundation
NSTC	National Science and Technology Council
NWS	National Weather Service
OAR	Oceanic and Atmospheric Research
OCO	Overseas Contingency Operations
OD	NIH Office of the Director
OIG	Office of the Inspector General
OMAO	Office of Marine and Aviation Operations
OMB	Office of Management and Budget
ONC	Office of the National Coordinator for Health Information Technology
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
P3	People, Prosperity and the Planet
R&D	Research and Development
RAMI Act	Revitalize American Manufacturing and Innovation Act of 2014
RBI	Radiation Budget Instrument
RCDC	Research, Condition, and Disease Categories
RCRV	Regional Class Research Vessels
RDT&E	Research, Development, Test, and Evaluation
RE&D	Research, Engineering, and Development
REE	Research, Education, and Economics
RHIC	Relativistic Heavy Ion Collider
ROE	Report on the Environment
RPG	Research Project Grant
RRA	Research and Related Activities
S&T	Science and Technology
SaTC	Secure and Trustworthy Cyberspace
SCAP	Single Cell Analysis Program
SEES	Science, Engineering, and Education for Sustainability
SIR	Surveys, Investigations, and Research
SLS	Space Launch System
SSW	Safe and Sustainable Water
STAG	State and Tribal Assistance Grants
STAR	Science to Achieve Results
STEM	Science, Technology, Engineering, and Mathematics
STEP	Supercritical Transformational Electric Power
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
USPSTF	U.S. Preventive Services Task Force
UtB	Understanding the Brain
VA	Department of Veterans Affairs

Appendix B. CRS Contacts for Agency R&D

The following lists the primary CRS expert on R&D funding for the agencies covered in this report. Congressional clients may contact them with questions.

Agency	CRS Contact for Congressional Clients
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