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# Federal Research and Development Funding: FY2015

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# Summary

President Obama's budget request for FY2015 included $135.352 billion for research and development (R&D), a $1.670 billion (1.2%) increase from the FY2014 level of $133.682 billion.

Funding for R&D is concentrated in a few departments and agencies. Under President Obama's FY2015 budget request, seven federal agencies would have received 95.4% of total federal R&D funding, with the Department of Defense (DOD, 47.6%) and the Department of Health and Human Services (HHS, 23.0%) accounting for more than two-thirds of all federal R&D funding.

In addition to the FY2015 base budget request, the President proposed an Opportunity, Growth, and Security Initiative (OGSI) that sought, together with funding for other purposes, $5.3 billion for R&D at certain agencies, including the National Institute of Standards and Technology (NIST, $2.515 billion), National Institutes of Health ($970 million), NASA ($874 million), National Science Foundation (NSF, $552 million), Department of Agriculture ($277 million), and the National Oceanic and Atmospheric Administration ($180 million). Of the NIST funding, $2.4 billion would have supported the establishment of a National Network for Manufacturing Innovation.

The R&D budgets of NIST, NSF, and the DOE Office of Science were targeted for doubling over 7 years, from their FY2006 levels, by the America COMPETES Act, and over 11 years by the America COMPETES Reauthorization Act of 2010. Although the President's FY2015 budget requested increases for these accounts, it departed, as did the FY2014 request, from earlier Obama and Bush Administration budgets that explicitly stated the doubling goal.

The President's FY2015 request continued support for three multi-agency R&D initiatives, as it proposed $1.537 billion for the National Nanotechnology Initiative (NNI), $3.786 billion for the Networking and Information Technology Research and Development (NITRD) program, and $2.501 billion for the U.S. Global Change Research Program (USGCRP). The request also proposed approximately $200 million in FY2015 for a Brain Research through Advancing Innovative Neurotechnologies (BRAIN) initiative, as well as funding for the Materials Genome Initiative and the National Robotics Initiative.

Congress completed appropriations action for most federal agencies through enactment of the Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235), which was signed into law on December 16, 2014. The measure provides FY2015 appropriations for agencies covered by 11 regular appropriations bills, and provides continuing appropriations for the Department of Homeland Security through February 27, 2015. Appropriations made under this act providing R&D funding for federal agencies are discussed throughout this report where it is possible to identify the levels of R&D funding; some appropriations accounts include both R&D and non-R&D funding and the final level of R&D funding will not be known until agencies with such accounts identify how these funds will be allocated.

Previously, Congress provided FY2015 appropriations to federal agencies through a series of continuing resolutions. In recent years, continuing resolutions and sequestration have resulted in the annual appropriations process being completed after the start of the fiscal year. This can affect agencies' execution of their R&D budgets, including the delay or cancellation of planned R&D activities and acquisition of R&D-related equipment.

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# Overview

The 113th Congress continues to take a strong interest in the health of the U.S. research and development (R&D) enterprise and in providing support for federal R&D activities. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the Internet to communications satellites, shale gas extraction, and defenses against disease. However, widespread concerns about the federal debt and recent and projected federal budget deficits are driving difficult decisions about the prioritization of R&D, both in the context of the entire federal budget and among competing needs within the federal R&D portfolio.

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

The federal R&D budget is an aggregation of the R&D components of each federal agency. There is no single, centralized source of funds that is allocated to individual agencies. In fact, agency R&D budgets are developed internally as part of each agency's overall budget development process and may be included in accounts that are entirely for R&D and 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 and become part of the President's annual budget submission to Congress. The federal R&D budget is then calculated by aggregating the R&D components of the appropriations provided by Congress to each federal agency.

Congress plays a central role in defining the nation's R&D priorities as it makes decisions about the level and allocation of R&D funding—overall, within agencies, and for specific programs. Some Members of Congress have expressed concerns about the level of federal spending (for R&D as for other purposes) in light of the current federal deficit and debt. As Congress acts to complete the FY2015 appropriations process, it faces two overarching issues: the extent to which federal R&D investments can grow in the face of increased pressure on discretionary spending and the prioritization and allocation of the available funding. Low or negative growth in the overall R&D investment may require movement of resources across disciplines, programs, or agencies to address priorities. Moving funding between programs/accounts/agencies can become more complex and difficult if the funding for programs/accounts/agencies is provided through different appropriations bills.

Structurally, this report begins with a discussion of the overall level of R&D funding requested in the President's budget, followed by analyses of requested R&D funding 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 about 98% of total federal R&D funding. A list of definitions associated with federal R&D funding is provided in the text box on the following page.

## Definitions Associated with Federal Research and Development Funding

Two key sources of definitions associated with federal research and development funding are the 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 2013). This document provides guidance to agencies in the preparation of the President's annual budget and instructions on budget execution.

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

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

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

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

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

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

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

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

**R&D Plant.** In general, R&D plant refers to the acquisition of, construction of, major repairs to, or alterations in structures, works, equipment, facilities, or land for use in R&D activities. Data included in this section refer to obligated federal dollars for R&D plant.

**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 FY2015 Budget Request

On March 4, 2014, President Obama released his proposed FY2015 budget. Using FY2014 as the base comparison year, this report provided government-wide, multi-agency, and individual agency analyses of the President's FY2015 request as it relates to R&D and related activities. The President's budget sought $135.352 billion for R&D in FY2015, a 1.2% increase over the estimated FY2014 R&D funding level of $133.682 billion.[1] Adjusted for anticipated inflation of 1.7%, the President's FY2015 R&D request represented a decrease of 0.5% from the FY2014 estimated level.[2]

President Obama's FY2015 budget reflected a reduced focus on a primary science and technology policy effort that Congress and two Administrations have pursued for the past eight years. Referred to frequently as the "doubling effort," Congress and Presidents Obama and Bush sought to increase support for the physical sciences and engineering by doubling funding for accounts at three federal agencies with a strong R&D emphasis in these disciplines: the Department of Energy (DOE) Office of Science, the National Science Foundation (NSF), and the Department of Commerce (DOC) National Institute of Standards and Technology (NIST) core laboratory research and construction of research facilities (collectively referred to as the "targeted accounts"). The doubling goal was expressed in President Bush's American Competitiveness Initiative, in budget requests from President Obama before FY2014, and implicitly in the America COMPETES Act (P.L. 110-69) and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358). The America COMPETES Act and the reauthorization act set appropriations authorization levels consistent with a doubling pace of 7 years and 11 years, respectively.[3] In aggregate, appropriations provided to these accounts fell short of the levels authorized in P.L. 110-69 and P.L. 111-358. In the FY2015 budget, the President requested a 1.2% increase in aggregate funding for the targeted accounts, a pace that would require more than 58 years to double and one that is below the expected rate of inflation (1.7%). See "Efforts to Double Certain R&D Accounts" below for more details.

More broadly, in a 2009 speech before members of the National Academy of Sciences, President Obama put forth a goal of increasing the national (public and private) investment in R&D to more than 3% of the U.S. gross domestic product (GDP). President Obama did not provide details on how this goal might be achieved (e.g., through increases in direct federal R&D funding or through indirect mechanisms such as the research and experimentation (R&E) tax credit).[4]

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[1] Funding levels included in this document are in current dollars unless otherwise noted. Inflation diminishes the purchasing power of federal R&D funds, so an increase that falls short of the inflation rate may reduce real purchasing power.

[2] As calculated by CRS using the GDP (chained) price index for FY2014 and FY2015 in Table 10.1, Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2018, *Budget of the United States Government, Fiscal Year 2015*, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2014/assets/hist10z1.xls.

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

[4] The research and experimentation tax credit is frequently referred to as the research and development tax credit or R&D tax credit, through the credit does not apply to development expenditures. For additional information about the R&E tax credit, see CRS Report RL31181, *Research Tax Credit: Current Law and Policy Issues for the 114th Congress*, by (name redacted)

Achieving the 3% goal would likely require a substantial increase in government and corporate R&D spending. When President Obama set forth the goal in 2009, total U.S. R&D expenditures were approximately 2.90% of GDP. In 2012, R&D as a percentage of GDP was 2.89%, with the federal government contributing 0.86% (down from 0.91% in 2009) and non-federal sources contributing 2.02% (up from 1.98% in 2009).[5]

Analysis of federal R&D funding is complicated by several factors, such as inconsistency among agencies in the reporting of R&D and the inclusion of R&D in accounts with non-R&D activities. As a result of these and other factors, figures reported by the Office of Management and Budget (OMB) and Office of Science and Technology Policy (OSTP), including those shown in **Table 1**, may differ somewhat from the agency budget analyses that appear later in this report. Another complicating factor in the President's FY2015 budget request was the Opportunity, Growth, and Security Initiative (OGSI), discussed in the next section.

# Opportunity, Growth, and Security Initiative

In addition to the FY2015 base budget request,[6] President Obama proposed an Opportunity, Growth, and Security Initiative that sought $56 billion, for various purposes, including $5.3 billion for R&D. A large fraction of the OGSI R&D funding ($2.4 billion) would have gone to NIST to support the establishment of a National Network for Manufacturing Innovation to promote the development of manufacturing technologies with broad applications (see "National Network for Manufacturing Innovation" for more details). Among other R&D agencies that would have received funding under the OGSI proposal were Department of Defense (DOD), National Institutes of Health (NIH), National Aeronautics and Space Administration (NASA), NSF, Department of Agriculture (USDA), Department of Transportation (DOT), National Oceanic and Atmospheric Administration (NOAA), and the Department of the Interior (DOI). There are few details on how agency OGSI funding would have been allocated between R&D and non-R&D activities.

The President's request referred to the OGSI as "separate" and "fully-paid-for."[7] The funding requested in the President's base budget sought to comply with the FY2015 discretionary spending cap set by the Bipartisan Budget Act of 2013 (Division A of P.L. 113-67). The OGSI sought funding above the cap and would have been offset by an equal amount of proposed additional revenue produced by spending reforms and changes in the tax code. Analyses in this report address only the R&D funding included in the base request, except as specifically noted.

# 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 viewed by agency, by the character of the work

[5] GDP figures from Bureau of Economic Analysis, *Survey of Current Business*, May 31, 2012; R&D figures from National Science Foundation, National Center for Science and Engineering Statistics, *National Patterns of R&D Resources* (annual series).

[6] The term "base budget" is used in the President's budget to distinguish the main request from additional funding requested as part of the OGSI.

[7] Executive Office of the President (EOP), OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

supported, by a combination of these two perspectives, and by defense-related and nondefense-related R&D.

## Federal R&D by Agency

Congress makes decisions about federal R&D funding through the authorization and appropriations process primarily from the perspective of individual agencies and programs. **Table 1** provides data on R&D by agency for FY2013 (actual), FY2014 (estimate), and FY2015 (request) as reported by OSTP.

Under President Obama's FY2015 budget request, seven federal agencies would have received more than 95% of total federal R&D funding: the Department of Defense (DOD), 47.6%; Department of Health and Human Services (HHS) (primarily NIH), 23.0%; DOE, 9.1%; NASA, 8.5%; NSF, 4.2%; USDA, 1.8%; and DOC, 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), Department of Veterans Affairs (VA), and Environmental Protection Agency (EPA). In total, these 12 agencies accounted for more than 98% of current and requested federal R&D funding.

The largest agency R&D increases in the President's FY2015 request (in dollars, not percentages), compared with FY2014, were for DOE, $950 million (8.4%); DOD, $574 million (0.9%); HHS, $157 million (0.5%); Interior, $85 million (10.1%); USDA, $29 million (1.2%); and DOT, $12 million (1.4%). Under the President's FY2015 budget request, DHS R&D funding would have been reduced by $156 million (15.1%), NASA by $112 million (1.0%), and DOC by $35 million (2.1%).

**Table 1. Federal Research and Development Funding by Agency, FY2013-FY2015**

(budget authority, dollar amounts in millions)

| | | | | Change, FY2014-FY2015 | |
|---|---|---|---|---|---|
| **Department/Agency** | **FY2013 Actual** | **FY2014 Estimate** | **FY2015 Request** | **Dollar** | **Percent** |
| Department of Defense | $63,838 | $63,856 | $64,430 | $574 | 0.9% |
| Department of Health and Human Services | 29,969 | 30,912 | 31,069 | 157 | 0.5% |
| Department of Energy | 10,740 | 11,359 | 12,309 | 950 | 8.4% |
| National Aeronautics and Space Administration | 11,282 | 11,667 | 11,555 | -112 | -1.0% |
| National Science Foundation | 5,319 | 5,729 | 5,727 | -2 | 0.0% |
| Department of Agriculture | 2,116 | 2,418 | 2,447 | 29 | 1.2% |
| Department of Commerce | 1,360 | 1,632 | 1,597 | -35 | -2.1% |
| Department of Veterans Affairs | 1,164 | 1,174 | 1,178 | 4 | 0.3% |
| Department of the Interior | 785 | 840 | 925 | 85 | 10.1% |
| Department of Homeland Security | 684 | 1,032 | 876 | -156 | -15.1% |
| Department of Transportation | 829 | 853 | 865 | 12 | 1.4% |
| Environmental Protection Agency | 532 | 560 | 560 | 0 | 0.0% |
| Other | 1,714 | 1,650 | 1,814 | 164 | 9.9% |

| Department/Agency | FY2013 Actual | FY2014 Estimate | FY2015 Request | Change, FY2014-FY2015 Dollar | Change, FY2014-FY2015 Percent |
|---|---|---|---|---|---|
| **Total** | **130,332** | **133,682** | **135,352** | **1,670.0** | **1.2%** |

**Source:** EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

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

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

Federal R&D funding can also be examined by the character of work it supports—basic research, applied research, or development—and by funding provided for construction of R&D facilities and acquisition of major R&D equipment. (See **Table 2**.) President Obama's FY2015 request included $32.079 billion for basic research, down $331 million (1.0%) from FY2014; $32.641 billion for applied research, up $582 million (1.8%) from FY2014; $68.017 billion for development, up $1.540 (2.3%) from FY2014; and $2.615 billion for facilities and equipment, down $121 million (4.4%) from FY2014.

**Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2013-FY2015**

(budget authority, dollar amounts in millions)

| | FY2013 Actual | FY2014 Estimate | FY2015 Request | Change, FY2014-FY2015 Dollar | Change, FY2014-FY2015 Percent |
|---|---|---|---|---|---|
| Basic research | $30,648 | $32,410 | $32,079 | $-331 | -1.0% |
| Applied research | 31,199 | 32,059 | 32,641 | 582 | 1.8% |
| Development | 66,614 | 66,477 | 68,017 | 1,540 | 2.3% |
| Facilities and Equipment | 1,871 | 2,736 | 2,615 | -121 | -4.4% |
| **Total** | **130,332** | **133,682** | **135,352** | **1,670** | **1.2%** |

**Source:** EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

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

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

A primary policy foundation for public investments in basic research and 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 because the social returns (i.e., all of the benefits (such as rewards, opportunities, improvements) to society resulting from the research) exceed the private returns (i.e., the benefits accruing to the investor (such as increased revenues, higher stock value)). Other factors inhibiting corporate investment in basic research include long time horizons for commercial applications (diminishing the potential returns due to

the time value of money), high levels of technical risk/uncertainty, shareholder demands for shorter-term returns, and asymmetric and imperfect information. The federal government is the nation's largest supporter of basic research, funding 52.6% of U.S. basic research in 2012.[8] Industry funded 21.3% of U.S. basic research in 2012, with state governments, universities, and other non-profit organizations funding the remaining 26.0%.[9] In contrast to basic research, industry is the primary funder of applied research in the United States, accounting for an estimated 54.0% in 2012, while the federal government accounted for an estimated 36.2%.[10] Industry also provides the vast majority of funding for development. Industry accounted for 76.4% of development in 2012, while the federal government provided 22.1% of the funding.[11]

## 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, from supporting advances in spaceflight to developing new and affordable sources of energy. These priorities and the mission of each individual agency contribute, in part, to the composition of that agency's R&D spending (i.e., the allocation between basic research, applied research, development, and facilities and equipment). In the President's FY2015 budget request, the Department of Health and Human Services, primarily NIH, accounted for somewhat more than half of all federal funding for basic research. HHS is also the largest funder of applied research, accounting for about 45% of all federally funded applied research in the President's FY2015 budget request. DOD is the primary federal agency funder of development, accounting for 84.9% of total federal development funding in the President's FY2015 budget request.[12]

**Table 3. Top R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2013-FY2015**

(budget authority, dollar amounts in millions)

| | | | | Change, FY2014-FY2015 | |
|---|---|---|---|---|---|
| | FY2013 Actual | FY2014 Enacted | FY2015 Request | Dollar | Percent |
| **Basic Research** | | | | | |
| Dept, of Health and Human Services | $15,424 | $15,861 | $16,085 | $224 | 1.4% |
| National Science Foundation | 4,357 | 4,711 | 4,708 | -3 | -0.1% |
| Dept. of Energy | 3,360 | 3,907 | 3,086 | -821 | -21.0% |
| **Applied Research** | | | | | |
| Dept. of Health and Human Services | 14,294 | 14,851 | 14,783 | -68 | -0.5% |

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

[9] Ibid.

[10] Ibid.

[11] Ibid.

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

| | FY2013 Actual | FY2014 Enacted | FY2015 Request | Change, FY2014-FY2015 Dollar | Change, FY2014-FY2015 Percent |
|---|---|---|---|---|---|
| Dept. of Defense | 4,158 | 4,376 | 4,530 | 154 | 3.5% |
| Dept. of Energy | 3,852 | 3,886 | 4,269 | 383 | 9.9% |
| **Development** | | | | | |
| Dept. of Defense | 57,774 | 57,326 | 57,747 | 421 | 0.7% |
| NASA | 5,064 | 5,162 | 6,009 | 847 | 16.4% |
| Dept. of Energy | 2,466 | 2,585 | 2,927 | 342 | 13.2% |
| **Facilities and Equipment** | | | | | |
| Dept. of Energy | 571 | 842 | 970 | 128 | 15.2% |
| National Science Foundation | 372 | 538 | 539 | 1 | 0.2% |
| Dept. of Commerce | 217 | 227 | 250 | 23 | 10.1% |

**Source:** EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2015,* March 2014.

**Note:** The top three funding agencies in each category are listed, based on the FY2015 request.

## Defense-Related and Nondefense-Related R&D

Federal R&D funding can also be characterized as defense-related or nondefense-related. Defense-related R&D is provided for primarily by the Department of Defense, but it also includes some activities at the Department of Energy and the Federal Bureau of Investigation. Defense-related R&D has constituted more than half of total federal R&D funding, fluctuating between 50% and 70% for more than three decades. Defense-related R&D grew from 52.7% of total federal R&D funding in FY2001 to 60.5% in FY2008, then declined over several years to 56.8% in 2012.[13] The President's FY2015 budget included $69.465 billion in defense-related R&D funding, or about 51.3% of the total R&D request.[14]

# Multiagency R&D Initiatives

Although this report focuses primarily on the R&D activities of individual agencies, President Obama's FY2015 budget request supported several multiagency R&D initiatives. The following sections discuss several of these.

## Efforts to Double Certain R&D Accounts[15]

In 2006, President Bush announced the American Competitiveness Initiative (ACI) which, in part, sought to increase federal funding for physical sciences and engineering research by doubling

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

[14] EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

[15] For more information, see CRS Report R41951, *An Analysis of Efforts to Double Federal Funding for Physical Sciences and Engineering Research*, by (name redacted)

funding over 10 years (FY2006-FY2016) for targeted accounts at three agencies: the National Science Foundation, the Department of Energy (DOE) Office of Science, and the NIST Scientific and Technical Research and Services (STRS) and construction of research facilities (CRF) accounts.

In 2007, Congress authorized substantial increases for these targeted accounts under the America COMPETES Act (P.L. 110-69), which set the combined authorization levels for these accounts for FY2008 to FY2010 at a seven-year doubling pace from the FY2006 baseline. However, funding provided for these agencies in the Consolidated Appropriations Act, 2008 (P.L. 110-161), the Omnibus Appropriations Act, 2009 (P.L. 111-8), and the Consolidated Appropriations Act, 2010 (P.L. 111-117), fell below these targets.[16] (See **Table 4**.)

In 2010, Congress passed the America COMPETES Reauthorization Act of 2010 (P.L. 111-358) which, among other things, authorized appropriations for the targeted accounts for FY2011 to FY2013.[17] The aggregate authorization levels for the targeted accounts in this act were consistent with an 11-year doubling path. However, aggregate FY2013 funding subsequently appropriated for the targeted accounts was approximately $12.201 billion, $2.904 billion less than authorized in the act. This funding level set a pace to double over 22 years from the FY2006 level—more than triple the length of time originally envisioned in the 2007 America COMPETES Act and about twice as long as the doubling period established by the America COMPETES Reauthorization Act of 2010.

Budget constraints appear to have put the future of the doubling path in question. In his FY2010 *Plan for Science and Innovation,* President Obama stated that he, like President Bush, would seek to double funding for basic research over 10 years (FY2006 to FY2016) at the ACI agencies.[18] In his FY2011 budget documents, President Obama extended the period over which he intended to double these agencies' budgets to 11 years (FY2006 to FY2017).[19] The FY2013 budget request reiterated President Obama's intention to double funding for the targeted accounts from their FY2006 levels but did not specify the length of time over which the doubling was to take place. President Obama's FY2014 budget expressed a commitment to increasing funding for the targeted accounts, but did not commit to doubling. In the President's FY2015 budget, there was no explicit statement of commitment to increasing funding for the targeted accounts. For FY2015, President Obama requested $13.105 billion in aggregate funding for the targeted accounts, an increase of $155 million (1.2%) above the estimated FY2014 aggregate funding level of $12.950 billion. However, adjusted for inflation, funding for the targeted accounts would decline by 0.5%.

Congress has not reauthorized the America COMPETES Reauthorization Act of 2010, major provisions of which (including authorizations for the targeted accounts) expired in FY2013, nor has Congress otherwise authorized appropriations for these accounts in FY2014 or future years. Two bills have been introduced in the House of Representatives that would set authorization levels for two or more of these accounts. H.R. 4186, the Frontiers in Innovation, Research, Science, and Technology Act of 2014, would provide authorizations for FY2014 and FY2015 for

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

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

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

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

NSF and NIST, but not for the DOE's Office of Science. H.R. 4159, the America Competes Reauthorization Act of 2014, would provide authorizations for FY2015 to FY2019 for NSF, NIST, and the DOE Office of Science.

**Figure 1** shows total funding for the targeted accounts as a percentage of their FY2006 funding level, and illustrates how actual (FY2006-FY2014), requested (FY2007-FY2015), and authorized appropriations (FY2008-FY2013) compare to different doubling rates using FY2006 as the base year. The thick black line at the top of the chart is at 200%, the doubling level. The data used in **Figure 1** are in current dollars, not constant dollars, thus the effect of inflation on the purchasing power of these funds is not taken into consideration.

**Table 4. Funding for Accounts Targeted for Doubling, FY2006-FY2015**

(budget authority, in millions of current dollars)

| Agency | FY2006 Actual | FY2007 Actual | FY2008 Actual | FY2009 Actual | FY2009 ARRA | FY2010 Actual | FY2011 Actual | FY2012 Actual | FY2013 Actual | FY2014 Est. | FY2015 Req. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NSF | $5,646 | $5,884 | $6,084 | $6,469 | $2,402 | $6,972 | $6,913[a] | $7,033 | $6,884 | $7,172 | $7,255 |
| DOE/Ofc. of Science | 3,632 | 3,837 | 4,083 | 4,807 | 1,633 | 4,964 | 4,843 | 4,874 | 4,681 | 5,071 | 5,111 |
| NIST/STRS | 395 | 434 | 441 | 472 | 220 | 515 | 497 | 567 | 580 | 651 | 680 |
| NIST/CRF | 174 | 59 | 161 | 172 | 360 | 147 | 70 | 55 | 56 | 56 | 59 |
| **Total** | **9,846** | **10,214** | **10,768** | **11,920** | **4,615** | **12,598** | **12,323** | **12,529** | **12,201** | **12,950** | **13,105** |

**Sources:** NIST budget requests, FY2008-FY2015, available at http://www.nist.gov/public_affairs/budget/index.cfm; DOE budget requests, FY2008-FY2015, available at http://www.cfo.doe.gov/crorgcf30.htm; NSF budget requests, FY2008-FY2015, available at http://www.nsf.gov/about/budget; and the President's FY2015 budget, available at http://www.whitehouse.gov/omb/budget/Appendix.

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

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

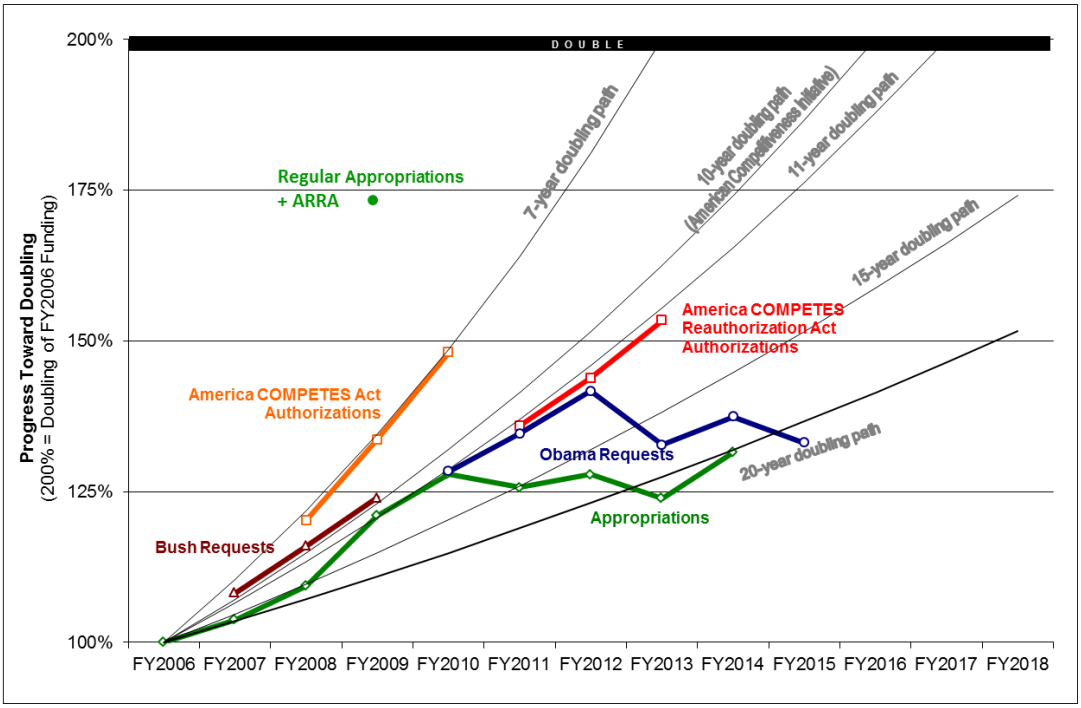
Some analysts have raised questions about the efficacy and unintended consequences of the doubling policy. Among the questions: What is the basis for asserting that a doubling of funding is the correct target for increases (as opposed to, say, an increase of 30%, 80%, or 120%)? What is the basis for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

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

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

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

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




**Sources:** Prepared by CRS based on data from agency budget justifications for FY2008 to FY2015 and agency authorization levels from the America COMPETES Act (P.L. 110-69) and the America COMPETES Reauthorization Act of 2010 (P.L. 111-358).

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

## National Nanotechnology Initiative[22]

Launched by President Clinton in his FY2001 budget request, the National Nanotechnology Initiative (NNI) is a multiagency R&D initiative to advance understanding and control of matter at the nanoscale, where the physical, chemical, and biological properties of materials differ in fundamental and useful ways from the properties of individual atoms or bulk matter.[23]

The President requested $1.537 billion for the NNI in FY2015, a reduction of $1 million from the FY2014 actual level of $1.538 billion. Among the changes in nanotechnology funding under the Administration's FY2015 request: reductions for DOD ($32 million, 18.1%), DOC ($15 million, 15.6%), and NASA ($4 million, 23.5%) and increases for DOE ($40 million, 13.1%) and DHS

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

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

($8 million, 35.2%). Nanotechnology funding for other NNI agencies would remain essentially flat in FY2015.[24]

**Table 5. National Nanotechnology Initiative Funding, FY2013-FY2015**

(budget authority, in millions of current dollars)

| | FY2013 Actual | FY2014 Estimated | FY2015 Request | Change, FY2014-FY2015 | |
|---|---|---|---|---|---|
| | | | | Dollars | Percent |
| NNI | $1,550 | $1,538 | $1,537 | -$1 | -0.4% |

**Source:** EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

## Networking and Information Technology Research and Development Program[25]

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

President Obama requested $3.786 billion in FY2015 for the NITRD program. This is $114 million (2.9%) below the FY2014 funding level. The most substantial agency increases in NITRD funding under the Administration's FY2015 request were for the DOE ($54 million, 9.3%) and DOC ($6 million, 3.8%). The President's budget sought to reduce NITRD funding at DOD by $146 million (11.9%), DHS by $13 million (13.6%), NASA by $7 million (5.6%), HHS by $6 million (1-1%), and NSF by $2 million (0.2%).[26]

**Table 6. Networking and Information Technology Research and Development Program Funding, FY2013-FY2015**

(budget authority, in millions of current dollars)

| | FY2013 Actual | FY2014 Estimated | FY2015 Request | Change, FY2014-FY2015 | |
|---|---|---|---|---|---|
| | | | | Dollars | Percent |
| NITRD | $3,622 | $3,900 | $3,786 | -$114 | -2.9% |

**Source:** OSTP, EOP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

[24] EOP, OSTP, *The 2014 Budget: A World-Leading Commitment to Science and Research—Science, Technology, Innovation, and STEM Education in the 2014 Budget,* Table 2, April 10, 2013.

[25] For additional information on the NITRD program, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Background, Funding, and Activities*, by (name red acted) .

[26] Ibid.

## U.S. Global Change Research Program[27]

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."[28] Thirteen departments and agencies participate in the USGCRP.

President Obama proposed $2.501 billion for the USGCRP in FY2015, $12 million (0.5%) above the FY2014 estimated level of $2.489 billion. The most substantial agency increases in USGCRP funding under the Administration's FY2014 request were for DOE ($29 million, 13.4%), DOC ($19 million, 5.9%), and DOI ($18 million, 34.3%). The most significant decreases in USGCRP funding were for NASA ($39 million, 2.7%) and USDA ($23 million, 20.7%).[29]

**Table 7. U.S. Global Change Research Program Funding, FY2013-FY2015**

(budget authority, in millions of current dollars)

| | FY2013 Actual | FY2014 Estimated | FY2015 Request | Change, FY2014-FY2015 | |
|---|---|---|---|---|---|
| | | | | Dollars | Percent |
| USGCRP | $2,379 | $2,489 | $2,501 | $12 | 0.5% |

**Source:** EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

## BRAIN Initiative

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

> There is this enormous mystery waiting to be unlocked, and the BRAIN Initiative will change that by giving scientists the tools they need to get a dynamic picture of the brain in action and better understand how we think and how we learn and how we remember. And that knowledge could be—will be—transformative.[30]

Among the agencies participating in the BRAIN Initiative are the Defense Advanced Projects Research Agency (DARPA), NIH, NSF, and the Food and Drug Administration (FDA). The research supported under this initiative seeks to facilitate a better understanding of "how the brain records, processes, uses, stores, and retrieves vast quantities of information, and shed light on the complex links between brain function and behavior,"[31] and to help improve the prevention, diagnosis, and treatment of brain diseases such as Parkinson's and Alzheimer's.

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

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

[29] Ibid.

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

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

According to OSTP, federal investment in the BRAIN initiative was approximately $100 million in FY2014. The President's budget request sought to double funding to approximately $200 million in FY2015, including $100 million in funding from NIH, $80 million from DARPA, and $20 million from NSF.[32]

## Materials Genome Initiative

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

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

In congressional testimony, OSTP Director John Holdren stated that the purpose of the Materials Genome Initiative is to "speed our understanding of the fundamentals of materials science, providing a wealth of practical information that American entrepreneurs and innovators will be able to use to develop new products and processes" in much the same way that the Human Genome Project accelerated a range of biological sciences by identifying and deciphering the human genetic code.[34] Such research may contribute to the identification of substitutes for critical minerals that are in short supply or have at-risk supply chains; the design, development, and use of materials that could reduce the number and severity of traumatic brain injuries resulting from blasts, impacts, and collisions incurred in military engagements, motor vehicle accidents, and athletics; and the development of new lightweight materials for vehicles that could enable new energy storage and propulsion systems and improve fuel efficiency.[35] The President's FY2015 budget did not include a table of agency funding for the MGI. Among the agencies funding MGI R&D are DOE, DOD, NSF, and NIST.

## Advanced Manufacturing Partnership

In June 2011, President Obama launched the Advanced Manufacturing Partnership (AMP), an effort to bring together "industry, universities, and the Federal government to invest in emerging technologies that will create high-quality manufacturing jobs and enhance our global competitiveness."[36] Two R&D-focused components of the AMP are the National Robotics Initiative (NRI) and the National Network for Manufacturing Innovation (NNMI).

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

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

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

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

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

## National Robotics Initiative

The National Robotics Initiative seeks to "develop robots that work with or beside people to extend or augment human capabilities."[37] Among the goals of the program are increasing labor productivity in the manufacturing sector, assisting with dangerous and expensive missions in space, accelerating the discovery of new drugs, and improving food safety by rapidly sensing microbial contamination.[38] In FY2012, four agencies—NSF, NIH, NASA, and USDA—issued a joint solicitation to provide research funding for next-generation robotics. In addition, the Department of Defense, through multiple component agencies, is supporting the NRI through the Defense University Research Instrumentation Program. DOD is supporting the purchase of equipment to assist in robotics research to advance defense technologies and applications, including unmanned ground, air, sea, and undersea vehicles and autonomous systems.[39] The President's FY2015 budget does not include a table of agency funding for the NRI, but the initiative is referred to in the *Analytical Perspectives* supplement to the President's budget.[40]

## National Network for Manufacturing Innovation[41]

The President's FY2015 budget again proposed the establishment of a National Network for Manufacturing Innovation to promote the development of manufacturing technologies with broad applications. This request was not part of the President's FY2015 base budget request, but rather a part of the adjunct $56 billion Opportunity, Growth, and Security Initiative proposal. (For more information, see the "Opportunity, Growth, and Security Initiative" section.) The OGSI included $2.4 billion to establish up to 45 NNMI institutes. The President's two previous budget requests sought mandatory appropriations to NIST of $1 billion in support of up to 15 NNMI manufacturing innovation institutes.

As originally conceived, the NNMI would consist of

> a network of institutes where researchers, companies, and entrepreneurs can come together to develop new manufacturing technologies with broad applications. Each institute would have a unique technology focus. These institutes will help support an ecosystem of manufacturing activity in local areas. The Manufacturing Innovation Institutes would support manufacturing technology commercialization by helping to bridge the gap from the laboratory to the market and address core gaps in scaling manufacturing process technologies.[42]

Though the NNMI program has not been authorized or funded, four NNMI-like institutes have been awarded, one is being competed, and a funding commitment has been made by the President for four more. These centers are being led by DOD and DOE, with additional funding and/or support being provided by NIST, NASA, NSF, and other agencies.

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[37] Ibid.

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

[39] Ibid.

[40] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2014*, p. 371.

[41] For additional information on the NNMI, see CRS Report R42625, *The Obama Administration's Proposal to Establish a National Network for Manufacturing Innovation*, by (name redacted)

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

## Reorganization of STEM Education Programs

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

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

For FY2015, the Obama Administration proposed what it described as a "fresh" reorganization of the federal STEM education portfolio. Unlike the FY2014 proposal, which sought to transfer funding between agencies, the FY2015 proposal sought to consolidate funding within agencies. According to the Office of Management and Budget, the FY2015 reorganization would have consolidated or eliminated 31 programs at 9 agencies, affecting $145 million in FY2014 budget authority. The FY2015 budget request aimed to further reduce STEM education programs to 111 from their FY2014 level of 138. For additional information, see CRS Insight IN10011, *The Administration's Proposed STEM Education Reorganization: Where Are We Now?*, by (name redacted); CRS In Focus IF00013, *The President's FY2015 Budget and STEM Education* (In Focus), by (name redacted); and CRS Report R42642, *Science, Technology, Engineering, and Mathematics (STEM) Education: A Primer*, by (name redacted) and (name redacted).

# FY2015 Appropriations Status

The remainder of this report provides a more in-depth analysis of R&D in 12 federal departments and agencies that, in aggregate, receive more than 98% of federal R&D funding. Annual appropriations for these agencies are provided through 9 of the 12 regular appropriations bills. For each agency covered in this report, **Table 8** shows the corresponding regular appropriations bill that provides funding for the agency, including its R&D activities.

Congress completed appropriations action for most federal agencies through enactment of the Consolidated and Further Continuing Appropriations Act, 2015, which was passed by the House on December 11 and by the Senate on December 13, and signed into law on December 16, 2014. The measure provides FY2015 appropriations for agencies covered by 11 of the regular appropriations bills, and provides for further continuing Homeland Security appropriations through February 27, 2015, in Division L of the act.

Previously, Congress has not completed action on any of the 12 regular appropriations bills for FY2015. The House Committee on Appropriations had reported all but the Labor-HHS appropriations bill and the House had passed seven of the regular appropriations bills that provide R&D funding. The Senate Committee on Appropriations had reported six of the regular appropriations bills that provide R&D funding; the full Senate had not passed any of the regular appropriations bills.

On September 19, 2014, President Obama signed into law the Continuing Appropriations Resolution, 2015 (P.L. 113-164). The act provided continuing FY2015 appropriations to federal

agencies for continuing projects and activities at the rate and under the authority and conditions provided in the Consolidated Appropriations Act, 2014 (P.L. 113-76), less a 0.0554% rescission, until December 11, 2014, or until enactment of regular appropriations legislation. H.J.Res. 130 (P.L. 113-202) extended the provisions of P.L. 113-164 through December 13, 2014. H.J.Res. 131 (P.L. 113-203) further extended the provisions of P.L. 113-164 through December 17, 2014.

This report will be updated when Congress and the President complete action on appropriations for the Department of Homeland Security.

In addition to this report, CRS produces individual reports on each of the appropriations bills. These reports can be accessed via the CRS website at http://crs.gov/Pages/clis.aspx?cliid=73. Also, the status of each appropriations bill is available on the CRS webpage, *Status Table of Appropriations*, available at http://crs.gov/Pages/AppropriationsStatusTable.aspx.

**Table 8. Alignment of Agency R&D Funding and Regular Appropriations Bills**

| Department/Agency | Regular Appropriations Bill |
|---|---|
| Department of Defense | Department of Defense Appropriations Act |
| Department of Homeland Security | Department of Homeland Security Appropriations Act |
| National Institutes of Health | Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act |
| Department of Energy | Energy and Water Development and Related Agencies Appropriations Act |
| National Science Foundation | Commerce, Justice, Science, and Related Agencies Appropriations Act |
| Department of Commerce<br>- National Institute of Standards and Technology<br>- National Oceanic and Atmospheric Administration | Commerce, Justice, Science, and Related Agencies Appropriations Act |
| National Aeronautics and Space Administration | Commerce, Justice, Science, and Related Agencies Appropriations Act |
| Department of Agriculture | Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act |
| Department of the Interior | Department of the Interior, Environment, and Related Agencies Appropriations Act |
| Environmental Protection Agency | Department of the Interior, Environment, and Related Agencies Appropriations Act |
| Department of Transportation | Transportation, Housing and Urban Development, and Related Agencies Appropriations Act |
| Department of Veterans Affairs | Military Construction and Veterans Affairs, and Related Agencies Appropriations Act |

**Source:** CRS website, FY2014 Status Table of Appropriations, available at http://crs.gov/Pages/AppropriationsStatusTable.aspx.

# Department of Defense[43]

Congress supports research and development in the Department of Defense (DOD) primarily through its Research, Development, Test, and Evaluation (RDT&E) appropriation. The appropriation supports the development of the nation's future military hardware and software and the technology base upon which those products rely.

Nearly all of what DOD spends on RDT&E is appropriated in Title IV of the defense appropriation bill. (See **Table 9**.) 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 and the Chemical Agents and Munitions Destruction Program. RDT&E funds are also appropriated as part of the National Defense Sealift Fund. The Defense Health Program supports the delivery of health care to DOD personnel and their families. Program funds are requested through the Operations and Maintenance appropriations request. The program's RDT&E funds support congressionally directed research in such areas as breast, prostate, and ovarian cancer and other medical conditions. Congress appropriates funds for this program in Title VI (Other Department of Defense Programs) of the defense appropriations bill. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program are requested through the Defensewide Procurement appropriations request. Congress appropriates funds for this program also in Title VI. The National Defense Sealift Fund (funded through Title V of the defense appropriation bill) supports the procurement, operation and maintenance, and research and development of the nation's naval reserve fleet and a U.S. flagged merchant fleet that can serve in time of need.[44]

The Joint Improvised Explosive Device Defeat Fund (JIEDDF, also funded through Title VI of the defense appropriation bill) contains RDT&E monies. However, the fund does not contain an RDT&E line item as do the programs mentioned above. The Joint Improvised Explosive Device Defeat Office, which administers the fund, tracks (but does not report) the amount of funding allocated to RDT&E. The JIEDDF funding is not included in the table below.

RDT&E funds also have been requested and appropriated as part of DOD's separate funding to support efforts in what the Bush Administration had termed the Global War on Terror (GWOT), and what the Obama Administration refers to as Overseas Contingency Operations (OCO). Typically, the RDT&E funds appropriated for GWOT/OCO activities go to specified Program Elements (PEs) in Title IV. However, they are requested and accounted for separately. The Bush Administration requested these funds in separate GWOT emergency supplemental requests. The Obama Administration, while continuing to identify these funds uniquely as OCO requests, has included these funds as part of the regular budget, not in emergency supplementals. However, the Obama Administration, on occassion, has asked for additional OCO funds in supplemental requests, if the initial OCO funding is not enough to get through the fiscal year. The OCO budget has been declining as operations in Iraq and Afghanistan are reduced.

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

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

[44] The Administration requested no funding for the National Defense Sealift Fund in FY2015, requesting instead that funding for those activities be supported by other programs. Congress did not approve the administration's request and continued to provide funding through the National Defense Sealift Fund, including RDT&E funds.

Forces Fund, the Afghanistan Security Forces Fund, and the Pakistan Counterinsurgency Capability Fund. Another transfer fund is the Mine Resistant and Ambush Protected Vehicle Fund (MRAPVF). Congress typically makes a single appropriation into each of these funds, and authorizes the Secretary to make transfers to other accounts, including RDT&E, at his discretion.

For FY2015, the Obama Administration requested $63.534 billion for DOD's baseline Title IV RDT&E. This is $569 million above what was enacted for FY2014. The Administration did not release an OCO budget for FY2015 until June 2014 and then made an amended OCO request in November. The June OCO request included $80 million for RDT&E activities. The November OCO request increased that to $225 million.

In addition to the baseline Title IV RDT&E request, the Administration requested $655 million in RDT&E through the Defense Health Program and $596 million in RDT&E through the Chemical Agents and Munitions Destruction program for FY2015. The Administration requested no RDT&E funding through the National Defense Sealift Fund for FY2015. RDT&E funding for these activities would be transferred to other Navy accounts.

The House approved its version of the defense appropriations bill (H.R. 4870) on June 20. It provided $63.363 billion for Title IV RDT&E, $171 million below what was requested, but $398 million above FY2014 funding. It fully funded the request for the Chemical Agents and Munitions Destruction RDT&E ($596 million) and increased RDT&E in the Defense Health Program to $1.278 billion (this includes $32 million added by amendments approved on the House floor). The House accepted the Administration's request to transfer funds from the National Defense Sealift Fund to baseline Title IV Navy program elements. Major changes made by the House to the budget request included $200 million added to the Air Force account for the development of liquid-fueled rocket engines; $100 million added to the Air Force account to recapitalize a program to develop a new combat rescue helicopter; $172 million added to the Defensewide account for the Israeli Cooperative Program; and $250 million added to the Defensewide account to continue support for the Rapid Innovation Program.[45] General Provision 8106 of the House bill called for a general reduction ($545 million) of the total amount appropriated by the bill, citing more favorable currency exchange rates. Although not stated in the provision, general reductions of this sort typically are made proportionately across all program elements. The House approved figures cited above and below do not factor in this general reduction.

The Senate Appropriations Committee reported its version of H.R. 4870 on July 17 (S.Rept. 113-211). The committee recommended $62.567 billion for Title IV RDT&E, $967 million below the administration's request. The committee's recommendation included full funding for the Chemical Agents and Munitions Destruction RDT&E and an increase in Defense Health Program RDT&E to $1.436 billion. The Senate did not agree to abolish the National Defense Sealift Fund, providing $30 million in RDT&E funding. In major adjustments, the committee did not support the Army's requested increase for Patriot Modernization (which the House supported), cutting the request by $115 million. The committee did not support the House's addition of $200 million for new liquid-fueled rocket development, but did add $100 million, as did the House, for the Air Force's rescue helicopter recapitalization. The committee provided an extra $174 million for the Israeli Cooperative Program ($2 million more than the House increase), but only provided $75 million for the Defense Rapid Innovation Fund.

[45] The Rapid Innovation Program is designed to help further mature technologies developed with Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) funds so they can be incorporated more quickly into system acquisition programs.

FY2015 DOD appropriations were included as Division C of the Consolidated and Further Continuing Appropriations Act of 2015 (P.L. 113-235). President Obama signed the act on December 16, 2014. The act provided $63.713 billion for Title IV RDT&E, $179 million above what was requested. The act fully funded the Chemical Agents and Munitions Destruction RDT&E and provided $1.731 billion for Defense Health Program RDT&E ($1.076 billion more than what was requested, $295 million than recommended by the Senate Appropriations Committee, and $443 million more than approved by the House). The act provided $24 million for RDT&E in the National Defense Sealift Fund. The act reduced the Patriot Modernization request by $95 million and no funds were provided for the liquid-fueled rocket development supported by the House, but it did include $100 million for the rescue helicopter recapitalization. The act also provided an additional $172 million for the Israeli Cooperative Program, $225 million for the Rapid Innovation Program, and $1 million in RDT&E for the Office of the Inspector General.

The act also provided $228 million in OCO-related RDT&E. In addition, the act provided $95 million in emergency RDT&E funding in Title X for Ebola Response and Preparedness. Funding would go to DARPA and the Chemical and Biological Defense Program to develop vaccines, therapeutics, and diagnostics, and conduct Phase I clinical trials on experimental vaccines and therapeutics.

RDT&E funding can be analyzed in different ways. Each of the military departments request and receive their own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency), collectively aggregated within the Defensewide account. RDT&E funding also can be characterized by budget activity (i.e., the type of RDT&E supported). Those budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced technology development, respectively) constitute what is called DOD's Science and Technology Program (S&T) and represent the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components (e.g., the Joint Strike Fighter or missile defense systems), for which an operational need has been determined and an acquisition program established. Budget activity 6.6 provides management support, including support for test and evaluation facilities. Budget activity 6.7 supports system improvements in existing operational systems.

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

The FY2015 Title IV baseline S&T funding request was $11.515 billion, $494 million below what was enacted in FY2014. The House approved $11.935 billion for the S&T accounts, more than what was requested but less than FY2014 levels. This does not include the $545 million general reduction to the overall appropriation mentioned above, nor does it include $69 million in undistributed cuts made to the DARPA account.[46] The Senate Appropriations Committee recommended $12.037 billion for S&T, not counting the general reduction it also recommended. P.L. 113-235 provided $12.414 billion for S&T, nearly $900 million more than what was

[46] Nearly all of this reduction will affect the House S&T figure since all but DARPA's research management support line item are S&T activities. The Senate Appropriations Committee recommended specific reductions to DARPA's request for a net reduction of $66 million. P.L. 113-235 reduced DARPA's request by $43 million.

requested. However, this does not include the S&T share of the $386 million general reduction approved in the final Act.

Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities. DOD is not a large supporter of basic research, when compared to NIH or NSF. However, over half of DOD's basic research budget is spent at universities and represents the major contribution of funds in some areas of science and technology (such as electrical engineering and material science). The Administration requested $2.018 billion for basic research for FY2015. This is $147 million less than what the Administration requested in FY2014, and $149 million less than what was enacted. The House bill provided $2.026 million for basic research, not including the general reduction or the potential reductions associated with DARPA's undistributed $69 million reduction. The Senate Appropriations Committee recommended $2.274 billion for basic research, not counting the general reduction it recommended. P.L. 113-235 provided $2.278 billion, not counting the agreed upon general reduction to DOD's overall appropriation.

**Table 9. Department of Defense RDT&E**

(in millions of dollars)

| | FY2014 Enacted | | FY2015 Request | | House Approved[a] | | Senate Committee[b] | | FY2015 Enacted[c] (P.L. 113-235) | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Budget Account** | **Base** | **OCO** | **Base** | **OCO[d]** | **Base** | **OCO** | **Base** | **OCO** | **Base** | **OCO** |
| Army | 7,123 | 14 | 6,594 | 5 | 6,720 | | 6,544 | 2 | 6,676 | 2 |
| Navy | 14,946 | 34 | 16,266 | 36 | 15,878 | | 15,920 | 35 | 15,958 | 36 |
| Air Force | 23,572 | 9 | 23,740 | 15 | 23,439 | | 23,083 | | 23,644 | 15 |
| Defensewide | 17,078 | 78 | 16,766 | 169 | 17,078[e] | | 16,806 | 46 | 17,226 | 175 |
| Dir. Test & Eval. | 246 | | 167 | | 248 | | 214 | | 209 | |
| **Total Title IV—By Account[f]** | **62,965** | **135** | **63,534** | **225** | **63,363** | | **62,567** | **83** | **63,713** | **228** |
| **Budget Activity** | | | | | | | | | | |
| 6.1 Basic Research | 2,167 | | 2,018 | | 2,026 | | 2,274 | | 2,278 | |
| 6.2 Applied Research | 4,641 | | 4,457 | | 4,530 | | 4,592 | | 4,605 | |
| 6.3 Advanced Dev. | 5,201 | | 5,040 | | 5,379 | | 5,171 | | 5,531 | |
| 6.4 Advanced Component Dev. and Prototypes | 11,629 | 7 | 12,334 | 5 | 12,247 | | 12,456 | 2 | 12,352 | 2 |
| 6.5 Systems Dev. And Demo | 11,517 | 7 | 11,087 | | 11,150 | | 10,526 | | 11,005 | |
| 6.6 Management Support[g] | 4,309 | | 4,216 | | 4,261 | | 4,249 | | 4,352 | |
| 6.7 Op. Systems Dev.[h] | 23,502 | 122 | 24,382 | 220 | 23,837 | | 23,298 | 81 | 23,590 | 226 |
| **Total Title IV—by Budget Activity[f]** | **62,965** | **135** | **63,534** | **225** | **63,430[i]** | | **62,567** | **83** | **63,713[c]** | **228** |

| Budget Account | FY2014 Enacted Base | FY2014 Enacted OCO | FY2015 Request Base | FY2015 Request OCO[d] | House Approved[a] Base | House Approved[a] OCO | Senate Committee[b] Base | Senate Committee[b] OCO | FY2015 Enacted[c] (P.L. 113-235) Base | FY2015 Enacted[c] (P.L. 113-235) OCO |
|---|---|---|---|---|---|---|---|---|---|---|
| **Title V—Revolving and Management Funds** | | | | | | | | | | |
| National Defense Sealift Fund | 45 | | 0[j] | | 0[j] | | 30 | | 24 | |
| **Title VI—Other Defense Programs** | | | | | | | | | | |
| Defense Health Program | 1,552 | | 655 | | 1,278[k] | | 1,436 | | 1,731 | |
| Chemical Agents and Munitions Destruction | 634 | | 596 | | 596 | | 596 | | 596 | |
| Inspector General | 0 | | 0 | | 0 | | 0 | | 1 | |
| **Title X—Ebola Response and Preparedness** | | | 112[l] | | | | 95 | | | |
| **Opportunity, Growth, and Security Initiative** | | | 2,100[m] | | | | | | | |
| **Grand Total[f]** | **65,196** | **135** | **66,997** | **225** | **63,292[e]** | | **64,724** | **83** | **66,065[c]** | **228** |

**Source:** CRS, adapted from the Department of Defense Budget, Fiscal Year 2015 RDT&E Programs (R-1), March 2014 and relevant FY2015 Budget Justification (R-2) documents. House of Representatives, Department of Defense Appropriations Bill, 2015, H.Rept. 113-474, to accompany H.R. 4870. Senate, Department of Defense Appropriations Bill, 2015, S.Rept. 113-211, to accompany H.R. 4877. *Congressional Record*, December 11, 2014, Explanatory Statement submitted by Mr. Rogers, pp. H9364-H9647.

a. Figures in this column do not reflect General Provision 8106 in H.R. 4870, which reduced the House's total DOD appropriation by $545 million.

b. Figures in this column do not reflect General Provision 8076 in the Senate version of H.R. 4870, which reduced the total recommended DOD appropriation by $300 million.

c. Figures in this column do not reflect General Provision 8080 in P.L. 113-235 which reduces DOD's total appropriation by $386 million.

d. DOD submitted two F2015 OCO requests: one in June and an amended request in November. This column reflects the November amended request.

e. Includes a $69 million undistributed reduction to the Defense Advanced Research Projects Agency (DARPA) program.

f. Figures may not add due to rounding.

g. Includes funding for Director of Test and Evaluation.

h. Includes funding for classified programs.

i. Does not include DARPA's $69 million undistributed reduction.

j. Transferred to other Navy RDT&E accounts.

k. Includes $32 million added by amendments on the House floor.

l. Requested as part of the administration's November 5, 2014, emergency supplemental request.

m. See fact sheet, "The 2015 Budget: Science, Technology, and Innovation for Opportunity and Growth. White House Office of Science and Technology Policy," March 2014, p. 4. Available at http://www.whitehouse.gov/administration/eop/ostp/rdbudgets.

# Department of Homeland Security[47]

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

The President has requested $1.394 billion in FY2015 for R&D and related programs in the Department of Homeland Security. This would be an 8.5% decrease from $1.524 billion in FY2014. The requested total includes $1.072 billion for the S&T Directorate, $304 million for DNDO, and $18 million for Research, Development, Test, and Evaluation (RDT&E) in the U.S. Coast Guard. In the 113th Congress, the House bill (H.R. 4903 as reported) would have provided $1.430 billion, including $1.107 billion for the S&T Directorate, $312 million for DNDO, and $11 million for Coast Guard RDT&E. The Senate bill (S. 2534 as reported) would have provided $1.396 billion, including $1.071 billion for the S&T Directorate, $306 million for DNDO, and $18 million for Coast Guard RDT&E. Both these bills expired at the end of the 113th Congress. The Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235) provided continuing appropriations for DHS through February 27, 2015, at the FY2014 rate. In the 114th Congress, H.R. 240 as passed by the House would provide $1.430 billion, including $1.104 billion for the S&T Directorate, $308 million for DNDO, and $18 million for Coast Guard RDT&E. (See **Table 10**.)

The S&T Directorate is the primary DHS R&D organization.[48] Led by the Under Secretary for Science and Technology, it performs R&D in several laboratories of its own and funds R&D performed by the DOE national laboratories, industry, universities, and others. It also conducts testing and other technology-related activities in support of acquisitions by other DHS components. The Administration's request of $1.072 billion for the S&T Directorate in FY2015 is 12.2% less than the FY2014 appropriation of $1.220 billion. The decrease results largely from the request in Laboratory Facilities for $300 million, versus $404 million in FY2014, for construction of the National Bio and Agro-Defense Facility (NBAF). Within the request for Research, Development, and Innovation, border security R&D would increase by $7 million; Apex projects would receive the same funding as in FY2014; and the other four thrust areas would all decrease. The proposed reduction of $9 million for University Programs would decrease the annual funding rate for existing university centers of excellence and might also reduce the number of centers supported.

In the 113th Congress, the House-reported bill would have provided $1.107 billion for the S&T Directorate in FY2015.[49] In previous years, the House committee report had criticized the Research, Development, and Innovation (RD&I) budget item for being too all-encompassing and not specifying funding levels for specific thrust areas. For FY2015, the House report

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

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

[49] Not including a rescission of $14 million from prior-year balances in the R&D, Acquisition, and Operations account.

recommended $28 million more than the request for RD&I and stated that "to provide the new Under Secretary for S&T flexibility to shift resources ... the Committee provides the funds for RD&I without breakouts for specific thrust areas." The report stated that the committee was pleased with the results of Apex projects (one of the RD&I thrust areas) and urged the S&T Directorate to expand the Apex concept into other areas of its work. In Laboratory Facilities, the report recommended the requested $300 million for NBAF construction. The recommended funding for University Programs was $10 million more than requested. The report stated that this level of support would allow the continuation of all existing university centers of excellence as well as a new center that is expected to be awarded in FY2015. The report directed DHS to define and report on key metrics used to make center awards.

Also in the 113th Congress, the Senate-reported bill would have provided $1.071 million for the S&T Directorate in FY2015.[50] As in the House, the Senate committee in previous years had criticized the consolidation of RD&I into a single budget item. For FY2015, the Senate report stated that "in order to provide additional flexibility ... the Committee does not break out the RD&I budget in thrust areas." Within RD&I, the report expressed support for the Apex concept and encouraged the S&T Directorate to invest more of its resources in that effort. In Laboratory Facilities, the recommended amount for NBAF construction was $300 million, as requested. In University Programs, the report recommended $9 million more than the Administration's request and explained that the increase was for university centers of excellence, including support for the existing centers and the new center to be awarded in FY2015.

In the 114th Congress, H.R. 240 would provide $1.104 billion for the S&T Directorate in FY2015.[51] The explanatory statement does not specify the distribution of RD&I funds among thrust areas. It directs DHS to brief the appropriations committees on that distribution and on the allocation of funds to Apex projects. In Laboratory Facilities, it allocates $300 million for NBAF construction. For University Programs, it allocates an amount between the House and Senate committee recommendations from the 113th Congress.

The NBAF is a planned replacement for the current Plum Island Animal Disease Center. Site preparation has been completed, and construction of a central utility plant is under way. DHS expects to award a contract for construction of the main laboratory in FY2015. In preparation for this, the department issued a request for information from industry in December 2014.[52] According to DHS, the FY2015 budget request, together with previously appropriated federal and state funds and additional anticipated funds from the state of Kansas, would fully fund the NBAF construction contract. Despite receiving $404 million for NBAF construction in FY2014, DHS does not intend to begin construction until full funding for the project is appropriated. The estimated total project cost for NBAF is $1.250 billion, up from $1.230 billion in the FY2014 budget. DHS expects NBAF construction and commissioning to be completed in the third quarter (Q3) of FY2021, one year later than the estimate of Q3 FY2020 provided in the FY2014 budget. The previous estimate for NBAF, given in the FY2012 budget, was a total project cost of $725 million with a completion date of Q1 FY2016.

DNDO is the primary DHS organization for combating the threat of nuclear attack. It is responsible for nuclear detection research, development, testing, evaluation, acquisition, and operational support. The Administration has requested $304 million for DNDO in FY2015, an

[50] Not including a rescission of $14 million from prior-year balances in the R&D, Acquisition, and Operations account.

[51] Not including a rescission of $17 million from prior-year balances in the R&D, Acquisition, and Operations account and a rescission of $0.5 million from prior-year balances in the Management and Administration account.

[52] Solicitation HSHQDC-15-I-NBAFK, December 12, 2014, available at https://www.fbo.gov.

increase of 6.7% from the FY2014 appropriation of $285 million. In the Systems Acquisition account, funding for the Securing the Cities program would decrease by $10 million, while funding for Human Portable Radiation Detection Systems would increase by $37 million to support the procurement of handheld radioisotope identification devices (RIIDs) for U.S. Customs and Border Protection.

In the 113th Congress, the House-reported bill would have provided $312 million for DNDO in FY2015. The report recommended $7 million more than the request for Securing the Cities and stated that this would "support ongoing efforts in current ... cities and the risk-based expansion to new cities." The report recommended the requested increase for Human Portable Radiation Detection Systems (HPRDS).

Also in the 113th Congress, the Senate-reported bill would have provided $306 million for DNDO in FY2015. Like the House report, the Senate report recommended $7 million more than the Administration's request for the Securing the Cities program. The Senate report recommended $2 million less than the request for HPRDS, and it directed DNDO to provide a multiyear procurement forecast and deployment schedule for these funds.

In the 114th Congress, H.R. 240 would provide $308 million for DNDO in FY2015. The explanatory statement includes the same amount for Securing the Cities as the House and Senate committee reports recommended in the 113th Congress. Its allocation for HPRDS is the same as the Senate committee report's recommendation from the 113th Congress.

In September 2012, the Government Accountability Office (GAO) reported that although the S&T Directorate, DNDO, and the Coast Guard are the only DHS components that report R&D activities to the Office of Management and Budget, several other DHS components also fund R&D and activities related to R&D.[53] The GAO report found that DHS lacks department-wide policies to define R&D and guide reporting of R&D activities, and, as a result, DHS does not know the total amount its components invest in R&D. The report recommended that DHS develop policies and guidance for defining, reporting, and coordinating R&D activities across the department, and that DHS establish a mechanism to track R&D projects. In March 2013, the explanatory statement for the Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) directed the Secretary of Homeland Security, through the Under Secretary for Science and Technology, to establish a review process for all R&D and related work within DHS.[54] In April 2013, citing its September 2012 report, GAO listed DHS R&D as an area of concern in its annual report on fragmented, overlapping, or duplicative federal programs.[55] In January 2014, the joint explanatory statement for the Consolidated Appropriations Act, 2014 (P.L. 113-76), directed DHS to implement and report on new policies for R&D prioritization, and to review and, in accordance with GAO's recommendations, to implement policies and guidance for defining and overseeing R&D department-wide.[56] In July 2014, GAO reported that DHS had updated its guidance to include a definition of R&D and was conducting R&D portfolio reviews across the department but had not yet developed policy guidance for DHS-wide R&D oversight, coordination, and tracking.[57]

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

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

[55] U.S. Government Accountability Office, *2013 Annual Report: Actions Needed to Reduce Fragmentation, Overlap, and Duplication and Achieve Other Financial Benefits*, GAO-13-279SP, April 2013.

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

[57] U.S. Government Accountability Office, *Department of Homeland Security: Continued Actions Needed to* (continued...)

**Table 10. Department of Homeland Security R&D and Related Programs**

(budget authority in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 H. Cmte. | FY2015 S. Cmte. | FY2015 House |
|---|---|---|---|---|---|
| **Directorate of Science and Technology** | **$1,220** | **$1,072** | **$1,107** | **$1,071** | **$1,104** |
| Management and Administration | 129 | 130 | 127 | 130 | 130[a] |
| R&D, Acquisition, and Operations | 1,091 | 942 | 980[b] | 942[b] | 974[c] |
| Research, Development, and Innovation | 462 | 434 | 462 | 426 | 457 |
| Laboratory Facilities | 548 | 435 | 435 | 435 | 435 |
| Acquisition and Operations Support | 42 | 42 | 42 | 42 | 42 |
| University Programs | 40 | 31 | 41 | 40 | 40 |
| **Domestic Nuclear Detection Office** | **285** | **304** | **312** | **306** | **308** |
| Management and Administration | 37 | 37 | 36 | 37 | 37 |
| Research, Development, and Operations | 205 | 199 | 201 | 196 | 198 |
| Systems Architecture | 21 | 18 | 18 | 17 | 17 |
| Systems Development | 21 | 22 | 22 | 21 | 21 |
| Transformational R&D | 71 | 70 | 70 | 69 | 70 |
| Assessments | 39 | 38 | 38 | 38 | 38 |
| Operations Support | 30 | 32 | 32 | 31 | 31 |
| National Technical Nuclear Forensics Center | 23 | 20 | 22 | 20 | 21 |
| Systems Acquisition | 43 | 68 | 75 | 73 | 73 |
| Radiation Portal Monitors Program | 7 | 5 | 5 | 5 | 5 |
| Securing the Cities | 22 | 12 | 19 | 19 | 19 |
| Human Portable Radiation Detection Systems | 14 | 51 | 51 | 49 | 49 |
| **U.S. Coast Guard RDT&E** | **19** | **18** | **11** | **18** | **18** |
| **DHS, Total** | **1,524** | **1,394** | **1,430** | **1,396** | **1,430** |

**Sources:** FY2014 enacted and FY2015 request from DHS FY2015 congressional budget justification, http://www.dhs.gov/dhs-budget. FY2015 House committee from H.R. 4903 as reported (113th Congress) and H.Rept. 113-481. FY2015 Senate committee from S. 2534 as reported (113th Congress) and S.Rept. 113-198. FY2015 House from H.R. 240 as passed by the House (114th Congress) and explanatory statement, *Congressional Record*, January 13, 2015, at pp. H287-H288.

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

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

b. Does not reflect a rescission of $14 million from prior-year balances.

c. Does not reflect a rescission of $17 million from prior-year balances.

(...continued)

*Strengthen Oversight and Coordination of Research and Development*, GAO-14-813T, July 31, 2014.

# National Institutes of Health[58]

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. An agency in the Department of Health and Human Services (HHS), the NIH mission is "to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce the burdens of illness and disability."[59] The agency's organization consists of the Office of the NIH Director and 27 institutes and centers.

NIH supports and conducts a wide range of basic and clinical research, research training, and health information dissemination across all fields of biomedical and behavioral sciences. About 83% of NIH's budget goes out to the extramural research community in the form of grants, contracts, and other awards. This funding supports research performed by more than 300,000 non-federal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions around the country and abroad.[60] The NIH Office of the Director (OD) sets overall policy for NIH and coordinates the programs and activities of all NIH components, particularly in areas of research that involve multiple institutes. The institutes and centers (collectively called ICs) focus on particular diseases, areas of human health and development, or aspects of research support. Each IC plans and manages its own research programs in coordination with OD. As shown in **Table 11**, Congress provides separate appropriations to 24 of the 27 ICs, to OD, and to an intramural Buildings and Facilities account. The other three centers, which perform centralized support services, are funded through assessments on the IC appropriations.

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

The President's FY2015 budget requested an NIH program level total of $30.362 billion, an increase of $211 million (0.7%) over the FY2014 level of $30.151 billion (see **Table 11**). Under the President's proposed Opportunity, Growth, and Security Initiative (OGSI), NIH would also have received an additional $970 million, increasing the requested NIH budget to a total program level of $31.332 billion in FY2015. These OGSI funds were targeted for the BRAIN Initiative, improving the sharing and analysis of complex biomedical data sets, expanding research on Alzheimer's disease and vaccine development, accelerating efforts to identify and develop new therapeutic drug targets, and supporting other innovative projects.[61]

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[58] This section was written by (name redacted), Specialist in Biomedical Policy , CRS Domestic Social Policy Division. For background information on NIH, see CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*, by (name redacted), and CRS Report R43341, *NIH Funding: FY1994-FY2015*, by (name redacted) .

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

[60] Department of Health and Human Services, *Fiscal Year 2015 Budget in Brief*, Washington, DC, March 4, 2014, p. 39, http://www.hhs.gov/budget/fy2015/fy-2015-budget-in-brief.pdf.

[61] Department of Health and Human Services, *Fiscal Year 2015 Budget in Brief*, Washington, DC, March 4, 2014, p. (continued...)

P.L. 113-235 (Division G) provides $30.084 billion for NIH in FY2015.[62] This total consists of $29.369 billion in discretionary budget authority for the NIH institutes and centers plus $715 million from a PHS Act transfer. NIH and other HHS agencies and programs authorized under the PHS Act are subject to a budget assessment called the PHS Program Evaluation Set-Aside, also called the evaluation tap. Section 241 of the PHS Act (42 U.S.C. §238j) authorizes the Secretary to use a portion of eligible appropriations to study the effectiveness of federal health programs and to identify improvements. Although the PHS Act limits the tap to no more than 1% of eligible appropriations, in recent years the annual Labor/HHS and Education appropriations act has specified a higher amount (2.5% in FY2015) and also typically directs 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 traditionally been the largest "donor" of program evaluation funds and a relatively minor recipient.[63] Under P.L. 113-235, NIH contributes $689 million to the tap and in FY2015 it receives $715 million, an increase over the $8.2 million the agency has received in the past from the transfer.[64] P.L. 113-235 allocates the entire $715 million to the National Institute of General Medical Sciences (NIGMS), offsetting the more than $700 million reduction in discretionary budget authority for NIGMS in the law compared with its FY2014 funding level. The NIH program level in FY2015 is $30.311 billion, which includes $77 million from the Interior/Environment appropriation for Superfund-related research and $150 million in mandatory funding for research on type 1 diabetes.[65]

Except for the mandatory diabetes funding, Congress does not usually specify amounts for particular diseases or research areas. Congress generally appropriates specific amounts to each IC and leaves it to NIH and its scientific advisory panels to allocate funding to different research areas.[66] Some bills may propose authorizations for designated research purposes, but funding generally remains subject to discretionary appropriations and the NIH peer review process. However, the explanatory statement on P.L. 113-235 states that the law provides an increase of over $25 million to the National Institute on Aging, and, without specifying an amount,

(...continued)

39, http://www.hhs.gov/budget/fy2015/fy-2015-budget-in-brief.pdf. Note that P.L. 113-235 did not provide any OGSI funds. For more information about the OGSI, see earlier discussion at "Opportunity, Growth, and Security Initiative Opportunity, Growth, and Security Initiative.")

[62] This amount does not include $238,000,000 for the National Institute for Allergy and Infectious Diseases (NIAID) for research on Ebola that was provided in Title VI of Division G.

[63] Section 205 of the FY2012 Labor/HHS and Education appropriations act capped the set-aside at 2.5%, which drew over $700 million from the NIH budget. The same percentage was assessed in FY2013 under the continuing appropriations act. The FY2014 President's budget proposed increasing the PHS set-aside to 3.0%. The Senate committee rejected the increase, largely because of its effect on NIH, estimating that it would have taken an extra $147 million from NIH. (See S.Rept. 113-71 on S. 1284, p. 41 and p. 83.) The Consolidated Appropriations Act, 2014 (P.L. 113-76), set the assessment at 2.5%. The President's FY2015 Budget again proposed increasing the tap from 2.5% to 3.0%; P.L. 113-235 set the assessment at 2.5%. By convention, budget tables such as **Table 11** do not subtract the amount of the evaluation tap from the agencies' appropriations. For further information on the PHS Evaluation Set-Aside, see CRS Report R43304, *Public Health Service Agencies: Overview and Funding*, coordinated by (name redac ted) .

[64] U.S. Department of Health and Human Services, "Use of Public Health Service Set-Aside Authority for Fiscal Year 2015, Report to Congress." This report includes a table at the end of the report that lists the amount of set-aside funds donated and received by each agency and office in FY2015.

[65] Mandatory funds for type 1 diabetes research under PHS Act §330B were provided by P.L. 112-240 in FY2014 and P.L. 113-93 in FY2015.

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

encourages NIH to direct a significant portion of the increase for research on Alzheimer's disease. In addition, the bill specifies that $12.6 million is added to the Common Fund for the purpose of carrying out pediatric research as authorized in the Gabriella Miller Kids First Research Act (P.L. 113-94). The Common Fund is located within OD and is intended to support research in emerging areas of scientific opportunity, public health challenges, or knowledge gaps that might benefit from collaboration between two or more institutes or centers.

Under the President's FY2015 budget request, most of the NIH institutes and centers would have received essentially flat funding compared to FY2014 with very few exceptions, such as a $50 million (9%) increase for the Common Fund, and a $25 million (4%) increase for the National Center for Advancing Translational Sciences (NCATS). The overview below outlines areas of emphasis in the FY2015 NIH budget request and response, when provided, in the congressional agreement on P.L. 113-235.

***Investing in Basic Research.*** About 54% of the proposed NIH budget was targeted for basic research on the causes of disease onset and progression. The multi-agency Brain Research through Application of Innovative Neurotechnologies (BRAIN) initiative develops and applies new tools for the study of complex brain functions. This collaboration with the National Science Foundation and the Defense Advanced Research Projects Agency (DARPA) planned on spending a total of $200 million in FY2015 under the request. The NIH portion of about $100 million was an increase of $60 million over FY2014. Insights into brain circuitry and activity gained via the BRAIN initiative are expected to help reveal the underlying problems in numerous brain disorders and may provide therapeutic or prevention approaches for conditions such as Alzheimer's disease, autism, epilepsy, schizophrenia, depression, chronic pain, addiction, post-traumatic stress disorder, and traumatic brain injury.

***Big Data.*** Continued support in FY2015 of the Big Data to Knowledge (BD2K) initiative seeks to improve the handling, sharing, analysis, and protection of large complex biomedical datasets of information, such as high-resolution medical images and DNA sequencing data from many individuals. The congressional agreement on P.L. 113-235 directs NIH to include privacy protection requirements in every grant that involves human research.

***Precision Medicine.*** In the FY2012 appropriations act, Congress approved an NIH reorganization that consolidated various programs into NCATS. The center focuses on improved methods to test possible new therapies and encourage their commercialization and dissemination into clinical practice. Part of this focus is what NIH calls precision medicine, tailoring therapy to the individual characteristics of the patient but also avoiding needless treatment and costs for those who will not benefit. Within NCATS, the Cures Acceleration Network (CAN) would have received $30 million under the President's FY2015 request, a $20 million increase over FY2014, to speed the development of "high need cures" by removing barriers between research discovery and clinical testing. Under the request, NIH would continue to carry out a new collaboration—the Accelerating Medicines Partnership (AMP)—with biopharmaceutical firms and non-profit organizations aimed at promising biological targets in three disease areas: Alzheimer's; type 2 diabetes; and the autoimmune disorders, rheumatoid arthritis, and lupus.

***Research Training and Research Workforce.*** NIH estimates it will require $767 million to support 15,715 individuals in its major research training program, the Ruth L. Kirschstein National Research Service Awards, with a 2% stipend increase in FY2015 for predoctoral and postdoctoral trainees. The request is $14 million (2%) above the FY2014 level. The congressional agreement on P.L. 113-235 directs NIH to provide no less than in FY2014 for stipend levels and training awards. NIH plans to continue with a special focus on promoting diversity and understanding barriers to career advancement of people traditionally underrepresented in the

research workforce. It is building a consortium of under-resourced institutions and creating a mentoring network to assist students interested in pursuing a biomedical research career.

The following are selected other program changes and areas of emphasis in the request and response, when provided, in the congressional agreement on P.L. 113-235.

***Alzheimer's Disease Research.*** To continue implementing the research components of the National Plan to Address Alzheimer's Disease (AD), NIH estimates it will spend $566 million on AD research in FY2015. NIH has recently set up the AD Genetics Warehouse to identify both genetic risk and protective factors. The Neuroimaging Initiative is analyzing brain scans, genetic profiles, and biomarkers in an effort to detect early-stage AD. Over 35 NIH-supported clinical trials are being conducted to test more than 40 compounds as possible prevention or treatment agents against AD and other forms of cognitive decline. As stated previously, P.L. 113-235 provides an increase of over $25 million to the National Institute on Aging, and without specifying an amount, encourages NIH to direct a significant portion of the increase for research on Alzheimer's disease.

***HIV/AIDS.*** NIH estimates it will spend about $3 billion on HIV/AIDS research in FY2015.

***Science, Technology, Engineering, and Mathematics (STEM) Education.*** For FY2015, the Administration proposed a modified version of its government-wide reorganization of STEM education, which, among other things, would reform undergraduate education and consolidate the administration of fellowships "to better meet national STEM goals." For HHS, the proposal would have eliminated two programs for a total savings of $2 million in FY2015.[67] The explanatory statement on P.L. 113-235 indicates that the proposal would have affected the National Institute of Allergy and Infectious Diseases (NIAID) Science Education Awards, the National Institute on Drug Abuse (NIDA) Science Education Drug Abuse Partnership Award, the National Institute of Environmental Health Sciences (NIEHS) Short Term Education Experience for Research, and the National Institute of Neurological Disorders and Stroke (NINDS) Diversity Research Education Grants in Neuroscience. Congress directed NIH to continue funding these programs in FY2015 and provided funding for the programs.

***Office of the Director/Common Fund.*** The FY2015 request for OD included an increase in funding for the Common Fund. The request for the Common Fund was $583 million, $50 million (9%) higher than the FY2014 level, including $30 million for projects modelled after the research flexibilities utilized by DARPA. P.L. 113-235 includes the same amount provided for the Common Fund in FY2014, $533 million, plus, as stated previously, $12.6 million for pediatric research, for a total of $546 million in FY2015.

***Research Project Grants.*** The main funding mechanism for supporting extramural research is research project grants (RPGs), which are competitive, peer-reviewed, and largely investigator-initiated. The FY2015 budget requested total funding for RPGs of $16.197 billion, representing about 53% of NIH's proposed budget. The amount is an increase of $120 million (0.7%) over the FY2014 level. The request would have supported an estimated 34,197 RPG awards, 16 less than in FY2014. Within that total, 9,326 would be competing RPGs, 329 (4%) more than in FY2014. (Competing awards are new grants plus competing renewals of existing grants.) The average amount of a competing RPG in FY2014 was estimated to be about $456,000, up from about

[67] The White House, "The Budget for FY2015, Discretionary Cuts, Consolidations, and Savings," p. 157, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2015/assets/ccs.pdf. For additional information on the proposed STEM reorganization, see "Reorganization of STEM Education Programs," above.

$421,000 in FY2012. Funding provided under the President's OGSI proposal would have been used to support 650 additional new grants in FY2015.

**Table 11. National Institutes of Health Funding**

(budget authority, in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|
| National Cancer Institute (NCI) | $4,923 | $4,931 | $4,950 |
| National Heart, Lung, and Blood Institute (NHLBI) | 2,989 | 2,988 | 2,998 |
| Dental/Craniofacial Research (NIDCR) | 399 | 397 | 400 |
| Diabetes/Digestive/Kidney (NIDDK)[a] | 1,744 | 1,743 | 1,750 |
| Neurological Disorders/Stroke (NINDS) | 1,588 | 1,608 | 1,605 |
| Allergy/Infectious Diseases (NIAID) | 4,359 | 4,423 | 4,359 |
| General Medical Sciences (NIGMS) | 2,364 | 2,369 | 1,656 |
| Child Health/Human Development (NICHD) | 1,283 | 1,283 | 1,287 |
| National Eye Institute (NEI) | 682 | 675 | 684 |
| Environmental Health Sciences (NIEHS) | 665 | 665 | 668 |
| National Institute on Aging (NIA) | 1,171 | 1,171 | 1,199 |
| Arthritis/Musculoskeletal/Skin Diseases (NIAMS) | 520 | 520 | 522 |
| Deafness/Communication Disorders (NIDCD) | 404 | 404 | 405 |
| National Institute of Mental Health (NIMH) | 1,446 | 1,440 | 1,463 |
| National Institute on Drug Abuse (NIDA) | 1,025 | 1,023 | 1,029 |
| Alcohol Abuse/Alcoholism (NIAAA) | 446 | 446 | 447 |
| National Institute of Nursing Research (NINR) | 141 | 140 | 141 |
| Nat'l Human Genome Research Inst (NHGRI) | 498 | 498 | 499 |
| Biomedical Imaging/Bioengineering (NIBIB) | 329 | 329 | 330 |
| Minority Health/Health Disparities (NIMHD) | 266 | 268 | 269 |
| Complementary/Integrative Health (NCCIH)[b] | 124 | 125 | 125 |
| Advancing Translational Sciences (NCATS) | 633 | 657 | 635 |
| Fogarty International Center (FIC) | 68 | 68 | 68 |
| National Library of Medicine (NLM) | 328 | 373 | 337 |
| Office of Director (OD) | 1,400 | 1,452 | 1,414 |
| Buildings and Facilities (B&F) | 129 | 129 | 129 |
| **Subtotal, Labor/HHS Appropriation** | **29,926** | **30,126** | **29,369** |
| PHS Evaluation Tap funding[c] | 8 | 8 | 715 |
| **Subtotal, NIH** | **29,934** | **30,134** | **30,084** |
| Superfund (Interior appropriation to NIEHS)[d] | 77 | 77 | 77 |
| Pre-appropriated type 1 diabetes funds | 139 | 150 | 150 |
| **Total, NIH program level** | **30,151** | **30,362** | **30,311** |

**Source:** P.L. 113-235, Division G, Departments of Labor, HHS, and Education and Related Agencies Appropriations Act, 2015, Explanatory Statement, NIH funding table; and Division F, Department of the Interior, Environment, and Related Agencies Appropriations Act, 2015, for Superfund amount.

**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 11** do not subtract the amount of transfers, such as the FY2015 $689 million evaluation tap, from the agencies' appropriation. FY2015 amounts do not include $238,000,000 for the National Institute for Allergy and Infectious Diseases (NIAID) for research on Ebola that was provided in P.L. 113-235 (Title VI of Division G).

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

c. Additional funds for NLM in FY2014 and FY2015 request and for NIGMS in FY2015 final bill (P.L. 113-235) from PHS Evaluation Set-Aside (§241 of PHS Act).

d. 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[68]

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

The Administration has requested $13.129 billion in FY2015 for Department of Energy R&D and related activities, including programs in three major categories: science, national security, and energy. This request is 5.6% more than the FY2014 appropriation of $12.436 billion. The House-passed bill (H.R. 4923) would provide $12.539 billion. The Senate subcommittee bill would provide $12.553 billion.[69] (See **Table 12** for details.)

The request for the DOE Office of Science is $5.111 billion, an increase of 0.9% from the FY2014 appropriation of $5.066 billion. There is no authorized funding level for the Office of Science in FY2015; the most recent authorization act (the America COMPETES Reauthorization Act of 2010, P.L. 111-358) authorized appropriations through FY2013. The FY2015 budget does not mention the Obama Administration's previous goal of doubling the combined funding of the Office of Science and two other agencies. (For more information on the doubling goal and how it has evolved, see "Efforts to Double Certain R&D Accounts.") The original target, announced by the Bush Administration in 2006, was to achieve the doubling in the decade from FY2006 to FY2016. The FY2015 request for the Office of Science is 41% more than its FY2006 baseline. The House bill and the Senate subcommittee bill would each be 40% above the baseline.

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

[69] The Subcommittee on Energy and Water Development of the Senate Committee on Appropriations approved this bill on June 17, 2014. A full committee markup scheduled for June 19, 2014, was cancelled. References in this section to the Senate subcommittee bill and report refer to the subcommittee-approved bill and draft report posted on the committee website on July 24, 2014. See http://www.appropriations.senate.gov/news/fy-2015-ew-subcommittee-reported-bill-and-draft-report.

The Office of Science includes six major research programs. The request for the largest program, Basic Energy Sciences (BES), is $1.807 billion, an increase of 5.5%. Major proposed changes in the BES program include the initiation of a new activity in computational materials science ($24 million); an increase of $18 million for Nanoscale Science Research Centers; an increase of $63 million, as previously planned, for continued construction of the Linac Coherent Light Source II (LCLS-II); and a shift from construction funding to research funding for the National Synchrotron Light Source II (NSLS-II) as the new facility begins operations. The request also includes $24 million for continuation of the Fuels from Sunlight Hub beyond its current five-year award term. The House bill would provide a total of $1.702 billion for BES. The House report recommends $8 million for computational materials science, $11 million less than the request for LCLS-II construction, $10 million less than the request for NSLS-II operations, and no funds for the Fuels from Sunlight Hub. The Senate subcommittee bill would provide the requested amount for BES, including $18 million for computational materials science. The Senate subcommittee report recommends funding for the Fuels from Sunlight Hub only if DOE completes a review of the hub and determines to extend it; otherwise, DOE is to spend that $24 million on other photochemistry and biochemistry research.

The request for High Energy Physics is $744 million, a decrease of 6.6%. Major proposed changes include a reduction of $24 million for experiments at the intensity frontier, especially NOvA, which will complete fabrication in FY2014; a decrease of $10 million, as previously planned, for continued construction of the Muon to Electron Conversion Experiment (Mu2e); and the elimination of construction funding ($16 million in FY2014) for the Long Baseline Neutrino Experiment (LBNE). The House bill would provide $775 million. The House report recommends $15 million more than the request for intensity frontier experiments, the requested amount for Mu2e, and $22 million for LBNE. The Senate subcommittee bill would provide $774 million, including the requested amount for Mu2e and $22 million for LBNE.

The request for Biological and Environmental Research is $628 million, an increase of 3.0%. This program consists of two roughly equal parts: Biological Systems Science and Climate and Environmental Sciences. Within the second of these, the request includes $29 million for a new activity in Climate Model Development and Validation. The House bill would provide $540 million. The House report states that "the Committee continues to support the Biological Systems Science subprogram" but does not mention Climate and Environmental Sciences. The House report recommends no funding for Climate Model Development and Validation. The Senate subcommittee bill would provide approximately the requested amount, divided between the two subprograms according to the request, and including the requested funds for Climate Model Development and Validation.

The request for Advanced Scientific Computing Research is $541 million, an increase of 13.2%. The proposed increase includes an additional $10 million for mathematical, computational, and computer sciences research; an additional $25 million for operations and upgrades at the Leadership Computing Facilities; and an additional $20 million for computing technology research, system design, and prototype evaluation. The House bill would provide the requested amount. The Senate subcommittee bill would provide $557 million; the report recommends directing the additional $16 million to increase operating time at the National Energy Research Scientific Computing Center (NERSC) at Lawrence Berkeley National Laboratory.

The request for Fusion Energy Sciences is $416 million, a decrease of 17.6%. The request includes $18 million for operations and research at the Alcator C-Mod tokamak, as a transition plan is developed for the facility. In the FY2013 and FY2014 budget cycles, DOE plans to close this facility encountered congressional opposition. Construction funding for the International Thermonuclear Experimental Reactor (ITER) would decrease from $200 million to $150 million,

while total funding for research and operations at domestic facilities would decrease from $305 million to $266 million. In 2008, the cost for the U.S. share of ITER, a multi-year international construction project, was estimated to be between $1.45 billion and $2.2 billion. Schedule delays, design and scope changes, and other factors have delayed formal approval of a revised cost estimate. According to DOE, the current best estimate of the total U.S. cost for ITER construction (which is 9.09% of the total international cost) is between $4 billion and $6.5 billion. In June 2014, the Government Accountability Office found that the cost of ITER has increased, its schedule has slipped, the international project schedule is "not reliable," and DOE can "only partially" influence the international project's performance.[70] The House bill would provide $540 million for Fusion Energy Sciences, including $225 million for ITER and $266 million for the domestic program; $22 million of the latter amount would be directed to Alcator C-Mod. The Senate subcommittee bill would provide $341 million, of which $75 million would be for ITER. The Senate subcommittee report states that "the Committee does not believe ITER is affordable and funding for ITER would crowd out other science investments where the United States has maintained leadership." It directs DOE to work with the Department of State to withdraw from the ITER project. The recommended $75 million for ITER would allow for the completion of existing contracts and support the U.S. ITER office during the termination process.

The request for DOE national security R&D is $4.220 billion, a 9.2% increase from $3.864 billion in FY2014. Most of the requested increase is in the Naval Reactors program. Naval Reactors construction funding would increase from $24 million to $210 million as construction begins on the Spent Fuel Handling Recapitalization project. Congress declined to fund this project in FY2014, and DOE is developing a new schedule and funding profile. In the Weapons Activities account, the Administration request would increase funding for nuclear weapons science and advanced simulation and computing and would slightly reduce funding (by 0.2%) for research on inertial confinement fusion. In the Defense Nuclear Nonproliferation account, the requested 23.0% decrease in R&D funding is largely the consequence of a DOE reprogramming of funds from other activities in FY2014. Relative to the amount originally enacted by Congress for FY2014, the request for nonproliferation R&D is a decrease of 9.5%. Both proliferation detection R&D and nuclear detonation detection R&D would decrease, with reductions and delays in multiple topic areas. The House bill would provide a total of $4.102 billion. The House report recommends half the requested amount for the Spent Fuel Handling Recapitalization project, smaller increases than requested for weapons science and advanced simulation and computing, and nearly the FY2014 amount for nonproliferation R&D. The Senate subcommittee bill would provide a total of $4.022 billion. The Senate subcommittee report recommends less than requested for weapons science but more for advanced simulation and computing. It recommends no funding for the Spent Fuel Handling Recapitalization project.

The request for DOE energy R&D is $3.797 billion, up 8.3% from $3.506 billion in FY2014. The request would increase funding for R&D in the Office of Energy Efficiency and Renewable Energy (EERE) by 20.5%, with increases requested for most EERE programs. Within EERE, Advanced Manufacturing would receive $305 million, an increase of $125 million. The Advanced Manufacturing request includes an increase of $109 million for R&D facilities, which would support the establishment of an additional Clean Energy Manufacturing Innovation institute (consistent with the previously discussed "National Network for Manufacturing Innovation"). Also in EERE, R&D on vehicle technologies would increase by $69 million. The Energy Efficient Buildings Hub, which the Senate Committee on Appropriations directed DOE to

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

terminate in its FY2014 report, has been renamed the Pennsylvania State University Consortium for Building Energy Innovation and would receive flat funding under the request. In Fossil Energy R&D, the proposed elimination of R&D on oil technologies ($15 million in FY2014) and the proposed reduction of $115 million for coal R&D (including carbon capture and storage) would be partly offset by $25 million for a new demonstration activity in natural gas carbon capture and storage and an increase of $14 million for natural gas technologies. In the Advanced Research Projects Agency–Energy (ARPA-E), R&D on transportation systems would increase by $47 million.

In the energy category, the House bill would provide $3.366 billion. Within this total, it would provide $528 million less than the request for EERE. The report recommends more than the request for hydrogen, wind energy, geothermal energy, and advanced manufacturing, and less than the request in all other topic areas, with particularly large reductions in solar energy and bioenergy. For fossil fuels, the House bill would increase coal R&D by $20 million rather than reducing it, provide $13 million for oil R&D rather than eliminating it, increase natural gas R&D by $2 million rather than $14 million, and reject the proposed demonstration of natural gas carbon capture and storage.

In the energy category, the Senate subcommittee bill would provide $3.445 billion. Its recommendation for EERE, $1.795 billion, includes more than the request for hydrogen and hydropower, the requested amount for bioenergy, and less than the request for other topics, especially advanced manufacturing, vehicle technologies, solar energy, and building technologies. The recommended total for fossil energy R&D is the same as the request. The recommendation for nuclear energy is $86 million less than the request. Within this total, the report recommends $97 million less for small modular reactor licensing technical support, $46 million less for reactor concepts R&D and demonstration, and $41 million more for fuel cycle R&D.

**Table 12. Department of Energy R&D and Related Activities**

(budget authority in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 House | FY2015 S. Subcte. |
|---|---|---|---|---|
| **Science** | **$5,066** | **$5,111** | **$5,071** | **$5,086** |
| Basic Energy Sciences | 1,712 | 1,807 | 1,702 | 1,807 |
| High Energy Physics | 797 | 744 | 775 | 774 |
| Biological and Environmental Research | 610 | 628 | 540 | 628 |
| Nuclear Physics | 569 | 594 | 600 | 602 |
| Advanced Scientific Computing Research | 478 | 541 | 541 | 557 |
| Fusion Energy Sciences | 505 | 416 | 540 | 341 |
| Other | 396 | 382 | 373 | 378 |
| **National Security** | **3,864** | **4,220** | **4,102** | **4,022** |
| Weapons Activities[a] | 2,278 | 2,467 | 2,421 | 2,408 |
| Naval Reactors | 1,095 | 1,377 | 1,215 | 1,208 |
| Defense Nuclear Nonproliferation R&D | 469 | 361 | 453 | 393 |
| Defense Environmental Cleanup Tech. Dev. | 22 | 16 | 13 | 13 |
| **Energy** | **3,506** | **3,797** | **3,366** | **3,445** |
| Energy Efficiency and Renewable Energy[b] | 1,670 | 2,012 | 1,538 | 1,795 |

| | FY2014 Enacted | FY2015 Request | FY2015 House | FY2015 S. Subcte. |
|---|---|---|---|---|
| Fossil Energy R&D | 562 | 476 | 593 | 476 |
| Nuclear Energy | 888 | 863 | 826 | 777 |
| Electricity Delivery and Energy Reliability R&D | 106 | 121 | 110 | 117 |
| Advanced Research Projects Agency–Energy | 280 | 325 | 300 | 280 |
| **DOE, Total** | **12,436** | **13,129** | **12,539** | **12,553** |

**Source:** FY2014 enacted and FY2015 request from DOE's FY2015 congressional budget justification, http://energy.gov/cfo/downloads/fy-2015-budget-justification. FY2015 House from H.R. 4923 as passed by the House and H.Rept. 113-486. FY2015 Senate subcommittee from the subcommittee-approved bill and draft subcommittee report posted on the Senate Committee on Appropriations website on July 24, 2014.

**Notes:** FY2014 enacted amounts reflect DOE's allocation of a $7 million reduction for contractor foreign travel expenses, as directed by P.L. 113-76, Section 317. Totals may differ from the sum of the components due to rounding.

a. Including Stockpile Services R&D Support, Stockpile Services R&D Certification and Safety, Science, Engineering except Enhanced Surety and Enhanced Surveillance; Ignition and High Yield; Advanced Simulation and Computing; and a prorated share of Readiness in Technical Base and Facilities. Additional R&D activities may take place in the subprograms of Directed Stockpile Work that are devoted to specific weapon systems, but these funds are not included in the table because detailed funding schedules for those subprograms are classified.

b. Excluding Weatherization and Intergovernmental Activities.

# National Science Foundation[71]

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

P.L. 113-235 provides $7.344 billion to the NSF in FY2015. This amount is $172 million (2%) more than the FY2014 estimated level of $7.172 billion. (See **Table 13**.)

The Administration initially sought $7.255 billion in funding for the NSF in FY2015.[73] This amount was $83 million (about 1%) more than the FY2014 estimate. The requested increase was split more or less evenly between Agency Operations and Award Management (AOAM, $40 million) and Education and Human Resources (EHR, $43 million). The Research and Related Activities (RRA) account, which constitutes a majority of NSF's budget and provides most of the foundation's research funding, would not have received an increase over FY2014 estimated levels ($5.809 million) under the Administration's FY2015 request.

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

[72] The National Science Foundation Act of 1950 (P.L. 81-507). For more information about the NSF, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by (name redacted) .

[73] NSF relied on its organic act for budget authority in FY2015.

The House, on the other hand, sought to increase funding for NSF (total) and RRA. It also sought increased funding for EHR and AOAM, albeit at lower-than-requested levels. The House-passed bill (H.R. 4660) would have provided $7.394 billion to NSF in FY2015. This amount included a $165 million (3%) increase over the FY2014 estimate for RRA, $30 million (3%) more for EHR, and $27 million (9%) more for AOAM.

The Senate Committee on Appropriations recommended the requested level for NSF in FY2015. However, like the House, the Senate Committee on Appropriations also recommended an increase over both the requested level, and the FY2014 estimate, for RRA. To accomplish this, while holding the total NSF allocation at the FY2015 requested level, Senate appropriators divided the requested increase for AOAM ($40 million) between AOAM ($9 million) and RRA ($31 million).

In its budget documents NSF indicated that its FY2015 priorities included four programs that were also foundation priorities in FY2013 and FY2014: Cyber-enabled Materials, Manufacturing, and Smart Systems (CEMMSS, $213 million); Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education (CIF21, $125 million); Science, Engineering, and Education for Sustainability (SEES, $139 million); and Secure and Trustworthy Cyberspace (SaTC, $100 million). The NSF added Cognitive Science and Neuroscience ($29 million request) to this list for FY2015.[74] Of these five programs, the Administration sought an increase over FY2014 estimated levels only for Cognitive Science and Neuroscience. The House report recommended $35 million for Cognitive Science and Neuroscience in FY2015, $21 million (153%) more than the FY2014 estimate of $14 million.[75] The explanatory statement, which accompanied P.L. 113-235, endorses the House recommendation for neuroscience.[76] The Senate report recommended the full request ($139 million) for SEES.[77]

Congress typically appropriates to NSF at the major account level. NSF's major accounts are RRA, EHR, and AOAM (mentioned in previous paragraphs), as well as Major Research Equipment and Facilities Construction (MREFC); the National Science Board (NSB); and the Office of Inspector General (OIG).[78]

P.L. 113-235 provides $5.934 billion to RRA in FY2015. This amount is $125 million (2%) over the FY2014 estimated funding level of $5.809 billion. The House-passed bill would have provided $5.974 billion to RRA in FY2015. The Senate Committee on Appropriations recommended $5.839 billion.

The Administration's request for RRA made few major changes from FY2014. Six of eight RRA subaccounts would have shifted (up or down) by less than 2%. Two accounts, Social, Behavioral and Economic Sciences (SBE) and the U.S. Arctic Research Commission (USARC), would have increased by more substantial amounts: 6.0% and 8.1%, respectively. SBE would have received the largest increase in dollar terms ($15 million). Most of the additional funding ($11 million) was for the National Center for Science and Engineering Statistics (NCSES), which among other

[74] The FY2012 Commerce, Justice, Science, and Related Agencies Appropriations Act conference report encouraged NSF to establish neuroscience as a crosscutting theme. See, H.Rept. 112-284.

[75] H.Rept. 113-448; referred to hereafter in this section as the "House report."

[76] See, "Explanatory Statement Submitted by Mr. Rogers of Kentucky, Chairman of the House Committee on Appropriations Regarding the House Amendment to the Senate Amendment on H.R. 83," *Congressional Record*, vol. 160, no. 151-Book II (December 11, 2014), pp.H9349-H9350; referred to hereafter in this section as the "explanatory statement."

[77] S.Rept. 113-181; referred to herein as the "Senate report."

[78] Funds from major NSF accounts may be merged at the program level and in many cases NSF's education, facilities, and research activities are deeply integrated as a matter of practice.

things, publishes the widely cited, bi-annual sourcebook for science and engineering statistics, *Science and Engineering Indicators*.[79]

An amendment (H.Amdt. 734) adopted during House floor debate over H.R. 4660 sought to hold SBE funding at the FY2014 estimated level.[80] (A second adopted amendment—H.Amdt. 762—would have prohibited NSF from using FY2015 funding to examine climate effects on tea quality and socioeconomic responses under award number 1313775.)[81] P.L. 113-235 does not incorporate these amendments. However, the explanatory statement effectively adopts language from the House report requiring NSF to apply any funding increases it receives for RRA (above requested levels) to Math and Physical Sciences (MPS), Computer and Information Science and Engineering (CISE), Engineering (ENG), and Biological Sciences (BIO). This appears to prevent NSF from providing increases—over amounts already in the request—to SBE, USARC, Geosciences (GEO), and International and Integrative Activities (IIA). The House report noted both the "intrinsic value in SBE sciences," while recognizing "longstanding Congressional concerns" about SBE-funded activities.[82]

Widely tracked RRA programs include the Experimental Program to Stimulate Competitive Research (EPSCoR) and Advanced Manufacturing programs. P.L. 113-235 provides $159.7 million to EPSCoR in FY2015, which is the same as the request, House recommendation, and Senate Committee on Appropriations' recommendation. EPSCoR received $158.2 million in FY2014 (estimated). For Advanced Manufacturing, the House report recommended the FY2014 current plan funding level ($164.7 million) in FY2015.[83] The Senate report further recommended that NSF target $15.0 million of the funding it receives for Advanced Manufacturing to biomanufacturing.

Among other provisions, the House report recommended prohibiting NSF from implementing any final divestment of astronomical infrastructure tied to the 2012 *Astronomical Science Portfolio Review* (hereinafter, "*Portfolio Review*") without first reporting to the House Appropriations Committee and ensuring that changes are undertaken in accordance with relevant reprogramming requirements.[84] The Senate report stated that the committee expects NSF to sustain support for the scientific facilities funded by the Astronomical Sciences division; including the National Radio Astronomy Observatory (NRAO), for which the committee recommended no less than the FY2014 estimated funding level of $43 million. (The *Portfolio Review* recommended divestment of certain NRAO facilities.)

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[79] For example, see National Science Board, *Science and Engineering Indicators 2014*, NSB 14-01, 2014, http://www.nsf.gov/statistics/seind14/.

[80] See Representative Lamar Smith, et al., "Commerce, Justice, Science, and Related Agencies Appropriations Act, 2015," remarks in the House, *Congressional Record*, daily edition, vol. 160, no. 82, (May 29, 2014), pp. H4957-H4959.

[81] The practical effect of this amendment is unclear. As a standard grant issued in FY2013, all funding for this award would typically have been obligated and expended in that fiscal year. More information about this award is available at http://www.nsf.gov/awardsearch/showAward?AWD_ID=1313775&HistoricalAwards=false.

[82] H.Rept. 113-448, p. 81. For more information on the debate over funding for the social sciences at the NSF, see CRS Report R43585, *The National Science Foundation: Background and Selected Policy Issues*, by (name redacted)

[83] FY2014 current plan funding for Advanced Manufacturing as per email correspondence between CRS and NSF, dated May 16, 2014.

[84] More information about the 2012 *Astronomical Sciences Portfolio Review* is available at http://www.nsf.gov/mps/ast/ast_portfolio_review.jsp. In December 2013, NSF issued a "Dear Colleague Letter" (NSF 14-022) providing information about the status of the foundation's response to the *Portfolio Review*. NSF 14-022 is available at http://www.nsf.gov/pubs/2014/nsf14022/nsf14022.jsp.

For FY2015 the Administration proposed what it called a "fresh" reorganization and consolidation of the federal STEM education effort. (See "Reorganization of STEM Education Programs.") Consistent with this plan, the NSF FY2015 budget justification stated that NSF would continue to collaborate with the Department of Education and Smithsonian Institution as "lead agencies" in the implementation of the National Science and Technology Council's strategic plan for STEM education, while partnering with federal science mission agencies.[85] The FY2015 NSF budget request also consolidated three NSF undergraduate education programs into the Improving Undergraduate STEM Education (IUSE) program.[86] In FY2014, NSF proposed reorganizing this same set of programs into the Catalyzing and Advancing Undergraduate STEM Education (CAUSE) program. H.Rept. 113-171, which accompanied H.R. 2787 (Commerce, Justice, Science, and Related Agencies Appropriations Act, 2014) when it was reported by the House Committee on Appropriations, prohibited NSF from establishing the CAUSE program. H.Rept. 113-448 appeared to adopt the IUSE consolidation in FY2015.

P.L. 113-235 provides $866 million to EHR in FY2015, $20 million (2%) more than the FY2014 estimate of $847 million. The FY2015 request for EHR continued the directorate's increased focus on R&D. Between FY2008 and FY2013, the portion of the EHR account that supported research and development in STEM education and learning increased from 11% to 35%. Since then, that percentage has held steady at about 35% (FY2014 estimate and FY2015 request). The character of EHR's R&D funding has also shifted, moving from about 90% basic research to about 40%.

The House would have provided $876 million to EHR in FY2015. The Senate Committee on Appropriations recommended the requested level ($890 million). Within EHR the House report recommended $66 million for Advanced Technological Education (ATE) and directed NSF to use FY2015 appropriations to begin development of a website to disseminate various STEM education-related materials. The Senate report recommended the following specific allocations: $64 million for ATE, $61 million for the Robert Noyce Teacher Scholarship Program (Noyce), $45 million for Cybercorps: Scholarships for Service, $55 million for Advancing Informal STEM Learning, and $57 million for STEM-C Partnerships. P.L. 113-235 provides $61 million for Noyce; the explanatory statement provides $66 million for ATE.

Other widely tracked EHR programs include the Graduate Research Fellowship (GRF) and the Integrative Graduate Education and Research Traineeship or IGERT (now called the NSF Research Traineeship or NRT). The FY2015 request for the GRF was $333 million, about 11% over the FY2014 estimate. NSF sought to increase the GRF stipend from $32,000 to $34,000 in FY2015. The NSF budget request included $58 million for the NRT in FY2015, an increase of 6% over the FY2014 estimate. NSF proposed a new track within NRT, to provide funding for research in graduate student training and professional development.

Both the House and Senate reports recommended the same amount (e.g., the request level or slightly more) for three of NSF's existing minority-serving institution programs, including Historically Black Colleges and Universities—Undergraduate Program (HBCU-UP, $32 million), Louis Stokes Alliances for Minority Participation (LSAMP, $46 million), and Tribal Colleges and Universities Program (TCUP, $13.5 million). Further, both reports sought to direct NSF to

[85] EOP, NSTC, Committee on STEM Education, *Federal Science, Technology, Engineering, and Mathematics (STEM) Education: 5-Year Strategic Plan*, May 2013, http://www.whitehouse.gov/sites/default/files/microsites/ostp/stem_stratplan_2013.pdf.

[86] These programs are the STEM Talent Expansion Program (STEP), Widening Implementation and Demonstration of Evidence-based Reforms (WIDER), and Transforming Undergraduate Education in STEM (TUES).

provide for Hispanic-Serving Institutions (HSIs). The House report recommended that NSF demonstrate that it provided $30 million in HSI-targeted opportunities across NSF programs in FY2015, while the Senate report recommended a specific allocation of $5 million for an HSI-specific program within EHR. The explanatory statement provides the above-listed amounts for HBCU-UP, LSAMP, and TCUP, and adopts the House report recommendation for HSIs.

Other accounts that fund R&D at the NSF include the MREFC account, which supports large construction projects and scientific instruments. P.L. 113-235 provides $201 million to MREFC in FY2015.This amount is about equal to the FY2014 estimate, House and Senate Committee on Appropriations' recommendations, and the Administration's request.

NSF indicated that FY2015 MREFC funding would provide the second-to-last year of support for the National Ecological Observatory Network (NEON), as well as ongoing support for the Large Synoptic Survey Telescope (LSST) and Daniel K. Inouye Solar Telescope (DKIST).[87] Historically, the MREFC account has typically supported between four and six projects at a time. The FY2015 request for three projects was lower than the historical trend, which could indicate that some potentially scientifically valuable projects are being delayed or overlooked. On the other hand, as can be seen in the FY2015 BIO and GEO requests, when these large projects come online their operations costs must be shouldered by research accounts. In a constrained budget environment, this dynamic can precipitate difficult choices between funding for research and funding research facilities and equipment.

P.L. 113-235 provided $325 million, $4 million, and $14 million for AOAM, NSB, and OIG (respectively). Funding for NSB and OIG is the same in FY2015 as it was in FY2014. Funding for AOAM is greater in FY2015 than it was in FY2014 ($298 million, estimated), but lower than the request ($338 million). The increase for AOAM is part of a multi-year plan to relocate NSF headquarters.

The FY2015 NSF budget request included funding for three multi-agency initiatives: National Nanotechnology Initiative (NNI, $410 million), Networking and Information Technology Research and Development (NITRD, $1.158 billion), and U.S. Global Change Research Program (USGCRP, $318 million). The request for NNI was about the same as the FY2014 estimate; the NITRD request was similarly equivalent; and the request for USGCRP was about $4 million (1%) more than the FY2014 estimate.

The Administration also sought $552 million in FY2015 funding for the NSF as part of the Opportunity Growth and Security Initiative. Without specifying program funding levels, the NSF FY2015 congressional budget justification noted that (among other things) OGSI funding would support an estimated 1,000 additional standard awards and would provide additional traineeship opportunities to approximately 3,000 graduate students over the next five years through the NRT program. (For more information on the OGSI, see earlier discussion at "Opportunity, Growth, and Security Initiative.")

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

## Table 13. NSF Funding by Major Account

(budget authority in millions of dollars)

| Account | FY2014 Estimate | FY2015 Request | FY2015 House (H.R. 4660) | FY2015 Senate Cmte. (S. 2437) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| **Research and Related Activities (RRA)** | **5,808.9** | **5,807.5** | **5,973.6** | **5,838.7** | **5,933.6** |
| Biological Sciences (BIO) | 721.3 | 708.5 | n/s | n/s | n/s[b] |
| Computer and Information Science and Engineering (CISE) | 894.0 | 893.4 | n/s | n/s | n/s[b] |
| Engineering (ENG) | 851.1 | 858.2 | n/s | n/s | n/s[b] |
| Geosciences (GEO) | 1,303.0 | 1,304.4 | n/s | n/s | n/s |
| Mathematical and Physical Sciences (MPS) | 1,299.8 | 1,295.6 | n/s | n/s | n/s[b] |
| Social, Behavioral, and Economic Sciences (SBE) | 256.9 | 272.2 | n/s[a] | n/s | n/s |
| International and Integrative Activities (IIA) | 481.6 | 473.9 | n/s | n/s | n/s |
| U.S. Arctic Research Commission (USARC) | 1.3 | 1.4 | n/s | n/s | n/s |
| **Education and Human Resources (EHR)** | **846.5** | **889.8** | **876.0** | **889.8** | **866.0** |
| **Major Research Equipment and Facilities Construction (MREFC)** | **200.0** | **200.8** | **200.8** | **200.8** | **200.8** |
| **Agency Operations and Award Management (AOAM)** | **298.0** | **338.2** | **325.0** | **307.0** | **325.0** |
| **National Science Board (NSB)** | **4.3** | **4.4** | **4.4** | **4.4** | **4.4** |
| **Office of the Inspector General (OIG)** | **14.2** | **14.4** | **14.4** | **14.4** | **14.4** |
| **NSF, Total** | **7,171.9** | **7,255.0** | **7,394.2** | **7,255.0** | **7,344.2** |

**Source:** Data in the columns titled, "FY2014 Estimate" and "FY2015 Request" are from the FY2015 *NSF Budget Request to Congress*. Data in the column titled "House (Full)" are from H.R. 4660, as passed by the House. Data in the column titled, "Senate (Committee)" are from S. 2437, as reported by the Senate Committee on Appropriations.

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

a. The explanatory statement effectively adopts House report language that requires NSF to distribute any additional RRA funding (over requested levels) to MPS, CISE, ENG, and BIO.

b. Although not included in P.L. 113-235, H.Amdt. 734 to H.R. 4660 sought to hold funding for SBE at the FY2014 level ($256.9 million). See Representative Lamar Smith, et al., "Commerce, Justice, Science, and Related Agencies Appropriations Act, 2015," remarks in the House, Congressional Record, daily edition, vol. 160, no. 82, (May 29, 2014), pp. H4957-H4959.

# National Aeronautics and Space Administration[88]

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 as a facility for R&D and other purposes.

The Administration requested $16.258 billion for NASA R&D in FY2015. This amount was 1.1% less than the $16.455 billion NASA received for R&D in FY2014. In addition to the base request, the proposed Opportunity, Growth, and Security Initiative included $874 million for NASA R&D. (For more information on the OGSI, see earlier discussion at "Opportunity, Growth, and Security Initiative.") The bill passed by the House (H.R. 4660) would have provided $16.702 billion. The bill reported by the Senate Committee on Appropriations (S. 2437) would have provided $16.725 billion. The final appropriation in P.L. 113-235 was approximately $16.828 billion for FY2015.[89] For a breakdown of these amounts, see **Table 14**. There is no authorized level for NASA funding in FY2015. The most recent authorization act (the NASA Authorization Act of 2010, P.L. 111-267) authorized appropriations through FY2013. Bills in the 113th Congress that would have authorized FY2015 appropriations for NASA included H.R. 2687, H.R. 2616, and S. 1317.[90]

The FY2015 request for Science was $4.972 billion, a decrease of 3.5%. The House and Senate bills would have provided $5.193 billion and $5.200 billion, respectively. The final appropriation for FY2015 was $5.245 billion. In Planetary Science, the request included $15 million for continued study of a potential future mission to Jupiter's moon Europa. Congress provided $69.7 million in FY2013 and $80 million in FY2014 for formulation of a Europa mission, which was a high priority of the 2011 National Research Council (NRC) decadal survey of planetary science.[91] The NRC expressed reservations, however, at the mission's estimated a cost of $4.7 billion, and in April 2014, NASA issued a request for information seeking Europa mission concepts costing less than $1 billion.[92] The House-passed bill for FY2015 would have provided $100 million for "a mission that meets the science goals outlined for the Jupiter Europa mission in the most recent planetary science decadal survey," plus an additional $18 million for assessment and development of related technologies. The House report stated that "the Committee has not seen any credible evidence" that a $1 billion cost is feasible and directed NASA "not to use further project resources in pursuit of such an unlikely outcome." The Senate report directed NASA to use the Space Launch System as the baseline launch vehicle for planning a Europa mission in order to maximize the scientific return. The heavy lift capability of this rocket suggested Senate support for a larger-scale Europa mission. Congress ultimately appropriated $100 million for FY2015 for planning a Europa mission in line with the planetary science decadal survey. The explanatory

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

[89] Based on a CRS estimate of $3.010 billion for the International Space Station, which was not specified in the act or explanatory statement.

[90] Another NASA authorization bill in the 113th Congress, H.R. 4412, did not include language authorizing FY2015 appropriations.

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

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

statement directed NASA to evaluate use of the Space Launch System as the launch vehicle for such a mission.

In Astrophysics, also funded in the Science account, the request included $12.3 million for the Stratospheric Observatory for Infrared Astronomy (SOFIA). SOFIA reached full operational capability in February 2014, and previous budgets envisioned 20 years of operations at a cost of about $80 million per year.[93] According to NASA's congressional budget justification, however, "because SOFIA development has taken much longer than originally envisioned ... the observatory will no longer provide the kind of scientific impact and synergies with other missions as once planned." NASA proposed placing the SOFIA aircraft in storage unless international partners could support the U.S. share of its operating costs. The House report rejected NASA's proposal to terminate SOFIA, recommended $70 million for the project, and directed NASA to "continue seeking third-party partners whose additional funding support would restore SOFIA's budget to its full operational level." The Senate report also disagreed with the proposal to terminate SOFIA; it recommended $87 million. Congress ultimately appropriated $70 million for FY2015for SOFIA to maintain core operations. The explanatory statement directed NASA to "continue to seek partners to restore SOFIA to its full operational level" and stated that "any science mission terminations should be made only after a senior review that evaluates the relative scientific benefit and return on investment."

The OGSI proposal included an additional $187.3 million for Science, above the Administration's base request. Although the House and Senate bills would have provided comparable amounts above the request, their increases did not appear to correspond closely to the content of the OGSI. For example, the House report did not mention the Orbiting Carbon Observatory 3 (OCO-3), which would have received $29.3 million under the OGSI, or the Pre-Aerosols, Carbon, and Ecosystems (PACE) mission, which would have received an additional $50 million. While the Senate report recommended $25 million for PACE, it also included funds for Jason-3 and DSCOVR, two Earth science satellites that the Administration proposed to fund through the National Oceanographic and Atmospheric Administration (NOAA) budget rather than NASA's. The final explanatory statement included $20 million for PACE for FY2015 and funded Jason-3 and DSCOVR in the NOAA budget.

The FY2015 request for Aeronautics was $551 million, a decrease of 2.6%. NASA proposed to reorganize its aeronautics research to align with a new strategic vision announced in August 2013.[94] Following this realignment, most individual projects were to continue, but funding for rotorcraft research was to decrease by $7.9 million. The OGSI proposal included an additional $43.9 million for Aeronautics and would have restored the proposed reduction in rotorcraft funding. The House-passed bill would have provided $666 million. The House report accepted the proposed restructuring and directed NASA to allocate the recommended funding increase proportionally across the new programs. It did not mention rotorcraft. The Senate bill would have provided $551 million. Like the House report, the Senate report supported the proposed reorganization, but it expressed disappointment with the requested reduction for rotorcraft research. The final appropriation for FY2015 was $651 million, with the increase above the request to be applied proportionally across the restructured programs.

[93] National Aeronautics and Space Administration, Office of Inspector General, *SOFIA: NASA's Stratospheric Observatory for Infrared Astronomy*, IG-14-022, July 9, 2014.

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

The FY2015 request for Space Technology was $706 million, an increase of 22.5%. Support for the proposed Asteroid Redirect Mission, including the accelerated development of high-power solar electric propulsion technology for future spacecraft, was proposed to increase from $38 million to $93 million. The OGSI proposal included an additional $100 million for Space Technology. The House-passed bill would have provided $627 million. Noting several specific examples, the House report encouraged the Space Technology Mission Directorate to prioritize technologies that have "the broadest applicability across [its] customer base." Separately, the report found it unclear whether Congress will commit to the Asteroid Redirect Mission and directed NASA to spend funds on that mission only in areas that "are also applicable to other current NASA programs, clearly extensible to other potential future exploration missions ... or have broad applicability to other future non-exploration activities." The Senate bill would have provided $580 million. The Senate report directed NASA to prioritize ongoing activities, recommended continued funding for the development of satellite servicing technology, and directed NASA to increase its focus on Small Business Innovation Research (SBIR) awards to companies with fewer than 50 employees. The final appropriation for Space Technology for FY2015 was $596 million.

The FY2015 request for Exploration was $3.976 billion, a decrease of 3.3%. This account funds development of the Orion Multipurpose Crew Vehicle (MPCV) and the Space Launch System (SLS) heavy-lift rocket, which were mandated by the 2010 authorization act for human exploration beyond Earth orbit. The account also funds development of a commercial crew transportation capability for future U.S. astronaut access to the International Space Station. The request of $2.784 billion for Orion, the SLS, and related ground systems (known collectively as Exploration Systems Development) was a decrease of 10.6%, while the request of $848 million for commercial crew was an increase of 21.8%. The OGSI proposal included an additional $100 million for SLS and Orion and an additional $250 million for commercial crew. As in past years, many in Congress saw the Exploration budget request as evidence of a difference in human spaceflight priorities between Congress and the Administration, and this perceived difference was controversial. The House-passed bill would have provided $4.167 billion for Exploration, including $3.055 billion for Exploration Systems Development and $785 million for commercial crew. The House report expressed frustration with the "arbitrarily reduced funding levels for SLS" and the increased request for commercial crew. It stated that its recommended funding for commercial crew was intended to support only one provider (subsequently, in September 2014, NASA awarded commercial crew contracts to two providers). The Senate bill would have provided $4.368 billion for Exploration, including $3.251 billion for Exploration Systems Development and $805 million for commercial crew. The Senate report stated that the request for Orion and the SLS had "again fallen below what is necessary" and "far short of requirements." For commercial crew, the Senate report would have required certified cost and pricing data for commercial crew contracts.[95] Advocates of this language described it as promoting transparency. Others, noting that it was drawn from federal cost-plus contracting, argued that it was not suitable for the fixed-price commercial approach that NASA is using for the commercial crew program. The final appropriation for FY2015 of $4.357 billion included $3.245 billion for Exploration Systems Development and $805 million for commercial crew. The explanatory statement did not include the Senate language about certified cost and pricing data.

The Administration's request of $3.051 billion for the International Space Station (ISS) was a 3.2% increase. Funding for the ISS includes the cost of commercial cargo flights for ISS resupply. The request would have eliminated one previously planned ISS cargo flight in FY2015. The

[95] This is a reference to requirements in Federal Acquisition Regulation 15.403-4.

OGSI proposal included an additional $101 million for the ISS and would have restored the eliminated flight. The House-passed bill would have provided $3.040 billion for the ISS.[96] The Senate report recommended $3.013 billion. The final appropriation for FY2015 for Space Operations, which includes the ISS, was somewhat below both the House and the Senate levels, but the explanatory statement did not specify how much of the Space Operations total was for the ISS.

**Table 14. NASA R&D**

(budget authority in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 OGSI | FY2015 House (H.R. 4660) | FY2015 Senate Cmte. (S. 2437) | FY2015 Enacted |
|---|---|---|---|---|---|---|
| **Science** | **$5,151.2** | **$4,972.0** | **$187.3** | **$5,193.0** | **$5,200.0** | **$5,244.7** |
| Earth Science | 1,826.0 | 1,770.3 | — | 1,750.0 | 1,831.9 | 1,772.5 |
| Planetary Science | 1,345.0 | 1,280.3 | — | 1,450.0 | 1,301.7 | 1,437.8 |
| Astrophysics | 668.0 | 607.3 | — | 680.0 | 707.8 | 684.8 |
| James Webb Space Telescope | 658.2 | 645.4 | — | 645.0 | 645.4 | 645.4 |
| Heliophysics | 654.0 | 668.9 | — | 668.0 | 671.2 | 662.2 |
| Education | — | — | — | — | 42.0[a] | 42.0[a] |
| **Aeronautics** | **566.0** | **551.1** | **43.9** | **666.0** | **551.1** | **651.0** |
| **Space Technology** | **576.0** | **705.5** | **100.0** | **627.0** | **580.2** | **596.0** |
| **Exploration** | **4,113.2** | **3,976.0** | **350.0** | **4,167.0** | **4,367.7** | **4,356.7** |
| Exploration Systems Development | 3,115.2 | 2,784.4 | 100.0 | 3,055.0 | 3,251.3 | 3,245.3 |
| Commercial Spaceflight | 696.0 | 848.0 | 250.0 | 785.0 | 805.0 | 805.0 |
| Exploration R&D | 302.0 | 343.4 | 0.0 | 327.0 | 311.4 | 306.4 |
| **International Space Station** | **2,964.1[b]** | **3,050.8** | **100.6** | **3,040.0** | **3,012.8** | —[b] |
| **Subtotal R&D** | **13,370.5** | **13,255.4** | **781.8** | **13,693.0** | **13,711.8** | **13,858.4** |
| Non-R&D Programs[d] | 968.0 | 980.5 | 10.0 | 978.0 | 963.5 | 973.8 |
| Cross-Agency Support[a] | 2,793.0 | 2,778.6 | 0.0 | 2,779.0 | 2,778.6 | 2,758.9 |
| *Associated with R&D[f]* | *2,604.4* | *2,587.2* | *0.0* | *2,592.5* | *2,596.2* | *2,577.8* |
| Construction & Environmental C&R | 515.0 | 446.1 | 93.7 | 446.0 | 446.1 | 419.1 |
| *Associated with R&D[f]* | *480.2* | *415.4* | *92.5* | *416.1* | *416.8* | *391.6* |
| **NASA, Total (R&D)** | **16,455.2** | **16,258.0** | **874.3** | **16,701.6** | **16,724.8** | **16,827.8** |
| **NASA, Total** | **17,646.5** | **17,460.6** | **885.5** | **17,896.0** | **17,900.0** | **18,010.2** |

**Sources:** FY2014 enacted from P.L. 113-76 and joint explanatory statement, *Congressional Record*, January 15, 2014, Book II, at pp. H515-H517. FY2015 request and OGSI from NASA's FY2015 congressional budget justification, http://www.nasa.gov/news/budget/, and other NASA budget documents. FY2015 House from H.R. 4660 as passed by the House and H.Rept. 113-448. FY2015 Senate Committee from S. 2437 as reported and

[96] The ISS amount was specified in report language, not the bill itself. The bill itself specified only the amount for Space Operations, which includes funding for other activities in addition to the ISS. A floor amendment in the House reduced funding for Space Operations by $7 million without indicating how that change might affect funding for the ISS. As a result, the amount ultimately provided for the ISS by the House bill might have been somewhat less than $3.040 billion.

S.Rept. 113-181. FY2015 enacted from P.L. 113-235 and explanatory statement, *Congressional Record*, December 11, 2014, Book II, at pp. H9348-H9349.

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

a. Included in Astrophysics in the request and the House bill. This item is separate from the Education account, which is included in Non-R&D Programs, lower in the table.

b. From NASA's operating plan. Not specified in P.L. 113-76 or the joint explanatory statement.

c. Not specified in P.L. 113-235 or the explanatory statement. The R&D totals shown in the table are calculated by using a CRS estimate of $3,010.0 million for the International Space Station.

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

e. Called Safety, Security, and Mission Services in the House bill and the final act.

f. Allocation between R&D and non-R&D is estimated by CRS in proportion to the underlying program amounts in order to allow calculation of a total for R&D. The Cross-Agency Support and Construction and Environmental Compliance and Remediation accounts consist mostly of indirect costs for other programs, assessed in proportion to their direct costs.

# Department of Commerce

## National Institute of Standards and Technology[97]

The National Institute of Standards and Technology (NIST) is an agency of the Department of Commerce with a mandate to increase the competitiveness of U.S. companies through appropriate support for industrial development of precompetitive, generic technologies and the diffusion of government-developed technological advances to users in all segments of the American economy. NIST research also provides the measurement, calibration, and quality assurance methods and techniques that underpin U.S. commerce, technological progress, product reliability, manufacturing processes, and public safety. NIST is also responsible for developing, maintaining, and retaining custody of the national standards of measurement; providing the means and methods for making measurements consistent with those standards; and ensuring the compatibility of U.S. national measurement standards with those of other nations.

The President's FY2015 budget requested $900.0 million for NIST, an increase of $50.0 million (5.9%) over the FY2014 enacted appropriation. (See **Table 15**.) The House-passed bill (H.R. 4660) would have provided $855.8 million. The bill reported by the Senate Committee on Appropriations (S. 2437) would have provided $900.0 million. P.L. 113-235 provides $863.9 million in total funding for NIST for FY2015, $13.9 million (1.6%) more than in FY2014.

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

The President requested $680 million for R&D in the STRS account for FY2015, $29 million (4.5%) above FY2014 funding. According to NIST, priority areas targeted for budget increases in requested STRS funding included R&D investments in forensic science ($3.5 million), cyber-physical systems ($7.5 million),[98] advanced materials ($5.0 million), and synthetic biology ($7.0 million), as well as a lab-to-market initiative ($6.0 million).[99] The House-passed bill (H.R. 4660)

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

[98] In this context, cyber-physical systems refers to interconnected machines and devices designed to create adaptive and predictive systems that respond in real time to improve performance.

[99] Department of Commerce, National Institute of Standards and Technology, "National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2-15 Budget Submission to Congress," March 2014, (continued...)

would have provided $670.5 million for the STRS account; the bill reported by the Senate Committee on Appropriations (S. 2437) would have provided $685 million. P.L. 113-235 provides $675.5 million for the STRS account for FY2015, $24.5 million (3.8%) more than in FY2014.

The President requested $161 million for the ITS account for FY2015, including $141.0 million for the Manufacturing Extension Partnership (MEP) program (up $13.0 million, 10.2% from FY2014), $15.0 million for the Advanced Manufacturing Technology Consortia (AMTech) (no change from FY2014), and $5.0 million for coordination of manufacturing innovation institutes which received no funding in FY21014.The manufacturing institutes to be coordinated include the nine launched or committed to launching by the Department of Defense, Department of Energy, and Department of Agriculture, as well as those envisioned as part of the President's proposed National Network for Manufacturing Innovation (discussed further below).[100] The House-passed bill would have provided $130.0 million for ITS; the House report (H.Rept. 113-448) states that the entire amount was for the MEP program. H.Rept. 113-448 directed NIST to use the reprogramming procedures specified in the bill if it intends to use a portion of these funds, as it has in previous years, for its contributions to interagency support for manufacturing innovation institutes. The Senate Committee-reported bill recommended $156.0 million for ITS, with the accompanying Senate report (S.Rept. 113-181) specifying $141 million for MEP and $15.0 million for AmTech. S.Rept. 113-181 directed NIST to fund its support for manufacturing institutes' coordination activities through AmTech. P.L. 113-235 provides $138.1 million for ITS for FY2014, $4.9 million (3.4%) less than in FY2014. The total for ITS includes $130.0 million for MEP (up $2.0 million, 1.6%, from FY2014) and $8.1 million for AMTech (down $6.9 million, 46.0%, from FY2014).

The President requested $59.0 million for the NIST Construction of Research Facilities account, up $3 million (5.4%) over FY2014.[101] The House-passed bill would have provided $55.3 million for CRF; the Senate Committee-reported bill recommended $59.0 million. P.L. 113-235 provides $50.3 million for CRF for FY2015, down $5.7 million (10.2%) from FY2014.

In addition to the appropriations included in the base budget proposal, the President proposed additional NIST funding as part of his Opportunity, Growth, and Security Initiative. In particular, the OGSI includes $2.4 billion for the establishment of the National Network for Manufacturing Innovation, a network of up to 45 institutes with unique foci that

> will support manufacturing technology commercialization by allowing new manufacturing processes and technologies to progress more smoothly from basic research to implementation in manufacturing, in addition to providing a much-needed environment and support for work-force development in advanced manufacturing.[102]

The OGSI also sought $115 million to fully fund NIST's requested FY2014 initiatives in advanced manufacturing, cybersecurity, forensic science, and disaster resilience; accelerate renovation of scientific facilities at the NIST laboratories in Boulder, CO; expand research and testing capabilities in advanced communications, including spectrum sharing and next-generation communication technologies; enhance research programs in quantum science; support robust cryptography capabilities for NIST's cybersecurity programs; support a data science and

(...continued)

http://www.osec.doc.gov/bmi/budget/FY15CJ/NISTandNTISFY2015CJFinal508Compliant.pdf.

[100] Ibid.

[101] Ibid.

[102] Ibid.

information program for the development of standards and validation tools for accessing, processing, distilling, storing, and protecting data; and strengthen forensics science research and collaborative efforts with stakeholders.[103] (For more information on the OGSI, see the earlier discussion at "Opportunity, Growth, and Security Initiative.") Congress did not act specifically on the OGSI proposal.

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

Increases in spending for NIST laboratories that perform research focused on the mission responsibilities of the agency have tended to remain small. As part of the American Competitiveness Initiative, announced in 2006, the Bush Administration stated its intention to double funding over 10 years for "innovation-enabling research" done, in part, at NIST through its "core" programs (defined as the STRS account and the construction budget). In April 2009, President Obama indicated his decision to double the budget of key science agencies, including NIST, over the next 10 years. In President Obama's FY2011 budget the time frame for doubling slipped to 11 years; his FY2012 budget was silent on a time frame for doubling. There is no mention of doubling or a time frame in the FY2015 budget request. For more information on the doubling effort, see "Efforts to Double Certain R&D Accounts" above.

**Table 15. NIST**

(budget authority, in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 House (H.R. 4660) | FY2015 Senate Cmte. (S. 2437) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| **Base Budget** | | | | | |
| **Scientific and Technical Research and Services** | **$651.0** | **$680.0** | **$670.5** | **$685.0** | **$675.5** |
| **Industrial Technology Services** | **143.0** | **161.0** | **130.0** | **156.0** | **138.1** |
| Manufacturing Extension Partnership | 128.0 | 141.0 | 130.0 | 141.0 | 130.0 |
| Advanced Manufacturing Technology Consortia | 15.0 | 15.0 | 0 | 15.0 | 8.1 |
| Manufacturing Innovation Institutes Coordination | 0 | 5.0 | 0 | n/a | 0 |
| **Construction** | **56.0** | **59.0** | **55.3** | **59.0** | **50.3** |
| **NIST, Total (Base Budget)** | **850.0** | **900.0** | **855.8** | **900.0** | **863.9** |

[103] Ibid.

| | FY2014 Enacted | FY2015 Request | FY2015 House (H.R. 4660) | FY2015 Senate Cmte. (S. 2437) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| **Opportunity, Growth, and Security Initiative** | | | | | |
| National Network for Manufacturing Innovation | 0 | 2,400.0 | 0 | 0 | 0 |
| Other NIST Research Activities | 0 | 115.0 | 0 | 0 | 0 |
| **NIST, Total (OGSI)** | 0 | **2,515.0** | **0** | **0** | **0** |

**Sources:** NIST website (http://www.nist.gov/public_affairs/releases/approps-summary2015.cfm), P.L. 113-76 and Explanatory Statement, Administration's FY2015 Budget Request, H.R. 4660, H.Rept. 113-448, S. 2437, and S.Rept. 113-181, and P.L. 113-235.

**Note:** Totals may differ from the sum of the components due to rounding. "n/a" indicates no action taken.

## National Oceanic and Atmospheric Administration[104]

The Commerce Department's National Oceanic and Atmospheric Administration conducts scientific research in areas such as ecosystems, climate, global climate change, weather, and oceans; supplies information on the oceans and atmosphere; and manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[105] The reorganization was intended to unify elements of the nation's environmental activities and to provide a systematic approach for monitoring, analyzing, and protecting the environment. One of the agency's main challenges is related to its diverse mission of science, service, and stewardship. A review of research undertaken by NOAA found, "The major challenge for NOAA is connecting the pieces of its research program and ensuring research is linked to the broader science needs of the agency."[106]

NOAA's Research Council has developed a five-year plan (2013-2017) to guide the agency's R&D efforts.[107] R&D efforts support the long-term goals and enterprise objectives of NOAA's Next Generation Strategic Plan.[108] The strategic plan is organized into four categories of long-term goals: (1) climate adaptation and mitigation, (2) a weather-ready nation,[109] (3) healthy oceans, and (4) resilient coastal communities and economies; and three groups of enterprise objectives: (1) stakeholder engagement, (2) data and observations, and (3) integrated

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

[105] "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.

[106] 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.

[107] 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.

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

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

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.[110] Key questions are used in the plan to frame and organize R&D objectives and to identify tasks associated with achieving these objectives.

The R&D plan notes that it "contains many elements to pursue and efforts must be prioritized as funding will likely not be available for all topics at all times." The plan also describes how priorities are set during the annual planning season. Although the plan identifies many different NOAA R&D efforts, the relative importance of these efforts and related funding needs are not considered by the R&D plan. Another challenge identified by 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 FY2015, President Obama requested $688.7 million in R&D funding for NOAA, a 3.4% increase in funding from the FY2014 enacted level of $666.0 million. R&D accounted for 12.5% of NOAA's total FY2015 discretionary budget request of $5.489 billion. The R&D request consisted of $468.1 million for research (68.0%), $65.8 million for development (9.5%), and $154.8 million for R&D equipment (22.5%).[111] NOAA's R&D funding also supports intramural activities of the agency and extramural activities of academic, nonprofit, and private sector organizations through grants, contracts, or cooperative agreements.

NOAA's administrative structure is organized by five line offices that reflect its diverse mission: the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite, Data, and Information Service (NESDIS); National Weather Service (NWS); and Office of Oceanic and Atmospheric Research (OAR). In addition to NOAA's five line offices, Program Support (PS), a cross-cutting budget activity, includes the Office of Marine and Aviation Operations (OMAO). **Table 16** provides R&D funding levels by line office for FY2014 and the FY2015 request.[112] The appropriations bills and accompanying committee reports do not specify the R&D funding levels for NOAA, but total agency and OAR funding have been provided in **Table 15** for context.

The Office of Oceanic and Atmospheric Research is the primary center for R&D within NOAA. The Consolidated and Further Continuing Appropriations Act (P.L. 113-235) provided OAR with a total of $446.3 million. This amount is $15.9 million (3.4%) less than the FY2015 request of $462.2 million, but $19.5 million (4.6%) more than the FY2014 enacted appropriation of $426.8 million. In FY2014, OAR accounted for 58.2% of NOAA's R&D funding. The President's FY2015 request would have provided OAR with $424.8 million in R&D funding, which would have accounted for 61.7% of total R&D funding requested by NOAA and 91.9% of OAR's total budget request of $462.2 million.[113]

OAR conducts research in three major areas: weather and air chemistry; climate; and ocean, coasts, and the Great Lakes. A significant portion of these efforts is implemented through

[110] 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.

[111] Courtney Barry, NOAA Budget Office, email, March 31, 2014.

[112] Ibid.

[113] The level of R&D funding in OAR's total appropriation for FY2015 was unavailable at the time this section was written.

partnerships between NOAA and cooperative research institutes and the National Sea Grant College Program. NOAA supports 16 cooperative research institutes that work with seven NOAA laboratories in all three of the main OAR research areas. The Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235) has funded the cooperative institutes with a total of $157.0 million, $7.7 million (4.7%) less than the FY2015 request of $164.7 million, but $7.1 million (4.7%) more than the FY2014 enacted appropriation of $149.9 million.

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. P.L. 113-235 provides Sea Grant with a total of $67.3 million, $3.9 million (6.2%) more than the FY2015 request of $63.4 million and equal to the FY2014 enacted appropriation.

The President's Opportunity, Growth, and Security Initiative included $1 billion for a Climate Resilience Fund that would have supported activities across multiple agencies. NOAA would have received $180 million from the OGSI to expand weather, climate, and oceans observations and research. NOAA also would have received $25 million from the Climate Resilience Fund for oceanic and atmospheric research grants to improve understanding of the effects of climate change on various sectors, and $50 million to improve coastal resilience by awarding competitive grants to state, local, and tribal governments and nonprofit organizations.[114] A significant portion of these efforts would have supported or supplemented ongoing R&D activities. It is possible that some activities related to these areas have been funded in FY2015, but it is not possible to determine specific programs or funding levels solely attributable to the initiative.

**Table 16. NOAA R&D**

(budget authority, in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2014 House Passed[a] | FY2015 Senate Committee[a] | FY2015 Enacted (P.L. 113-235)[b] |
|---|---|---|---|---|---|
| National Ocean Service | $73.1 | $75.0 | n/a | n/a | n/a |
| National Marine Fisheries Service | 67.0 | 61.4 | n/a | n/a | n/a |
| National Weather Service | 33.0 | 19.0 | n/a | n/a | n/a |
| National Environmental Satellite, Data, and Information Service | 26.0 | 26.0 | n/a | n/a | n/a |
| Office of Marine and Aviation Operations[c] | 79.1 | 82.4 | n/a | n/a | n/a |
| Office of Oceanic and Atmospheric Research | 387.8 | 424.8 | n/a | n/a | n/a |
| **Total, R&D** | **666.0** | **688.7** | n/a | n/a | **n/a** |
| **OAR Total, R&D and Non-R&D** | **426.8** | **462.2** | **393.3** | **443.4** | **446.3** |
| **NOAA Total, R&D and Non-R&D** | **5,314.6** | **5,488.7** | **5,337.1** | **5,420.0** | **5,441.0** |

[114] NOAA, *Budget Estimates Fiscal Year 2015*, Congressional Submission, Washington, DC, March 2014, p. x, http://www.corporateservices.noaa.gov/nbo/docs/NOAA_FY15_CJ_508%20compliant.pdf.

**Source:** Courtney Barry, NOAA Budget Office, email to CRS concerning NOAA R&D, March 31, 2014.

**Notes:**

a. House and Senate Committees do not break out NOAA R&D funding levels by line office.

b. The final R&D funding levels for FY2015 were not available from NOAA at the time this section was prepared.

c. R&D for the Office of Marine and Aviation Operations is for equipment in support of R&D activities.

# Department of Agriculture[115]

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 decision making, and other social sciences affecting consumers, farmers, and rural communities.

Four agencies carry out USDA's research and education activities, grouped together into the Research, Education, and Economics (REE) mission area. The agencies are the Agricultural Research Service (ARS), National Institute of Food and Agriculture (NIFA), National Agricultural Statistics Service (NASS), and Economic Research Service (ERS).[116]

The enacted FY2015 consolidated appropriation (P.L. 113-235) provides $2.725 billion to the USDA REE mission area, which is $86 million more than in FY2014 (+3%). About half of the overall increase is for ARS buildings and facilities (+$45 million), an account that has not received any appropriation in recent years. Furthermore, after adjusting for the additional cost of building rental payments at the agency level (rather than the former practice of being paid from a central account at the department level), most agricultural research programs remain effectively at the same levels as in FY2014 (see **Table 17**).

Prior to enacting the final omnibus appropriation, both the House and Senate Committees on Appropriations had reported their respective FY2015 Agriculture appropriations bills in May 2014 (H.R. 4800 and S. 2389). In each chamber, floor action began in June 2014, but in both chambers proceedings stopped before the bills were completed or brought to a final vote. In the House, most of H.R. 4800 was read procedurally on the floor and several amendments were adopted before the bill was left unfinished. In the Senate, agriculture was Division C of a minibus appropriation (S.Amdt. 3244 to H.R. 4660), but action stopped over disagreements about procedures for amendments.[117]

**The Agricultural Research Service (ARS)** is USDA's in-house basic and applied research agency. It operates approximately 90 laboratories nationwide with about 7,400 employees. ARS also operates the National Agricultural Library, one of the Department's primary information repositories for food, agriculture, and natural resource sciences. ARS laboratories focus on

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

[116] For more background on agricultural research, see CRS Report R40819, *USDA's Research, Education, and Economics (REE) Mission Area: Issues and Background*, by (name redacted) .

[117] For more background on agricultural appropriations, see CRS Report R43669, *Agriculture and Related Agencies: FY2015 Appropriations*, coordinated by (name redacted)

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 FY2015, the enacted appropriation provides $1.133 billion for ARS salaries and expenses, plus $45 million for ARS buildings and facilities construction. The salaries and expenses portion is $10 million more than FY2014 (+1%). The $45 million for buildings and facilities construction is the first time in several years that this account has received appropriations. The joint explanatory statement directs that it is to be used for "priorities identified in the USDA ARS Capital Investment Strategy."[118]

The joint explanatory statement for the enacted appropriation, as well as the House and Senate report language, rejects the Administration's request to close six ARS research centers and to redirect research programs at other laboratories. This is a continuation of the instructions in recent years' appropriations. Likewise, the appropriation does not fund the Administration's OGSI proposal for five high-priority ARS research areas.

**The National Institute of Food and Agriculture (NIFA**, formerly the Cooperative State Research, Education, and Extension Service)[119] 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, 1994 tribal land-grant colleges, and Hispanic-serving institutions.[120] Federal funds are distributed to enhance capacity at universities and institutions by statutory formula funding, competitive awards, and grants.

For FY2015, the enacted appropriation provides $1.290 billion for NIFA, $12 million more than the FY2014 appropriation (+1%). The Agriculture and Food Research Initiative (AFRI), with about one-fourth of NIFA's total budget, receives a $9 million increase to $325 million. Funding remains constant for Hatch Act activities that fund 1862 land-grant universities ($244 million), as well as Evans-Allen activities that fund 1890 land-grant universities ($52 million).

The Administration proposed to establish three new "Innovation Institutes" that would focus on emerging agricultural research challenges. The institutes would provide $75 million per year to leverage private funding. The enacted appropriation does not fund this initiative (although the research topics are addressed in other program funding).

In addition to the base request for NIFA, the Administration proposed an additional $80 million for NIFA through the OGSI. Most of this extra amount was to provide increased support for additional AFRI competitive research grants ($60 million). The rest would have established a new competitive research grant program to complement formula-funded NIFA grants. The enacted appropriation, like the House and Senate bills, does not address this request.

**The National Agricultural Statistics Service (NASS)** conducts the Census of Agriculture and provides official statistics on agricultural production and indicators of the economic and environmental status of the farm sector. For FY2015, the enacted appropriation provides $172 million for NASS, an increase of $11 million over FY2014 (+7%). Most of this increase ($9

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

[119] The 2008 farm bill restructured and renamed this agricultural research agency.

[120] 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.

million) is needed to pay for the additional cost of rental payments that agencies are paying instead of through a central account in the department.

The Administration's requested level ($6.6 million more than the enacted amount) was to restore selected surveys that were reduced or eliminated in recent years for budgetary reasons (including a variety of fruit and vegetable surveys and a chemical use survey).

**The Economic Research Service (ERS)** supports economic and social science information analysis on agriculture, rural development, food, commodity markets, and the environment. It collects and disseminates data concerning USDA programs and policies to various stakeholders. For FY2015, the enacted appropriation provides $85 million for ERS, an increase of $7 million over FY2014 (+9%). This amount is effectively equal to the FY2014 amount after adjusting for the additional cost of facility rental payments.

**Table 17. U.S. Department of Agriculture R&D**

(budget authority in millions of dollars)

| | FY2014 | FY2015 | | | | |
|---|---|---|---|---|---|---|
| | | Admin. Request | | | | |
| Agency or Major Program | Enacted (P.L. 113-76) | Base Budget | OGSI | House-reported (H.R. 4800) | Senate-reported (S. 2389) | Enacted (P.L. 113-235) |
| **Ag. Research Service: Salaries & expenses** | **1,122.5** | **1,104.4** | **42.2** | **1,120.3** | **1,139.7** | **1,132.6** |
| **Buildings and Facilities** | — | — | **155.0** | **155.0** | — | **45.0** |
| **National Institute of Food and Agriculture** | **1,277.1** | **1,335.5** | **80.0** | **1,273.8** | **1,292.4** | **1,289.5** |
| *Research and Education* | *772.6* | *837.7* | *80.0* | *774.5* | *787.5* | *786.9* |
| *AFRI* | *316.4* | *325.0* | *60.0* | *325.0* | *325.0* | *325.0* |
| *Hatch Act* | *243.7* | *243.7* | *15.0* | *243.7* | *243.7* | *243.7* |
| *Evans-Allen* | *52.5* | *52.5* | *5.0* | *52.5* | *52.5* | *52.5* |
| *McIntire-Stennis* | *34.0* | *34.0* | — | *34.0* | *34.0* | *34.0* |
| *Innovation Institutes* | — | *75.0* | — | — | — | — |
| *Other* | *126.0* | *107.6* | — | *119.3* | *132.4* | *131.7* |
| *Extension* | *469.2* | *469.0* | — | *467.3* | *472.7* | *471.7* |
| *Smith-Lever (b) and (c)* | *300.0* | *300.0* | — | *300.0* | *300.0* | *300.0* |
| *Smith-Lever (d)* | *85.5* | *85.7* | — | *85.7* | *85.5* | *85.5* |
| *Other* | *83.7* | *83.2* | — | *81.6* | *87.2* | *86.2* |
| *Integrated Activities* | *35.3* | *28.8* | — | *32.0* | *32.2* | *30.9* |
| **National Agricultural Statistics Service** | **161.2** | **179.0** | — | **169.4** | **178.2** | **172.4** |
| **Economic Research Service** | **78.1** | **83.4** | — | **85.8** | **85.4** | **85.4** |
| **Total, USDA Research Mission Area** | **2,638.8** | **2,702.4** | **277.2** | **2,804.2** | **2,695.6** | **2,724.9** |

**Source:** CRS, compiled from tables in the joint explanatory statements for P.L. 113-235 and P.L. 113-76, the committee reports for S. 2389 and H.R. 4800; and the USDA *FY2015 Budget Explanatory Notes*.

# Department of the Interior[121]

The Department of the Interior (DOI) seeks to protect and manage the nation's natural resources and cultural heritage, and provides scientific and other information about those resources. DOI's responsibilities include, among other things, mapping, geological, hydrological, and biological science; migratory bird and wildlife conservation; endangered species preservation; surface-mined lands protection and restoration; and historic preservation.[122]

In January 2015, DOI provided information to CRS on R&D appropriations provided to DOI agencies in P.L. 113-235. DOI adjusted its previously specified FY2014 enacted appropriations levels for the Bureau of Ocean Energy Management (BOEM) and the Bureau of Reclamation based on new accounting methodologies, and used the new methodologies to calculate the FY2015 enacted levels as well. The DOI did not adjust the FY2015 request levels to reflect the new methodologies, however. FY2014 actual and FY2015 enacted figures in **Table 18** are based on the new methodologies; the President's FY2015 request are based on the previous methodology. Comparisons of the FY2015 enacted level to the FY2014 actual level are based on figures derived using the new methodologies; comparisons of the President's FY2015 request to the FY2014 enacted levels are based on figures using the previous methodologies.

For FY2015, P.L. 113-235 provides $934.6 million for DOI R&D, an increase of $3.5 million (0.4%) over the FY2014 actual level. The U.S. Geological Survey (USGS) accounts for most of DOI's R&D in FY2015 ($665.8 million in FY2015, 71.2% of total DOI R&D). USGS is also the most R&D-intensive agency in DOI.

Based on data provided by DOI in March 2014, the Administration requested $888.7 million in DOI R&D funding for FY2015, $60.4 million (7.3%) above its FY2014 enacted level of $828.4 million. [123] According to DOI,

> Activities supported by this [R&D] funding range from scientific observations of the earth, streams, and wildlife populations, to applied research in the field to better address the impacts of a changing climate on Interior's lands and address species specific problems such as white nose syndrome in bats.[124]

Of the R&D funding provided for DOI agencies in P.L. 113-23 for FY2015, 5.7% is for basic research, 82.3% is for applied research, and 12.0% is for development. The USGS is the only DOI agency that conducts basic research.[125]

With respect to the appropriations process, funding for DOI R&D is generally included in line items that also include non-R&D funding. Therefore it is not possible to know precisely how much of the funding provided for in appropriations bills will be allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOI agencies allocate their appropriations to specific activities and report those figures.

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

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

[123] Email correspondence between the DOI budget office and CRS, March 7, 2014.

[124] Department of the Interior, *Fiscal Year 2015: The Interior Budget in Brief*, March 2014, p. DH-35, http://www.doi.gov/budget/appropriations/2015/highlights/upload/2015_Highlights_Book.pdf.

[125] CRS analysis of unpublished information provided by the DOI budget office via email communication with CRS, March 7, 2014.

Information on congressional appropriations actions related to research and development is included in this section to the extent available.

## U.S. Geological Survey

All USGS funding is provided through a single account, Surveys, Investigations, and Research (SIR). 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 FY2015 budget request for USGS (SIR account) was $1.073 billion. It included $685.1 million for R&D, an increase of $35.6 million (5.5%) over the FY2014 level of $649.5 million. The largest R&D increase in the FY2015 USGS budget was for Climate Variability (up $18.4 million, 34.3%), which is a part of the Climate Change and Land Use activity area (up $17.8 million, 18.6%). Other activity/program areas receiving additional funding in the request were Ecosystems (up $9.2 million, 6.0%) and Energy, Minerals, and Environmental Health (up $7.6 million, 8.3%). Water Resources and Core Science Systems was to receive smaller increases. Natural Hazards and Science Support funding was to be reduced.

The House Committee on Appropriations recommended $1.036 billion for the SIR account in FY2015, $3.7 million more than in FY2014 and $37.6 million less than the request. The committee-recommended level includes $153.2 million for Ecosystems; $133.4 million for Climate and Land Use Change; $91.6 million for Energy, Minerals, and Environmental Health; $133.2 million for Natural Hazards; $209.3 for Water Resources; $106.2 million for Core Science Systems; $105.6 million for Science Support; and $103.3 million for Facilities.[126] P.L. 113-235 provides $1.045 billion for the SIR account in FY2015, up $13.0 million (1.3%) from FY2014 and down $28.3 million (2.6%) from the request.

P.L. 113-235 provides $665.8 million to USGS for R&D in the SIR account, $16.4 million (2.5%) above the FY2014 actual level. The FY2015 appropriations includes $157.0 million for Ecosystems, up $4.2 million (2.8%) from the FY2014 actual level; $100.0 million for Climate and Land Use Change, up $4.0 million (4.2%); $92.3 million for Energy, Minerals, and Environmental Health, up $0.8 million (0.8%); $111.3 million for Natural Hazards, up $5.0 million (4.7%); $121.6 million for Water Resources, up $3.4 million (2.9%); $83.2 million for Core Science Systems, down $0.9 million (1.1%); and $0.4 million for Science Support, down slightly from FY2014.

## Other DOI Agencies

In addition to the USGS, the following DOI agencies also received appropriations for R&D in FY2015:

- The Bureau of Reclamation received $76.0 million in R&D funding for FY2015, down $18.6 million (19.7%) from FY2014. The FY2015 request for the Bureau of Reclamation included $12.7 million for applied research and development, a decrease of $3.9 million (23.5%).[127]

[126] H.Rept. 113-551.

[127] The Bureau of Reclamation's FY2015 R&D request estimate was not adjusted in the manner discussed in table note d to **Table 18**. Source: email communication between DOI and CRS on January 18, 2015.

- The Bureau of Ocean Energy Management received $70.5 million for applied research in FY2015, up $2.5 million (3.7%) from FY2014. The FY2015 request for BOEM included $50.2 million for applied research, an increase of $2.4 million (5.0%) from FY2014.[128]
- Fish and Wildlife Service received $32.5 million for applied research in FY2015, up $2.0 million (6.6%) from FY2014. The FY2015 request for the Fish and Wildlife Service included $49.9 million for applied research, an increase of $19.5 million (63.8%). The House Appropriations Committee recommended $5.1 million for science, $12.1 million below the fiscal year 2014 enacted level and $5.1 million above the budget request.
- The Bureau of Safety and Environmental Enforcement received $27.1 million for applied research for FY2015, essentially the same as for FY2014. The FY2015 request for the Bureau of Safety and Environmental Enforcement included $27.1 million for applied research, essentially unchanged. The House Appropriations Committee recommended $14.9 million for oil spill research, equal to the FY2014 enacted and FY2015 request levels.
- The National Park Service received $27.0 million in R&D funding for FY2015, an increase of $0.2 million (0.7%) from FY2014. The FY2015 request for the National Park Service included $27.0 million for R&D, an increase of $0.2 million (0.7%).
- The Bureau of Land Management received $20.2 million in R&D funding for FY2015, up $1.0 million (5.2%) from FY2014. The FY2015 request for the Bureau of Land Management included $22.4 million for applied research and development, an increase of $3.2 million (16.4%).
- The Bureau of Indian Affairs received $9.5 million for applied research for FY2015, the same as in FY2014. The FY2015 request for the Bureau of Indian Affairs included $5.0 million for applied research, the same as in FY2014.
- Wildland Fire Management received $6.0 million for applied research for FY2015, the same as in FY2014. The FY2015 request for Wildland Fire Management included $6.0 million in FY2015 for applied research, the same as in FY2014.
- The Office of Surface Mining Reclamation and Enforcement received no FY2015 funding for R&D, the same as in FY2014. The FY2015 request for the Office of Surface Mining included $3.4 million for applied research.[129]

**Table 18** summarizes R&D funding for DOI agencies.

[128] According to the DOI, "Beginning in FY 2015, BOEM will report R&D consistent with Required Supplementary Stewardship Information (RSSI) data that includes PFM and ABC codes. Beginning in FY 2016, BOEM will report on conventional energy science data in addition to environmental data." The FY2015 request is compared to the FY2014 funding level using the previous methodology for comparability. Source: email communication between DOI and CRS on January 18, 2015.

[129] Email correspondence between the DOI budget office and CRS, March 7, 2014; H.Rept. 113-551.

## Table 18. Department of the Interior R&D

(budget authority, in millions of dollars)

| | FY2014 Enacted (based on previous methodology) | FY2014 Actual (based on revised methodology) | FY2015 Request | FY2015 H. Cmte. (H.R. 5171) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| U.S. Geological Survey | $649.5 | $649.5 | $685.1 | [a] | $665.8 |
| Bureau of Reclamation | 16.6 | 94.6[d] | 12.7[e] | [a] | 76.0 |
| Bureau of Ocean Energy Management | 47.8 | 68.0[b] | 50.2[c] | [a] | 70.5 |
| Fish and Wildlife Service | 30.5 | 30.5 | 49.9 | [a] | 32.5 |
| Bureau of Safety and Environmental Enforcement | 27.1 | 27.1 | 27.1 | [a] | 27.1 |
| National Park Service | 26.8 | 26.8 | 27.0 | [a] | 27.0 |
| Bureau of Land Management | 19.2 | 19.2 | 22.4 | [a] | 20.2 |
| Bureau of Indian Affairs | 5.0 | 9.5 | 5.0 | [a] | 9.5 |
| Wildland Fire Management | 6.0 | 6.0 | 6.0 | [a] | 6.0 |
| Office of Surface Mining | 0 | 0 | 3.4 | [a] | 0 |
| **DOI, Total** | **828.4** | **931.1** | **888.7**[f] | [a] | **934.6** |

**Source:** Unpublished data provided to CRS by the DOI Budget Office.

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

a. Determination of total agency R&D funding is not possible at this time due to its inclusion in agency account(s) that also include non-R&D funding.

b. According to the DOI, "Beginning in FY 2015, BOEM will report R&D consistent with Required Supplementary Stewardship Information (RSSI) data that includes PFM and ABC codes. Beginning in FY 2016, BOEM will report on conventional energy science data in addition to environmental data."

c. The BOEM's FY2015 R&D request estimate was not adjusted in the manner discussed in table note b.

d. According to the DOI, "Beginning in 2016 [the Bureau of] Reclamation will report their Science activities consistent with [the Office of Management and Budget's Circular] A-11 guidance."

e. The Bureau of Reclamation's FY2015 R&D request estimate was not adjusted in the manner discussed in tablenote d.

f. The FY2015 "DOI, Total" request figure is not comparable to the FY2014 actual or FY2015 enacted levels as it does not incorporate the changes in methodology discussed in tablenotes b and d.

# Environmental Protection Agency[130]

The U.S. Environmental Protection Agency (EPA), the federal regulatory agency responsible for carrying out a number of environmental pollution control laws, funds a broad range of R&D activities to provide scientific tools and knowledge to support decisions relating to preventing, regulating, and abating environmental pollution. Beginning in FY2006, EPA has been funded through the Interior, Environment, and Related Agencies appropriations. Funding for EPA R&D is generally included in line items that also include non-R&D activities; therefore, it is not possible to identify precisely how much of the funding provided in appropriations laws is allocated to EPA R&D specifically (see discussion later in this section). The agency's Science and Technology (S&T) account funds much of EPA's scientific research activities, including R&D and other related scientific evaluations conducted by universities, foundations, and other non-federal entities that receive EPA grants, as well as R&D conducted by the agency at its own laboratories and facilities. The S&T account is funded by a "base" appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account. The transferred funds are dedicated to research on more effective methods to clean up contaminated sites.

Title II of Division F of the Consolidated and Further Continuing Appropriations Act, 2015 (P.L. 113-235; H.R. 83) provided $753.5 million for the EPA S&T account for FY2015 including transfers ($18.8 million) from the Superfund account. Including transfers, the FY2015 total for the S&T account, which represents 9.3% of the $8.14 billion for the agency overall for FY2015 appropriations, is $29.1 million (3.7%) less than the $782.6 million requested for FY2015, and $24.9 million (3.2%) less than the FY2014 enacted level of $778.4 million.

No bill providing regular appropriations for FY2015 for Interior, Environment, and Related Agencies was passed in the House or Senate. On July 15, 2014, the House Appropriations Committee reported the FY2015 Interior, Environment, and Related Agencies appropriations bill, H.R. 5171. The reported bill would have provided $735.4 million for FY2015 for EPA's S&T account, including transfers from the Superfund account ($18.8 million). On August 1, 2014, the Chairman and Ranking Member of the Senate Appropriations Subcommittee on Interior, Environment, and Related Agencies released the Chairman's Recommendation for FY2015 with an accompanying explanatory statement.[131] The Subcommittee Chairman's recommendation included $771.7 million for EPA's S&T account, including transfers from the Superfund account ($18.8 million).

**Table 19** at the end of this section presents the FY2015 amounts for program activities within EPA's S&T account as enacted compared to the House-reported bill, the Senate Subcommittee Chairman's recommendation for FY2015, the President's FY2015 budget request, and FY2014 enacted.[132] As indicated in the explanatory statement and table in the December 11, 2014,

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

[131] The Senate Subcommittee Chairman's recommendation and accompanying explanatory statement are available on the Senate Committee on Appropriations' website, http://www.appropriations.senate.gov/news/fy15-interior-subcommittee-bill-draft-report; text of the Chairman's recommendation is available at http://www.appropriations.senate.gov/sites/default/files/INTERIORFY15bill.pdf, and the explanatory statement is available at http://www.appropriations.senate.gov/sites/default/files/INTFY15Report.pdf.

[132] For an overview of the EPA FY2014 appropriations see CRS Report R43689, *Environmental Protection Agency (EPA): Appropriations for FY2014 in P.L. 113-76*, by (name redacted) and (name redacted) .

*Congressional Record*[133] and reflected in **Table 19**, the enacted FY2015 base amount for the S&T account included mostly decreases for individual EPA program and activity line items below the account level compared to the FY2015 request and FY2014 enacted amounts. P.L. 113-235 included $4.1 million for "Research: National Priorities" for FY2015, a slight decrease compared to the $4.2 million FY2014 enacted level. The FY2015 funding is for competitively awarded research grants to fund "high-priority water quality and availability research by not-for-profit organizations."[134] As in previous requests, the President's FY2015 budget request did not include funding for these "national priorities."[135]

The FY2015 request had proposed eliminating $0.2 million within the S&T account appropriated in FY2014 to support radon testing. Proposed elimination of this funding was also included in the FY2014 budget request.[136] The explanatory statement presented in the December 11, 2014 *Congressional Record* rejected the proposed elimination of radon activities but did not specify funding amount for these activities within the S&T account.[137]

With regard to the proposed Opportunity, Growth, and Security Initiative introduced earlier in this report (see "Opportunity, Growth, and Security Initiative," above), in testimony before Congress, the EPA Administrator reported that the initiative would include $1.0 billion for a Climate Resilience Fund. The Administrator indicated that through this fund the budget would invest in research and data collection across multiple federal departments and agencies to "better understand and prepare for the impacts of a changing climate."[138] According to the testimony, within the Climate Resilience Fund, EPA would support the preparation for the impacts of climate change with $10.0 million for protecting and enhancing coastal wetlands and $5.0 million to support urban forest enhancement and protection. This proposed funding was separate from the base request for the S&T account and other EPA appropriations accounts.

The EPA S&T account incorporates elements of the former EPA Research and Development account, as well as portions of the former Salaries and Expenses and Program Operations accounts, which were in place until FY1996.[139] Although the Office of Management and Budget (OMB) reports historical and projected budget authority (BA) for R&D at EPA (and other federal agencies),[140] OMB documents do not present a breakout of EPA R&D budget authority by

[133] "Explanatory Statement" submitted by the Chairman of the House Committee on Appropriations in the House *Congressional Record*, vol. 160 No. 151-Book II (December 11, 2014), http://www.gpo.gov/fdsys/pkg/CREC-2014-12-11/content-detail.html. Under Division F, see discussion regarding EPA S&T account under "Title II—Environmental Protection Agency," p. H9766; and in the funding table, pp. H9801-H9802.

[134] See footnote 133, pp. H9766, and H9802.

[135] See EPA's FY2015 Justification of Appropriation Estimates for Committee on Appropriations (FY2015 Congressional Justification), http://www2.epa.gov/planandbudget/fy2015, p. xi, and pp.101-102.

[136] See EPA's FY2014 Justification of Appropriation Estimates for Committee on Appropriations (FY2014 Congressional Justification), http://www2.epa.gov/planandbudget/archive, p. viii, p. 15, and pp. 99-100.

[137] See footnote 133, p. H9766.

[138] EPA Administrator McCarthy testimony during Compressional hearings on EPA's Fiscal Year 2015 Budget: April 2, 2014, before the Committee on Energy and Commerce, Subcommittee on Energy and Power and Subcommittee on Environment and Economy, http://docs.house.gov/meetings/IF/IF03/20140402/102045/HHRG-113-IF03-Wstate-McCarthyG-20140402.pdf; and March 26, 2014, before the Senate Committee on Environment and Public Works, http://www.epw.senate.gov/public/index.cfm?FuseAction=Hearings.Testimony&Hearing_ID=bffc28f9-f780-7d6d-66c5-1b8d66ce2ce8&Witness_ID=9d6074e8-137f-4b99-a4bd-87373539cd8d.

[139] Since 1996, EPA's annual appropriations have been requested, considered, and enacted according to eight statutory appropriations accounts established by Congress. A ninth account, Hazardous Waste Electronic Manifest System Fund, was added during the FY2014 budget process. Because of the differences in the scope of the activities included in these accounts, apt comparisons before and after FY1996 are not readily available.

[140] The Office of Management and Budget (OMB) reports R&D budget authority (BA) amounts in its Analytical (continued...)

specific individual program or activity. Typically, the R&D BA amounts reported by OMB have been considerably less than amounts requested and appropriated for the S&T account as a whole. This difference would indicate that not all of the EPA S&T account funding is allocated to R&D. (The amounts reported by OMB are included in **Table 19** for purposes of comparison.)

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

**Table 19. Environmental Protection Agency S&T Account**

(millions of dollars)

| | FY2014 Enacted (P.L. 113-76) | FY2015 Request | FY2015 H.R. 5171 As Reported | FY2015 S. Subcmte. Chairman Recommended | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| **Science and Technology Appropriations Account** | | | | | |
| Clean Air and Climate | $120.4 | $118.5 | $112.7 | $117.5 | $116.5 |
| Clean Air Allowance Trading Program | 8.6 | 8.4 | NR | NR | NR |
| Climate Protection Program | 8.3 | 8.0 | 8.0 | 8.0 | 8.0 |
| Federal Support for Air Quality Management | 7.0 | 7.0 | NR | NR | NR |
| Federal Vehicle and Fuel Standards and Certification | 96.5 | 95.0 | NR | NR | NR |
| Enforcement | 14.1 | 14.1 | 13.1 | 13.9 | 13.7 |
| Homeland Security | 38.4 | 39.4 | 38.3 | 38.7 | 37.1 |
| Indoor Air and Radiation | 6.4 | 6.1 | 6.1 | 6.1 | 6.0 |
| Indoor Air: Radon | 0.2 | 0.0 | NR | NR | NR |
| Radiation: Protection | 2.1 | 2.0 | NR | NR | NR |
| Radiation: Response Preparedness | 3.8 | 3.7 | NR | NR | NR |
| Reduce Risks from Indoor Air | 0.3 | 0.4 | NR | NR | NR |
| IT/Data Management/Security | 3.5 | 3.1 | 3.1 | 3.0 | 3.1 |
| Operations and Administration | 70.4 | 75.8 | 70.4 | 75.8 | 68.3 |
| Pesticide Licensing | 6.2 | 6.2 | 6.2 | 6.2 | 6.0 |
| Research: Air, Climate, and Energy | 95.0 | 101.9 | 90.3 | 98.9 | 91.9 |
| Research: Chemical Safety and Sustainability | 130.8 | 136.5 | 130.8 | 127.1 | 126.9 |
| Human Health Risk Assessment | 40.0 | 37.9 | NR | NR | NR |

(...continued)

Perspectives accompanying the annual President's budget request. See OMB, *Fiscal Year 2015 Budget of the United States: Analytical Perspectives—Special Topics/Research and Development, pp. 309-315,* http://www.whitehouse.gov/sites/default/files/omb/budget/fy2015/assets/topics.pdf.

| | FY2014 Enacted (P.L. 113-76) | FY2015 Request | FY2015 H.R. 5171 As Reported | FY2015 S. Subcmte. Chairman Recommended | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| Research: Computational toxicology | 21.4 | 28.6 | 28.6 | 21.4 | 21.4 |
| Research: Endocrine disruptor | 16.3 | 15.7 | 16.9 | 15.7 | 16.3 |
| Research: Other Activities | 53.2 | 54.3 | NR | NR | NR |
| Research: Safe and Sustainable Water Resources | 111.0 | 114.2 | 102.6 | 112.0 | 107.4 |
| Research: Sustainable and Healthy Communities | 155.0 | 144.1 | 135.1 | 145.1 | 150.0 |
| Water: Human Health Protection (Drinking Water Programs) | 3.6 | 3.7 | 3.7 | 3.6 | 3.5 |
| Research: National [Congressional] Priorities (Water Quality and Availability) | 4.2 | 0.0 | 4.2 | 5.0 | 4.1 |
| **Subtotal S&T Account Base Appropriations** | **759.2** | **763.8** | **716.6** | **752.9** | **734.6** |
| **Transfer in from Hazardous Substance Superfund Account** | **19.2** | **18.8** | **18.8** | **18.8** | **18.8** |
| **EPA, Total (Science and Technology)** | **778.4** | **782.6** | **735.4** | **771.7** | **753.5** |
| **EPA, R&D Budget Authority Reported by OMB (for purposes of comparison)** | **560.0** | **560.0** | **N/A** | **N/A** | **N/A** |

**Source**: Prepared by the Congressional Research Service. The FY2015 enacted and requested, and FY2014 enacted amounts are as presented in the table in the House *Congressional Record*, vol. 160, No. 151-Book II (December 11, 2014), pp. H9801-H9802, http://www.lis.gov/crtext/113-datesection.shtml. The Senate Subcommittee Chairman recommendations are as reported in the table contained in the Chairman's explanatory statement (p. 100), http://www.appropriations.senate.gov/sites/default/files/INTFY15Report.pdf. The FY2015 House Committee reported amounts are as presented in the House committee report (H.Rept. 113-551) accompanying H.R. 5171 as reported. NR (not reported) indicates those instances where the December 11, 2014, *Congressional Record*, Senate Subcommittee Chairman's explanatory statement, and the House Committee Report (H.Rept. 113-551) did not specify funding amounts for these sub-program activities. OMB amounts of R&D budget authority are as reported in OMB, Fiscal Year 2015 Budget of the United States: Analytical Perspectives—Special Topics/Research and Development, pp. 309-315, http://www.whitehouse.gov/sites/default/files/omb/budget/fy2015/assets/topics.pdf. Totals may differ from the sum of the components due to rounding.

# Department of Transportation[141]

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

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

President Obama has requested $896.3 million for Department of Transportation R&D in FY2015, an increase of $21.9 million (2.5%) from the FY2014 enacted level. (See **Table 20**.) Two DOT agencies—the Federal Highway Administration (FHWA) and the Federal Aviation Administration (FAA)—account for more than three-fourths of the department's R&D funding (76.9% in the FY2015 request).[142]

With respect to the appropriations process, funding for DOT R&D is generally included in line items that also include non-R&D funding. Therefore it is not possible to know precisely how much of the funding provided for in appropriations bills will be allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOT agencies allocate their appropriations to specific activities and report those figures. The section will provide appropriations information on House and Senate actions where bills and accompanying reports provide such detail.

## Federal Highway Administration

Under the President's request, the Federal Highway Administration would have received $406.8 million in R&D funding in FY2015, an increase of $38.0 million (10.3%) from the FY2014 enacted level.[143] Of these funds, $130.0 million were to support highway R&D, up $20.9 million (19.1%); $94.5 million were to support Intelligent Transportation Systems R&D, up $15.1 million (19.0%); $165.9 would have supported for State Planning and Research, up $2.0 million (1.2%); and $16.4 million would have supported administrative expenses.

## Federal Aviation Administration

The Federal Aviation Administration requested $282.1 million for R&D and R&D facilities in FY2015, a decrease of $38.3 million (11.9%) from the FY2014 enacted level. The FY2015 request included $256.9 million for research and development, a decrease of $46.5 million (15.3%), and $25.2 million for R&D facilities, an increase of $8.2 million (48.5%). P.L. 113-235 provides FAA funding for FY2015. As of the date of this report, it was not possible to accurately identify how much of this funding is for R&D and R&D facilities.

Of these funds requested by the President, $156.8 million were included in the FAA's Research, Engineering, and Development (RE&D) account (down $2.0 million, 1.3%). All RE&D account funding is research and development. The RE&D account supports research in NextGen-specific areas such as wake turbulence, human factors, and clean aircraft technologies, as well as in fire safety, propulsion systems, advanced materials, aircraft icing, and continued airworthiness. P.L. 113-235 provides $156.8 million for the RE&D account, the same level included in the request, the House-passed bill (H.R. 4745), and the bill reported by the Senate Committee on Appropriations (S. 2438).

Within the RE&D account, the request included $94.5 million for safety research, up $7.2 million (8.3%) from FY2014; $22.3 million for research in support of economic competitiveness, down $2.0 million (8.4%); $34.4 million for research supporting environmental sustainability, down

[142] The R&D funding figures in this section come from unpublished data provided by the DOT to CRS; DOT agencies' congressional budget justifications; the Office of Science and Technology Policy's March 4, 2014, press release, *The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth;* and House and Senate bills and reports.

[143] FHWA, *Budget Estimates Fiscal Year 2015: Federal Highway Administration*, http://www.dot.gov/sites/dot.gov/files/docs/FHWA-FY2015-Budget-Estimates.pdf.

$7.1 million (17.2%); and $5.5 million for mission support, down $0.1 million (1.7%). The House report (H.Rept. 113-464) recommended $91.0 million for safety research, $22.3 million for research in support of economic competitiveness, $38.0 for research supporting environmental sustainability, and $5.6 million for mission support. The Senate report (S.Rept. 113-182) recommended $92.5 million for safety research, $22.3 million for research in support of economic competitiveness, $36.4 for research supporting environmental sustainability, and $5.4 million for mission support. P.L. 113-235 provides $91.0 million for safety research, $3.5 million (3.7%) less than the request; $22.3 for economic competitiveness, equal to the request; $37.9 million for environmental sustainability, $3.5 million (10.2%) above the request; and $5.5 million for mission support, essentially the same as the request.

Included in the President's request for RE&D funding (discussed above) was $47.5 million in funding for NextGen RE&D research activities, down $10.8 million (18.5%) from the FY2014 enacted level.[144] H.Rept. 113-464 recommended $51.3 million for NextGen RE&D activities, including increases above the requested levels for alternative fuels ($0.3 million) and aircraft technologies, fuels, and metrics ($3.5 million); S.Rept. 113-182 recommended $49.8 million for NextGen RE&D activities. P.L. 113-235 provides $51.3 million for NextGen R&D, $3.8 million above the request and $7.0 million below FY2014. Included in the safety research funding is $15.0 million for unmanned aircraft systems research, $6.0 million above the request. The additional funds include $4.0 million for a new center of excellence on unmanned aircraft systems, for a total of $5.0 million for the center; and $2.0 million "to help meet FAA's UAS research goals of system safety and data gathering, aircraft certification, command and control link challenges, control station layouts and certification, sense and avoid, and environmental impacts."[145]

Within the Administration and Research Program account, P.L. 113-235 provided $15 million for the Airport Cooperative Research Program for FY2015, equal to the FY2014 level and the request; and $29.8 million for airport technology research, equal to the request and up $0.3 million from FY2014. Both the House-passed and the Senate Committee-reported bills sought the requested levels for the Airport Cooperative Research Program and airport technology research for FY2015.

The FAA Facilities and Equipment account includes funding for R&D as well.

## Other DOT Agencies

A number of other DOT agencies fund research and development.

- The FY2015 request included $75.1 million in R&D funding for the National Highway Traffic Safety Administration, up $9.9 million (15.2%). It is not possible to parse the R&D from other NHTSA funding in the House and Senate appropriations bills. The House Committee on Appropriations supports the requested increases for vehicle electronics and emerging technology research, and encourages heavy duty vehicle safety research for fleets and owner-operators, and research to advance predictive engineering for plastics and

[144] FAA, *Budget Estimates Fiscal Year 2015: Federal Aviation Administration*, http://www.dot.gov/sites/dot.gov/files/docs/FAA-FY2015-Budget-Estimates.pdf.

[145] Rep. Harold Rogers, "Explanatory Statement Submitted by Mr. Rogers Of Kentucky, Chairman of the House Committee on Appropriations Regarding the House Amendment to the Senate Amendment on H.R. 83," Explanatory Statement, *Congressional Record*, daily edition, vol. 160, part 151 (December 11, 2014), pp. H9307-H10003.

polymer-based composites in the automotive field. The Senate Committee supports research on fuel efficiency improving technologies, emerging alternative fuel systems, and motorcoach safety regulatory activities including the prevention and mitigation of fires.

- The FY2015 request for Federal Railroad Administration R&D totaled $61.9 million, an increase of $21.9 million (54.7%) over FY2014. The request included $35.1 million in FRA's Railroad Research and Development account, slightly below the FY2014 level of $35.3 million. The House-passed bill would have provided $35.3 million for the Railroad R&D account for FY2015; the Senate Committee-passed bill would have provided $40.7 million. P.L. 113-235 provides $39.1 million for the Railroad R&D account for FY2015.
- The FY2015 request included $28.2 million for Federal Transit Administration R&D, down by a third from its $42.2 million level in FY2014. The House-passed bill would have provided $15.0 million for the FTA Transit Research account in FY2015, down $28.0 million from the FY2014 level of $43.0 million; the Senate Committee-passed bill would have provided $33.0 million. P.L. 113-235 provides $33.0 million for the FTA Transit Research account, including $30.0 million for its national research program and $3.0 million for its cooperative research program.
- The FY2015 request includes $21.1 million in R&D funding for the Pipeline and Hazardous Materials Safety Administration, up $4.8 million (29.3%) from FY2014. It is not possible to parse the R&D from other PHMSA funding in P.L. 113-235 and the House and Senate appropriations bills.
- Federal Motor Carrier Safety Administration R&D would have fallen by $1.5 million (19.4%) to $6.1 million in FY2015, down from $7.5 million in FY2014. It is not possible to parse the R&D from other FMCSA funding in P.L. 113-235 and the House and Senate appropriations bills.[146]

The DOT FY2015 request also included $15.0 million for the Office of the Assistant Secretary for Research and Technology, up $1.0 million (7.2%) from FY2014.[147] As requested by DOT in its FY2014 request, Congress eliminated the Research and Innovative Technology Administration (RITA), and moved its programs and related funding to the Office of the Assistant Secretary for Research and Technology in the Office of the Secretary under the provisions of the Consolidated Appropriations Act, 2014 (P.L. 113-76). P.L. 113-235 provides $13.0 million for the Office of the Assistant Secretary for Research and Technology for FY2015; the House-passed bill would have provided $12.6 million and the Senate Committee-reported bill would have provided $13.5 million.

**Table 20** summarizes R&D funding for the DOT agencies.

[146] Email communication between CRS and the Department of Transportation, March 27, 2014; H.R. 4745; H.Rept. 113-464; S. 2438; and S.Rept. 113-182.

[147] Email communication between CRS and the Department of Transportation, March 27, 2014.

## Table 20. Department of Transportation R&D

(budget authority, in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 House-passed (H.R. 4745) | FY2015 S. Cmte. (S. 2438) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| Federal Highway Administration | $368.8 | $406.8 | a | a | a |
| Federal Aviation Administration | 320.4 | 282.1 | a | a | a |
| *Research, Engineering, and Development* | *158.8* | *156.8* | *156.8* | *156.8* | *156.8* |
| National Highway Traffic Safety Administration | 65.1 | 75.1 | a | a | a |
| Federal Railroad Administration | 40.0 | 61.9 | a | a | a |
| *Railroad Research and Development* | *35.3* | *35.1* | *35.3* | *40.7* | *39.1* |
| Federal Transit Administration | 42.2 | 28.2 | 15.0 | 33.0 | 33.0 |
| Pipeline and Hazardous Materials Safety Administration | 16.3 | 21.1 | a | a | a |
| Office of the Secretary | 14.0 | 15.0 | a | a | $15.0 |
| Federal Motor Carrier Safety Administration | 7.5 | 6.1 | a | a | a |
| **DOT, Total** | **874.4** | **896.3** | a | a | a |

**Source:** DOT FY2015 department and agency budget justification; email communication between CRS and the Department of Transportation, March 27, 2014; and P.L. 113-235 and explanatory statement.

**Notes:** Figures include R&D and R&D facilities. Totals may differ from the sum of the components due to rounding.

a. Determination of total agency R&D funding is not possible at this time due to its inclusion in agency accounts that also include non-R&D funding.

# Department of Veterans Affairs[148]

The Department of Veterans Affairs (VA) operates programs to provide America's veterans with medical care, benefits, social support, and memorials.[149] VA provides a broad range of primary care, specialized care, and related medical and social support services. VA seeks to advance medical R&D in areas that most directly address the diseases and conditions that affect veterans and eligible beneficiaries.

Funding for VA R&D is generally included in line items that also include non-R&D funding. Therefore it is not possible to know precisely how much of the funding provided for in appropriations bills will be allocated to R&D unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after the VA allocates its appropriations to specific activities and reports those figures. The R&D funding figures in this section—for FY2014 and the President's request—come from the VA's *2015 Congressional Submission* and the Office of Science and Technology Policy's *The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth.*[150]

The President proposed $1.178 billion for VA R&D in FY2015, up 0.3% from FY2014. VA research focuses on biomedical topics of special relevance to wounded soldiers, including clinical and translational research.[151] The VA requested $589.0 million for its Medical and Prosthetic Research account and an equal amount for VA research as part of its Medical Care appropriation. The Medical and Prosthetic Research account supports medical, rehabilitative, and health services research. VA medical research includes basic and clinical studies that advance knowledge leading to improvements in the prevention, diagnosis, and treatment of diseases and disabilities. Rehabilitation research focuses on rehabilitation engineering problems in the fields of prosthetics, orthotics, adaptive equipment for vehicles, sensory aids, and related areas. Health services research focuses on improving the effectiveness and economy of the delivery of health services.[152]

Under the VA's budget request, FY2015 research would have emphasized addressing the critical needs of veterans of Operation Enduring Freedom (OEF), Operation Iraqi Freedom (OIF), and Operation New Dawn (OND), while continuing to address the health care needs of all veterans. A primary focus of the FY2015 research request was the ability to extract knowledge from large, complex collections of digital data, including the storage, retrieval, and analysis of biological data. To store and manage the data, the VA Million Veteran Program (MVP) is building one of the

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

[149] VA administers compensation benefits, pension benefits, fiduciary services, education benefits, vocational rehabilitation and employment services, transition services, and home loan and life insurance programs. VA also operates the largest national cemetery system for veterans, eligible beneficiaries, and their families.

[150] EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

[151] EOP, OSTP, "The FY 2015 Science and Technology R&D Budget: Science, Technology, and Innovation for Opportunity and Growth," press release, March 4, 2014, http://www.whitehouse.gov/sites/default/files/microsites/ostp/2015%20Budget%20Release.pdf.

[152] S.Rept. 113-174.

world's largest medical databases, GenISIS, to support MVP and VA genomic-medicine studies.[153]

**Table 21** summarizes R&D program funding for VA, in total, and for certain efforts, including OEF/OIF/OND-focused research, Prosthetics, Women's Health, Gulf War Veterans Illness programs, amyotrophic lateral sclerosis (ALS) and other neurodegenerative disorders, and Genomic Medicine.

**Table 21. Department of Veterans Affairs R&D**

(budget authority, in millions of dollars)

| | FY2014 Enacted | FY2015 Request | FY2015 House (H.R. 4486) | FY2015 S. Cmte. (H.R. 4486) | FY2015 Enacted (P.L. 113-235) |
|---|---|---|---|---|---|
| **VA, Total** | **$1,174** | **$1,178** | a | a | a |
| **Selected VA Research Efforts** | | | a | a | a |
| *OEF/OIF/OND* | | | | a | |
| *Pain* | *18.9* | *19.2* | a | a | a |
| *Post-deployment Mental Health* | *55.4* | *56.3* | a | a | a |
| *Sensory Loss* | *17.7* | *17.9* | a | a | a |
| *Spinal Cord Injury* | *28.8* | *29.2* | a | a | a |
| *Traumatic Brain Injury and Other Neurotrauma* | *35.0* | *35.5* | a | a | a |
| *Prosthetics* | *12.7* | *12.9* | a | a | a |
| *Women's Health* | *16.6* | *16.8* | a | a | a |
| *Gulf War Veterans Illness* | *15.0* | *15.0* | a | a | a |
| *ALS and Other Neurodegenerative Disorders* | *37.2* | *37.8* | a | a | a |
| *Genomic Medicine, including MVP* | *51.5* | *52.2* | a | a | a |

**Source:** Department of Veterans Affairs, *2015 Congressional Submission*, p. Highlights-33, http://www.va.gov/budget/docs/summary/Fy2015-Volumel-Summary.pdf.

**Notes:** Italicized lines do not add to total.

a. Determination of R&D funding is not possible at this time due to its inclusion in VA accounts that also include non-R&D funding.

[153] VA describes MVP as, "a national, voluntary research program funded entirely by the Department of Veterans Affairs Office of Research & Development ... to study how genes affect health ... by safely collecting blood samples and health information from one million Veteran volunteers. Data collected from MVP will be stored anonymously for research on diseases like diabetes and cancer, and military-related illnesses, such as post-traumatic stress disorder." Department of Veterans Affairs, Office of Research and Development, website, http://www.research.va.gov/MVP.

# Appendix. Acronyms and Abbreviations

## Glossary

| | |
|---|---|
| **ACE** | Air, Climate, and Energy |
| **ACI** | American Competitiveness Initiative |
| **AD** | Alzheimer's Disease |
| **AFRI** | Agriculture and Food Research Initiative |
| **AMP** | Advanced Manufacturing Partnership |
| **AMTech** | Advanced Manufacturing Technology Consortia |
| **AOAM** | Agency Operations and Award Management |
| **ARPA-E** | Advanced Research Projects Agency–Energy |
| **ARS** | Agricultural Research Service |
| **B&F** | Buildings & Facilities |
| **BD2K** | Big Data to Knowledge |
| **BES** | Basic Energy Sciences |
| **BIO** | Directorate for Biological Sciences |
| **BioMaPS** | Research at the Interface of Biological, Mathematical, and Physical Sciences |
| **BRAIN** | Brain Research through Advancing Innovative Neurotechnologies |
| **CAN** | Cures Acceleration Network |
| **CAUSE** | Catalyzing and Advancing Undergraduate STEM Education |
| **CEMMSS** | Cyber-enabled Materials, Manufacturing, and Smart Systems |
| **CIF21** | Cyberinfrastructure Framework for 21st Century Science, Engineering, and Education |
| **CRF** | Construction of Research Facilities |
| **DARPA** | Defense Advanced Projects Research Agency |
| **DHS** | Department of Homeland Security |
| **DKIST** | Daniel K. Inouye Solar Telescope |
| **DOC** | Department of Commerce |
| **DOD** | Department of Defense |
| **DOE** | Department of Energy |
| **DOI** | Department of the Interior |
| **DOT** | Department of Transportation |
| **EERE** | Office of Energy Efficiency and Renewable Energy |
| **EHR** | Education and Human Resources |
| **EPA** | Environmental Protection Agency |
| **EPM** | Environmental Program and Management |
| **EPSCoR** | Experimental Program to Stimulate Competitive Research |
| **ERS** | Economic Research Service |
| **FAA** | Federal Aviation Administration |

| | |
|---|---|
| **FDA** | Food and Drug Administration |
| **FHWA** | Federal Highway Administration |
| **FIC** | Fogarty International Center |
| **GAO** | Government Accountability Office |
| **GDP** | Gross Domestic Product |
| **GEO** | Directorate for Geosciences |
| **GRF** | Graduate Research Fellowship |
| **GRO** | Greater Research Opportunities |
| **GWOT** | Global War on Terror |
| **HHS** | Department of Health and Human Services |
| **ICER** | Integrative and Collaborative Education and Research |
| **ICs** | Institutes and Centers |
| **IFF** | Iraqi Freedom Fund |
| **IG** | Inspector General |
| **IGERT** | Integrative Graduate Education and Research Traineeship |
| **ISS** | International Space Station |
| **ITER** | International Thermonuclear Experimental Reactor |
| **ITS** | Industrial Technology Services |
| **IUSE** | Improving Undergraduate STEM Education |
| **JIEDDF** | Joint Improvised Explosive Device Defeat Fund |
| **LBNE** | Long Baseline Neutrino Experiment |
| **LCLS-II** | Linac Coherent Light Source II |
| **LSST** | Large Synoptic Survey Telescope |
| **MEP** | Manufacturing Extension Partnership |
| **MGI** | Materials Genome Initiative |
| **MPCV** | Multipurpose Crew Vehicle |
| **MREFC** | Major Research Equipment and Facilities Construction |
| **Mu2e** | Muon to Electron Conversion Experiment |
| **MRAPVF** | Mine Resistant and Ambush Protected Vehicle Fund |
| **NASA** | National Aeronautics and Space Administration |
| **NASS** | National Agricultural Statistics Service |
| **NBAF** | National Bio and Agro-Defense Facility |
| **NCATS** | National Center for Advancing Translational Sciences |
| **NCCAM** | National Center for Complementary and Alternative Medicine |
| **NCI** | National Cancer Institute |
| **NCSES** | National Center for Science and Engineering Statistics |
| **NEI** | National Eye Institute |
| **NEON** | National Ecological Observatory Network |

| | |
|---|---|
| **NESDIS** | National Environmental Satellite, Data, and Information Service |
| **NHGRI** | National Human Genome Research Institute |
| **NHLBI** | National Heart, Lung, and Blood Institute |
| **NIA** | National Institute on Aging |
| **NIAAA** | National Institute on Alcohol Abuse and Alcoholism |
| **NIAID** | National Institute of Allergy and Infectious Diseases |
| **NIAMS** | National Institute of Arthritis and Musculoskeletal and Skin Diseases |
| **NIBIB** | National Institute of Biomedical Imaging and Bioengineering |
| **NICHD** | National Institute of Child Health and Human Development |
| **NIDA** | National Institute on Drug Abuse |
| **NIDCD** | National Institute on Deafness and Other Communication Disorders |
| **NIDCR** | National Institute of Dental and Craniofacial Research |
| **NIDDK** | National Institute of Diabetes and Digestive and Kidney Diseases |
| **NIEHS** | National Institute of Environmental Health Sciences |
| **NIFA** | National Institute of Food and Agriculture |
| **NIGMS** | National Institute of General Medical Sciences |
| **NIH** | National Institutes of Health |
| **NIMH** | National Institute of Mental Health |
| **NIMHD** | National Institute on Minority Health and Health Disparities |
| **NINDS** | National Institute of Neurological Disorders and Stroke |
| **NINR** | National Institute of Nursing Research |
| **NIST** | National Institute of Standards and Technology |
| **NITRD** | Networking and Information Technology Research and Development |
| **NLM** | National Library of Medicine |
| **NMFS** | National Marine Fisheries Service |
| **NNI** | National Nanotechnology Initiative |
| **NNMI** | National Network for Manufacturing Innovation |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **NOS** | National Ocean Service |
| **NRC** | National Research Council |
| **NRI** | National Robotics Initiative |
| **NRT** | NSF Research Traineeships |
| **NSB** | National Science Board |
| **NSLS-II** | National Synchrotron Light Source II |
| **NSTC** | National Science and Technology Council |
| **NWS** | National Weather Service |
| **OAR** | Oceanic and Atmospheric Research |
| **OCO** | Overseas Contingency Operations |

| | |
|---|---|
| **OCO-3** | Orbiting Carbon Observatory 3 |
| **OGSI** | Opportunity, Growth, and Security Initiative |
| **OMAO** | Office of Marine and Aviation Operations |
| **OMB** | Office of Management and Budget |
| **OOI** | Ocean Observatories Initiative |
| **ORD** | Office of Research and Development |
| **OSTP** | Office of Science and Technology Policy |
| **PHS** | Public Health Service |
| **R&D** | Research and Development |
| **R&E** | Research and Experimentation |
| **RDT&E** | Research, Development, Test, and Evaluation |
| **RE&D** | Research, Engineering, and Development |
| **REE** | Research, Education, and Economics |
| **REU** | Research Experiences for Undergraduates |
| **RIID** | Radioisotope Identification Device |
| **RITA** | Research and Innovative Technology Administration |
| **RPG** | Research Project Grant |
| **RRA** | Research and Related Activities |
| **S&T** | Science and Technology |
| **SaTC** | Secure and Trustworthy Cyberspace |
| **SBE** | Social, Behavioral and Economic Sciences |
| **SEES** | Science, Engineering, and Education for Sustainability |
| **SIR** | Surveys, Investigations, and Research |
| **SLS** | Space Launch System |
| **SOFIA** | Stratospheric Observatory for Infrared Astronomy |
| **SSW** | Safe and Sustainable Water |
| **STAG** | State and Tribal Assistance Grants |
| **STAR** | Science to Achieve Results |
| **STEM** | Science, Technology, Engineering, and Mathematics |
| **STRS** | Scientific and Technical Research and Services |
| **USARC** | U.S. Arctic Research Commission |
| **USDA** | Department of Agriculture |
| **USGCRP** | U.S. Global Change Research Program |
| **USGS** | U.S. Geological Survey |
| **VA** | Veterans Administration |

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