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Federal Research and Development (R&D) Funding: FY2021

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SUMMARY

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September 2, 2020

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Federal Research and Development (R&D) Funding: FY2021

President Trump's budget request for FY2021 includes approximately $142.2 billion for research and development (R&D) for FY2021, $13.8 billion (8.8%) below the FY2020 enacted level of $156.0 billion. In constant FY2020 dollars, the President's FY2021 R&D request would result in a decrease of $16.6 billion (10.6%) from the FY2020 level.

In 2017, the Office of Management and Budget (OMB) adopted a change to the definition of development, applying a more narrow treatment that it describes as "experimental development." This change was intended to harmonize the reporting of U.S. R&D funding data with the approach used by other nations. The new definition is used in this report.

Funding for R&D is concentrated in a few departments and agencies. In FY2020, five federal agencies received 93.2% of total federal R&D funding, with the Department of Defense (DOD, 41.4%) and the Department of Health and Human Services (HHS, 26.2%) combined accounting for more than two-thirds of all federal R&D funding. In the FY2021 request, the top five R&D agencies would account for 93.8%, with DOD accounting for 42.1% and HHS for 26.6%.

Under the President's FY2021 budget request, nearly all federal agencies would see their R&D funding decline relative to FY2020. The only exception is the Department of Veterans Affairs, which would increase by $38 million (2.9%) in FY2021 to $1.351 billion. The largest dollar reductions in R&D funding would be made to the DOD (down $4.713 billion), the Department of Energy (down $3.168 billion), and HHS (down $2.843 billion). The largest percentage declines in R&D funding would be at the Department of Transportation (down 47.6%), the Environmental Protection Agency (down 35.4%), and Department of the Interior (down 25.5%)

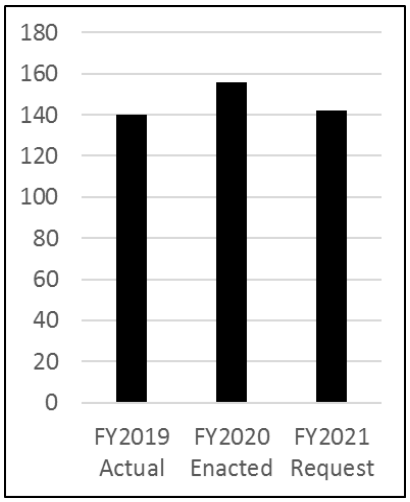
The President's FY2021 budget request would reduce funding for basic research by $2.822 billion (6.5%), applied research by $5.125 billion (11.7%), development by $3.466 billion (5.5%), and facilities and equipment by $2.375 billion (39.6%).

Several multiagency R&D initiatives continue under the President's FY2021 budget. Some activities supporting these initiatives are discussed in agency budget justifications and are reported in the agency analyses in this report. However, comprehensive aggregate budget information on these initiatives will likely not be available until budget supplements for each are released later in the year.

The request represents the President's R&D priorities. Congress may opt to agree with none, part, or all of the request, and it may express different priorities through the appropriations process. As of the date of this report, the House has passed 10 of the 12 regular annual appropriations acts through the use of two consolidated bills, H.R. 7608 and H.R. 7617; the Department of Homeland Security Appropriations Act is the only appropriations act that includes R&D that the House has not yet passed. In recent years, Congress has completed the annual appropriations process after the start of the fiscal year. Completing the process after the start of the fiscal year and the accompanying use of continuing resolutions can affect agencies' execution of their R&D budgets, including the delay or cancellation of planned R&D activities and acquisition of R&D-related equipment.

It is not yet clear how the national response to the Coronavirus Disease 2019 (COVID-19) pandemic will affect Administration and congressional priorities for FY2021 R&D funding, or the congressional authorization and appropriations processes for enacting that funding.

Federal Research and Development Funding, FY2019-FY2021
In billions of dollars



Source: CRS analysis of data from OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020.

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Introduction

The 116th Congress continues its interest in U.S. research and development (R&D) and in evaluating support for federal R&D activities. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the internet to communications satellites, shale gas extraction, and defenses against disease. In recent years, federal budget caps have driven executive and legislative branch 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 Bipartisan Budget Act of 2019, among other things, increased the previously established FY2020 and FY2021 discretionary spending limits for defense and nondefense spending. This act reduced some of the budgetary constraints affecting R&D decisions.

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

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

Congress plays a central role in defining the nation's R&D priorities as it makes decisions about the level and allocation of R&D funding—overall, within agencies, and for specific programs. In recent years, some Members of Congress have expressed concerns about the level of federal spending (for R&D and for other purposes) in light of the federal deficit and debt. Other Members of Congress have expressed support for increased federal spending for R&D as an investment in the nation's future competitiveness. As Congress acts to complete the FY2021 appropriations process, it faces two overarching issues: the amount of the federal budget to be spent on federal R&D and the prioritization and allocation of the available funding.

This report begins with a discussion of the overall level of R&D in President Trump's FY2021 budget request, followed by analyses of R&D funding in the request from a variety of perspectives and for selected multiagency R&D initiatives. The remainder of the report discusses and analyzes the R&D budget requests of selected federal departments and agencies that, collectively, account for approximately 98% of total federal R&D funding.

Selected terms associated with federal R&D funding are defined in the text box on the next page. **Appendix A** provides a list of acronyms and abbreviations.

Definitions Associated with Federal Research and Development Funding

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

Office of Management and Budget. The Office of Management and Budget provides the following definitions of R&D-related terms in OMB Circular No. A-11, "Preparation, Submission, and Execution of the Budget."[1] This document provides guidance to agencies in the preparation of the President's annual budget and instructions on budget execution. In 2017, OMB adopted a refinement to the categories of R&D, replacing "development" with "experimental development," which more narrowly defines the set of activities to be included. The new definition has resulted in lower reported R&D by some agencies, including the Department of Defense and the National Aeronautics and Space Administration. This definition is used in the President's FY2021 budget.

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

Basic Research. Basic research is defined as experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, such as the study of how plant genomes change, but excludes research directed towards a specific application or requirement, such as the optimization of the genome of a specific crop species.

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

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

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

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

National Science Board/National Science Foundation. The National Science Board/National Science Foundation provides the following definitions of R&D-related terms in its report *Science and Engineering Indicators: 2020*.[2]

Research and Development (R&D): Research and experimental development comprise creative and systematic work undertaken to increase the stock of knowledge—including knowledge of humankind, culture, and society—and its use to devise new applications of available knowledge.

Basic Research: Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Applied Research: Original investigation undertaken to acquire new knowledge; directed primarily, however, toward a specific, practical aim or objective.

Development (or Experimental Development): Systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

[1] The White House, Office of Management and Budget, Circular No. A-11, "Preparation, Submission, and Execution of the Budget," December 18, 2019, https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf.

[2] National Science Board/National Science Foundation, *Science and Engineering Indicators 2020*, January 2020, https://ncses.nsf.gov/pubs/nsb20201/glossary.

The President's FY2021 Budget Request

On February 10, 2020, President Trump released his proposed FY2021 budget. President Trump is proposing $142.2 billion for R&D for FY2021, a decrease of $13.8 billion (8.8%) below the FY2020 level of $156.0 billion. Adjusted for inflation to FY2021 dollars, the President's FY2021 R&D request represents a constant-dollar decrease of 10.6% from the FY2020 actual level.[3]

The President's request includes continued R&D funding for existing single-agency and multiagency programs and activities, as well as new initiatives. This report provides government-wide, multiagency, and individual agency analyses of the President's FY2021 request as it relates to R&D and related activities. Additional information and analysis will be included as the House and Senate act on the President's budget request through appropriations bills.

It is not yet clear how the national response to the Coronavirus Disease 2019 (COVID-19) pandemic will affect Administration and congressional priorities for FY2021 R&D funding, or the congressional authorization and appropriations processes for enacting that funding.

Factors Affecting Analysis of the FY2021 Budget Request

Two factors complicate the analysis of changes in R&D funding for FY2021, both in aggregate and for selected agencies:

- Beginning in FY2018, OMB replaced the R&D category "development" with a subset referred to as "experimental development" in an effort that OMB asserts better aligns its data with the survey data collected by the National Science Foundation, and for greater consistency with international standards. The new definition excludes some activities, primarily at the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA) that had been characterized as development in previous budgets. The new definition (experimental development) is used throughout this report for FY2017 and later years, except in the section "**Department of Defense**," which treats non-experimental development funding as part of its total research, development, testing, and evaluation budget in line with DOD practice.
- Inconsistency among agencies in the reporting of R&D and the inclusion of R&D activities in accounts with non-R&D activities may result in different figures being reported by OMB and the White House Office of Science and Technology Policy (OSTP), including those shown in **Table 1**, and those in agency budget analyses that appear later in this report.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide different insights. The following sections examine the data by agency, by the character of the work supported, and by a combination of these two perspectives.

Federal R&D by Agency

Congress makes decisions about R&D funding through the authorization and appropriations processes primarily from the perspective of individual agencies and programs. **Table 1** provides data on R&D funding by agency for FY2019 (actual), FY2020 (enacted), and FY2021 (request).[4]

[3] As calculated by CRS using the Gross Domestic Product (GDP) (chained) price index for FY2020-FY2021 in Table 10.1, "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2022," *Budget of the United States Government, Fiscal Year 2021*, https://www.whitehouse.gov/wp-content/uploads/2018/02/hist10z1-fy2019.xlsx.

[4] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2020, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

Under the request, eight federal agencies would receive nearly 98% of total federal R&D funding in FY2021: the Department of Defense (DOD), 42.1%; Department of Health and Human Services (HHS), primarily the National Institutes of Health (NIH), 26.6%; Department of Energy (DOE), 11.3%; National Aeronautics and Space Administration (NASA), 9.4%; National Science Foundation (NSF), 4.5%; Department of Agriculture (USDA), 1.9%; Department of Commerce (DOC), 1.1%; and Department of Veterans Affairs (VA), 1.0%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Department of Homeland Security (DHS), Department of the Interior (DOI), Department of Transportation (DOT), and Environmental Protection Agency (EPA).

All but one federal agency would see their R&D funding decrease under the President's FY2021 request compared to their FY2020 enacted level. The only agency that would see an increase in R&D funding in FY2021 relative to the FY2020 level would be the VA (up $38 million, 2.9%).

The agencies with the largest R&D funding declines (measured in dollars) in the FY2021 request compared to FY2020 enacted level are DOD (down $4.713 billion), DOE (down $3.168 billion), HHS (down $2.943 billion), NASA (down $723 million), and DOT (down $540 million). See **Table 1**.

The agencies with the largest percentage declines in R&D funding in the FY2021 request compared to FY2020 enacted level are DOT (down 47.6%), EPA (down 35.4%), DOI (down 25.5%), DOC (down 22.7%), and DOE (down 16.5%). See **Table 1**.

Table 1. Federal Research and Development Funding by Agency, FY2019-FY2021

(budget authority, dollar amounts in millions)

Department/Agency	FY2019 Actual	FY2020 Enacted	FY2021 Request	FY2020-FY2021 Dollar Change	FY2020-FY2021 Percent Change
Department of Defense	54,691	64,544	59,831	-4,713	-7.3%
Dept. of Health and Human Services	38,511	40,818	37,875	-2,943	-7.2%
Department of Energy	18,271	19,219	16,051	-3,168	-16.5%
NASA	10,698	14,057	13,334	-723	-5.1%
National Science Foundation	6,586	6,752	6,328	-424	-6.3%
Department of Agriculture	3,026	2,941	2,769	-172	-5.8%
Department of Commerce	1,959	1,948	1,506	-442	-22.7%
Department of Veterans Affairs	1,370	1,313	1,351	38	2.9%
Department of Transportation	1,071	1,134	594	-540	-47.6%
Department of the Interior	958	973	725	-248	-25.5%
Department of Homeland Security	668	532	450	-82	-15.4%
Smithsonian Institution	339	330	328	-2	-0.6%
Environmental Protection Agency	489	492	318	-174	-35.4%
Department of Education	248	259	230	-29	-11.2%
Other	1,249	661	495	-166	-25.1%
Total	140,134	155,973	142,185	-13,788	-8.8%

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

Note: Components may not sum to totals 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 Trump's FY2021 request includes $40.638 billion for basic research, down $2.822 billion (6.5%) from FY2020 enacted level; $38.805 billion for applied research, down $5.125 billion (11.7%); $59.112 billion for development, down $3.466 billion (5.5%); and $3.630 billion for facilities and equipment, down $2.375 billion (39.6%).

Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2019-FY2021

(budget authority, dollar amounts in billions)

Character of Work, Facilities, and Equipment	FY2019 Actual	FY2020 Enacted	FY2021 Request	Change, FY2020-FY2021 Dollars	Change, FY2020-FY2021 Percent
Basic research	39.316	43.460	40.638	-2.822	-6.5%
Applied research	42.964	43.930	38.805	-5.125	-11.7%
Development	53.369	62.578	59.112	-3.466	-5.5%
Facilities and Equipment	4.485	6.005	3.630	-2.375	-39.6%
Total	**140.134**	**155.973**	**142.185**	**-13.788**	**-8.8%**

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

Note: Components may not sum to totals due to rounding.

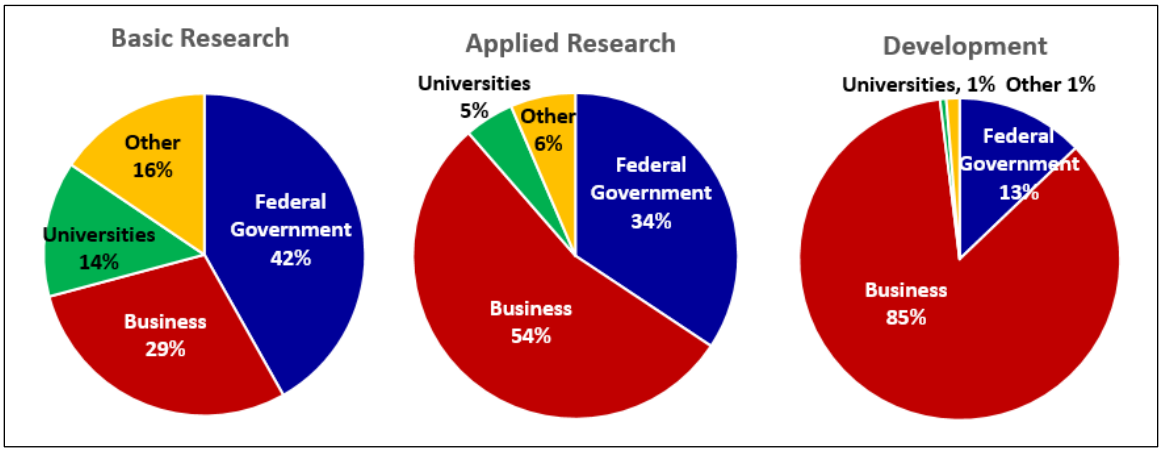
Federal Role in U.S. R&D by Character of Work

A primary policy justification for public investments in basic research and for incentives (e.g., tax credits) for the private sector to conduct research is the view, widely held by economists, that the private sector will, left on its own, underinvest in basic research from a societal perspective. The usual argument for this view is that the social returns (i.e., the benefits to society at large) exceed the private returns (i.e., the benefits accruing to the private investor, such as increased revenues or higher stock value). Other factors that may inhibit corporate investment in basic research include long time horizons for achieving commercial applications (diminishing the potential returns due to the time value of money), high levels of technical risk and 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 42% of U.S. basic research in 2018 (the most recent year for which comprehensive data are available). Business funded 29% of U.S. basic research in 2018, with state governments, universities, and

other nonprofit organizations funding the remaining 30%.[5] For U.S. applied research, business is the primary funder, accounting for an estimated 54% in 2018, while the federal government accounted for an estimated 34%. State governments, universities, and other nonprofit organizations funded the remaining 11%. Business also provides the vast majority of U.S. funding for development. Business accounted for 85% of development funding in 2018, while the federal government provided 13%. State governments, universities, and other nonprofit organizations funded the remaining 2% (see **Figure 1**).[6]

Figure 1. Composition of U.S. Basic Research, Applied Research, and Development by Funding Sector, 2018



Source: CRS analysis of National Science Foundation, *National Patterns of R&D Resources: 2017–18 Data Update*, NSF 20-307, Tables 6-9, January 8, 2020.

Notes: Components may not add to total due to rounding. Data are preliminary and may be revised.

Federal R&D by Agency and Character of Work Combined

Federal R&D funding can also be viewed from the combined perspective of each agency's contribution to basic research, applied research, development, and facilities and equipment. **Table 3** lists the three agencies with the most funding in each of these categories as proposed in the President's FY2021 budget. The overall federal R&D budget reflects a wide range of national priorities, including supporting advances in spaceflight, developing new and affordable sources of energy, and understanding and deterring terrorist groups. These priorities and the mission of each individual agency contribute to the composition of that agency's R&D spending (i.e., the allocation of R&D funding among basic research, applied research, development, and facilities and equipment).

In the President's FY2021 budget request, the Department of Health and Human Services, primarily NIH, would account for nearly half (47.1%) of all federal funding for basic research. HHS would also be the largest federal funder of applied research, accounting for about 47.3% of all federally funded applied research in the President's FY2021 budget request. DOD would be the primary federal funder of development, accounting for 88.0% of total federal development funding in the President's FY2021 budget request. DOE would be the primary federal funder of

[5] Percentages may not sum to 100% due to rounding.

[6] CRS analysis of National Science Foundation, *National Patterns of R&D Resources: 2017–18 Data Update*, NSF 20-307, Tables 6-9, January 8, 2020. Components may not add to total due to rounding.

facilities and equipment, accounting for 58.7% of total federal facilities and equipment funding in the President's FY2021 budget request.[7]

Table 3. Selected R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2019 Actual, FY2020 Enacted, and FY2021 Request

(budget authority, dollar amounts in billions)

				Change, FY2020-FY2021	
Character of Work/Agency	**FY2019 Actual**	**FY2020 Enacted**	**FY2021 Request**	**Dollars**	**Percent**
Basic Research					
Health and Human Services	19.082	20.492	19.154	-1.338	-6.5%
NASA	4.948	6.880	6.110	-0.770	-11.2%
Energy	5.103	5.514	5.461	-0.053	-1.0%
Applied Research					
Health and Human Services	19.110	20.026	18.336	-1.690	-8.4%
Energy	8.318	8.351	6.526	-1.825	-21.9%
Defense	6.071	6.288	5.506	-0.782	-12.4%
Experimental Development					
Defense	46.106	53.775	51.994	-1.781	-3.3%
NASA	2.890	4.121	3.767	-0.354	-8.6%
Energy	2.606	2.982	1.935	-1.047	-35.1%
Facilities and Equipment					
Energy	2.244	2.372	2.129	-0.243	-10.2%
National Science Foundation	0.663	0.623	0.523	-0.100	-16.1%
Health and Human Services	0.243	0.265	0.350	0.085	32.1%

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

Note: This table shows only the top three funding agencies in each category, based on the FY2021 request.

Multiagency R&D Initiatives

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

[7] CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

operated at the discretion of the President, without such a basis, and may be eliminated at the discretion of the President. President Trump's FY2021 budget is largely silent on funding levels for these efforts and whether any or all of the nonstatutory initiatives will continue. Some activities related to these initiatives are discussed in agency budget justifications and may be addressed in the agency analyses later in this report. This section provides available multiagency information on these initiatives and will be updated as additional information becomes available.

Networking and Information Technology Research and Development Program (NITRD)[8]

Established by the High-Performance Computing Act of 1991 (P.L. 102-194), the Networking and Information Technology Research and Development 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. According to NITRD, it coordinates the information technology R&D activities of 24 federal agency members and more than 45 other participating agencies with program interests and activities in IT R&D. NITRD efforts are coordinated by the National Science and Technology Council (NSTC) Subcommittee on Networking and Information Technology Research and Development.[9]

P.L. 102-194, as reauthorized by the American Innovation and Competitiveness Act of 2017 (P.L. 114-329), requires the director of NITRD to prepare an annual report to be delivered to Congress along with the President's budget request. This annual report, often referred to as a budget supplement, is to include, among other things, detailed information on the program's budget for the current and previous fiscal years and the proposed budget for the next fiscal year. The latest annual report was published in September 2019 and related to the FY2020 budget request. President Trump requested $5.506 billion for NITRD research in FY2020, a decrease of $195 million (3.4%) from the estimated FY2019 level (see **Table 4**).[10] For additional information on the NITRD program, see CRS Report RL33586, *The Federal Networking and Information Technology Research and Development Program: Background, Funding, and Activities*, by Patricia Moloney Figliola. Additional NITRD information also can be obtained at https://www.nitrd.gov.

[8] For additional information on the Networking and Information Technology Research and Development program, please contact Patricia Moloney Figliola, Specialist in Internet and Telecommunications Policy.

[9] The NSTC was established by Executive Order 12881 in 1993. According to the White House, "This Cabinet-level Council is the principal means within the Executive Branch to coordinate science and technology policy across the diverse entities that make up the Federal research and development enterprise. Chaired by the President, the membership of the NSTC is made up of the Vice President, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other White House officials. In practice, the Assistant to the President for Science and Technology Policy oversees the NSTC's ongoing activities." (Source: The White House, Office of Science and Technology Policy, "NSTC," https://www.whitehouse.gov/ostp/nstc/.) For more information on the NSTC, see CRS Report R43935, *Office of Science and Technology Policy (OSTP): History and Overview*, by John F. Sargent Jr. and Dana A. Shea; and https://www.whitehouse.gov/ostp/nstc/.

[10] EOP, National Science and Technology Council, *The Networking and Information Technology Research and Development Program: Supplement to the President's FY2020 Budget,* September 2019.

Table 4. Networking and Information Technology Research and Development Program Funding, FY2019-FY2021

(budget authority, in billions of current dollars)

	FY2019 Estimate	FY2020 Request	FY2021 Request
Total, NITRD	5.701	5.506	n/a

Source: EOP, National Science and Technology Council, *The Networking and Information Technology Research and Development Program: Supplement to the President's FY2020 Budget,* September 2019.

Note: n/a = not available.

U.S. Global Change Research Program (USGCRP)[11]

The U.S. Global Change Research Program 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."[12] In FY2019, 10 departments and agencies received appropriations for their USGCRP participation. USGCRP efforts are coordinated by the NSTC Subcommittee on Global Change Research. Each agency develops and carries out its activities as its contribution to the USGCRP, and funds are appropriated to each agency for those activities; those activities may or may not be identified as associated with the USGCRP in agency budget justifications or other program materials available publicly. Complementing USGCRP activities are many federal climate change or global change-related activities with programmatic missions, not predominantly scientific. These are reported separately in budget justifications.

The Global Change Research Act of 1990 (GCRA) (P.L. 101-606) requires each federal agency or department involved in global change research to report annually to Congress on each element of its proposed global change research activities, as well as the portion of its budget request allocated to each element of the program.[13] The President is also required to identify those activities and the annual global change research budget in the President's annual budget request. The President's budget requests for years later than FY2017 do not report these budget data required by the GCRA, although some agencies report their contributions in their budget justifications to Congress.

In addition, in the 20 years prior to FY2018, language in appropriations laws required the President to submit a comprehensive report to the appropriations committees "describing in detail all Federal agency funding, domestic and international, for climate change programs, projects, and activities … including an accounting of funding by agency…."[14] As these are no longer reported by the Office of Management and Budget, **Table 5** presents data compiled by CRS from communications with departments and agencies that participated in the USGCRP in FY2018.

[11] For additional information on the U.S. Global Change Research Program, please contact Jane A. Leggett, Specialist in Energy and Environmental Policy.

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

[13] Directives to report annually to Congress on budget requests and spending occur in several sections of P.L. 101-606, including Sections 105(b) and (c) on Budget Coordination, and Section 107, Annual Report.

[14] See, most recently, P.L. 115-31, Consolidated Appropriations Act, 2017, Section 416.

For additional information on the USGCRP, see CRS Report R43227, *Federal Climate Change Funding from FY2008 to FY2014*, by Jane A. Leggett, Richard K. Lattanzio, and Emily Bruner. Additional USGCRP information can be obtained at http://www.globalchange.gov.

Table 5. U.S. Global Change Research Program Funding, FY2019-FY2021

(budget authority, in billions of current dollars)

	FY2019 Enacted	FY2020 Request	FY2021 Request
Total, USGCRP	2.244	1.937	n/a

Source: Communications from federal agencies to CRS, cross-checked against information in U.S. Global Change Research Program, *Our Changing Planet: The U.S. Global Change Research Program for Fiscal Years 2018-2019,* 2019, p. 29. https://downloads.globalchange.gov/ocp/ocp2018/Our-Changing-Planet_FY-2018-2019.pdf. The estimates are not always identical but are similar.

Notes: n/a = not available. Funding for activities that contribute to the USGCRP has been appropriated to more than a dozen federal departments and agencies in the past, and some spending of it is transferred or coordinated through interagency agreements. Almost all of the funding is spent directly by agencies on research and related activities; a small percentage is spent for interagency coordination and communications in the USGCRP program office.

National Nanotechnology Initiative (NNI)[15]

Launched in FY2001, the National Nanotechnology Initiative 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 sometimes useful ways from the properties of individual atoms or bulk matter.[16] In 2003, Congress enacted the 21st Century Nanotechnology Research and Development Act (P.L. 108-153), providing a legislative foundation for some of the activities of the NNI. NNI efforts are coordinated by the NSTC Subcommittee on Nanoscale Science, Engineering, and Technology (NSET). For FY2020, the President's request included NNI funding for 15 federal departments and independent agencies and commissions with budgets dedicated to nanotechnology R&D. The NSET includes other federal departments and independent agencies and commissions with responsibilities for health, safety, and environmental regulation; trade; education; intellectual property; international relations; and other areas that might affect or be affected by nanotechnology.

P.L. 108-153 requires the NSTC to prepare an annual report to be delivered to Congress at the time the President's budget request is sent to Congress. This annual report, often referred to as a budget supplement, is to include detailed information on the program's budget for the current fiscal year and the program's proposed budget for the next fiscal year, as well as additional information and data related to the performance of the program. The latest annual report was published in August 2019 and related to the FY2020 budget request. President Trump requested $1.469 billion for NNI research in FY2020, a decrease of $103 million (6.6%) from the estimated FY2019 level.[17]

[15] For additional information on the National Nanotechnology Initiative, please contact John F. Sargent, Jr., Specialist in Science and Technology Policy.

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

[17] EOP, National Science and Technology Council, *The National Nanotechnology Initiative: Supplement to the President's 2020 Budget*, August 2019.

For additional information on the NNI, see CRS Report RL34401, *The National Nanotechnology Initiative: Overview, Reauthorization, and Appropriations Issues*, by John F. Sargent Jr. Additional NNI information can be obtained at http://www.nano.gov.

Table 6. National Nanotechnology Initiative Funding, FY2019-FY2021

(budget authority, in billions of current dollars)

	FY2019 Estimated	FY2020 Request	FY2021 Request
Total, NNI	1.572	1.468	n/a

Source: EOP, National Science and Technology Council, *The National Nanotechnology Initiative: Supplement to the President's 2020 Budget,* August 2019.

Other Highlighted R&D in the President's FY2021 Budget

The President's FY2021 budget highlights R&D spending in several areas discussed in the following sections.

Science and Technology Supporting the "Industries of the Future"

The President's FY2021 budget states the Administration's prioritization for areas of science and technology that it asserts will underpin the Industries of the Future (IotF),[18] among other prioritizations and reallocations in lower priority areas.

> For 2021, the Administration is prioritizing the science and technology that underpin the Industries of the Future (IotF)—artificial intelligence (AI), quantum information science (QIS), 5G/advanced communications, biotechnology, and advanced manufacturing. Relative to the 2020 President's Budget, this includes major increases in QIS and non-defense AI R&D as part of a commitment to double Federal AI and QIS R&D investments by 2022. R&D investments in AI and QIS, in particular, act as innovation multipliers and employment drivers, not only by promoting S&T progress across many disciplines, but also by helping to build a highly-skilled American workforce. Other IotF areas, such as biotechnology and advanced manufacturing, are poised for potentially transformative advances. Together, IotF investments are vital to the Nation's global competitiveness and the health, prosperity, and security of the American people.[19]

Artificial Intelligence (AI)[20]

On February 11, 2019, President Trump issued Executive Order 13859,[21] "Maintaining American Leadership in Artificial Intelligence," launching the American AI Initiative and later that year

[18] "Industries of the Future" is a term that generally refers to new industries that are expected to emerge out of leading-edge technologies.

[19] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development*, February 10, 2020, p. 235, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

[20] For additional information on artificial intelligence and the American AI Initiative, please contact Laurie A. Harris, Analyst in Science and Technology Policy.

[21] Executive Order 13859, "Maintaining American Leadership in Artificial Intelligence," 84 *Federal Register* 3967-3972, February 14, 2019.

defined the effort's priority investment areas in *The National Artificial Intelligence Research and Development Strategic Plan: 2019 Update.*[22]

The FY2021 budget states that AI "is transforming every segment of American life, with applications ranging from medical diagnostics and precision agriculture, to autonomous transportation, job reskilling and upskilling and national defense, and beyond."[23]

The FY2021 budget includes increases in the AI R&D budget as part of its efforts to double non-defense AI R&D funding by FY2022. The President's proposed AI R&D funding for FY2021 includes

- A 76% increase in the AI R&D budget of the National Science Foundation to $868 million over the FY2020 level, for AI-related research and the creation of several National AI Research Institutes, in collaboration with USDA, DHS, DOT, and VA. The institutes are to support multisector, multidisciplinary research and workforce efforts among academia, industry, federal agencies, and nonprofits.
- An additional $100 million for the USDA Agriculture and Food Research Initiative (AFRI) for AI and machine learning research to promote advanced manufacturing in the food and agricultural sciences, as well as to continue efforts in robotics and the application of big data to precision agriculture.
- $125 million for DOE's Office of Science, a $54 million increase over the FY2020 request.
- $50 million for NIH research on chronic diseases using AI and related approaches.
- $459 million for DARPA AI R&D, an increase of $50 million from the FY2020 request.
- $290 million for DOD's Joint AI Center, up from $242 million in FY2020.[24]

Quantum Information Science[25]

The FY2021 budget seeks an increase of more than 50% for federal quantum information science (QIS) funding over the FY2020 budget as part of the Administration's goal of doubling funding for QIS by FY2022. The President's proposed QIS R&D funding for FY2021 includes

- $230 million for NSF to support the National Quantum Initiative, $120 million above the FY2020 level.

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[22] EOP, NSTC, Committee on Technology, Subcommittee on Networking and Information Technology Research and Development (NITRD), *The National Artificial Intelligence Research and Development Strategic Plan: 2019 Update*, June 21, 2019, https://www.nitrd.gov/pubs/National-AI-RD-Strategy-2019.pdf.

[23] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* p. 235, February 10, 2020.

[24] Ibid., pp. 235-236; The White House, Fact Sheets, "President Trump's FY 2021 Budget Commits to Double Investments in Key Industries of the Future," February 11, 2020, https://www.whitehouse.gov/briefings-statements/president-trumps-fy-2021-budget-commits-double-investments-key-industries-future/; NSF, *FY 2021 Budget Request to Congress*, February 10, 2020, p. Overview-3; and NSF, *FY2020 Budget Request to Congress,* March 18, 2019, p. Overview-9.

[25] For additional information on quantum information science and the National Quantum Initiative, please contact Patricia Moloney Figliola, Specialist in Science and Technology Policy.

- $237 million for the DOE Office of Science, an increase of approximately $75 million, for QIS work at the national laboratories and in academia and industry.
- $25 million for the DOE Office of Science to support early stage research for a quantum internet.

Additionally, the budget provides

- funding for NIST work in QIS standards and engineering efforts in quantum systems;
- funding for the defense and intelligence community for QIS science and technology, new applications, and industrial engagement; and
- initial funding for NASA to explore the potential for a space-based quantum entanglement experiment.[26]

The President's budget also includes an additional $50 million for NSF, compared to the 2020 budget, for education and workforce development for AI and QIS, with focused outreach efforts to community colleges, Historically Black Colleges and Universities (HBCUs), and Minority Serving Institutions (MSIs).

National Security

The President's FY2021 budget also highlights investments in national security-related R&D, including more than $59 billion in research, engineering, and prototyping activities in FY2021 to enable advanced military capabilities, including work in "offensive and defensive hypersonic weapons capabilities, resilient national security space systems, and modernized and flexible strategic and nonstrategic nuclear deterrent capabilities."[27]

The FY2021 budget request for Department of Homeland Security R&D includes $83 million for detection and defense against radiological, nuclear, chemical, and biological threats; $44 million for improving resilience to natural disasters and physical threats, for first responder technologies and public safety, and for cross-border threat screening and supply chain defense; and $38 million for cybersecurity.

FY2020 Appropriations Status

The remainder of this report provides a more in-depth analysis of R&D in 12 federal departments and agencies that, in aggregate, receive nearly 99% of total federal R&D funding. Agencies are presented in order of the size of their FY2020 R&D budget requests, with the largest presented first.

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

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

[26] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development*, p. 236, February 10, 2020.

[27] Ibid., p. 236.

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

As of the date of this report, the House had completed action on 10 of the 12 appropriations acts through passage of two consolidated appropriations bills, H.R. 7608 and H.R. 7617. The only appropriations bill containing R&D funding that the House has not yet acted upon is the Department of Homeland Security Appropriations Act, 2021. The Senate had not, as of the date of this report, acted on any of the appropriations bills.

In addition to this report, CRS produces individual reports on each of the appropriations bills and for a number of federal agencies. These reports can be accessed via the CRS website at http://www.crs.gov/iap/appropriations. Also, the status of each appropriations bill is available on the CRS web page "Appropriations Status Table," available at http://www.crs.gov/AppropriationsStatusTable/Index.

Table 7. Alignment of Agency R&D Funding and Regular Appropriations Bills

Department/Agency	Regular Appropriations Bill
Department of Defense	Department of Defense Appropriations Act
Department of Health and Human Services - National Institutes of Health	(1) Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act (2) Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Energy	Energy and Water Development and Related Agencies Appropriations Act
National Aeronautics and Space Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
National Science Foundation	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Agriculture	Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act
Department of Commerce - National Institute of Standards and Technology - National Oceanic and Atmospheric Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Veterans Affairs	Military Construction and Veterans Affairs, and Related Agencies Appropriations Act
Department of the Interior	Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Transportation	Transportation, Housing and Urban Development, and Related Agencies Appropriations Act
Department of Homeland Security	Department of Homeland Security Appropriations Act
Environmental Protection Agency	Department of the Interior, Environment, and Related Agencies Appropriations Act

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

Department of Defense[28]

The mission of the Department of Defense is to provide "the military forces needed to deter war and ensure our nation's security."[29] Congress supports research and development activities at DOD primarily through the department's Research, Development, Test, and Evaluation (RDT&E) funding. These funds support the development of the nation's future military hardware and software and the science and technology base upon which those products rely.

Most of what DOD spends on RDT&E is appropriated in Title IV of the annual defense appropriations bill. (See **Table 8**.) Title IV RDT&E funds support activities such as R&D performed by academic institutions, DOD laboratories, and companies, as well as test and evaluation activities at specialized DOD facilities, among other things. 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, the Chemical Agents and Munitions Destruction Program, and the National Defense Sealift Fund. The Defense Health Program (DHP) supports the delivery of health care to DOD personnel and their families. DHP funds (including the RDT&E funds) are requested through the Defense-wide Operations and Maintenance appropriations request. The program's RDT&E funds support congressionally directed research on breast, prostate, and ovarian cancer; traumatic brain injuries; orthotics and prosthetics; and other medical conditions. Congress appropriates funds for this program in Title VI (Other Department of Defense Programs) of the defense appropriations bill. The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program are requested through the Defense-wide Procurement appropriations request. Congress appropriates funds for this program also in Title VI. The National Defense Sealift Fund supports the procurement, operation and maintenance, and research and development associated with the nation's naval reserve fleet and supports a U.S. flagged merchant fleet that can serve in time of need. In some fiscal years, RDT&E funding for this effort is requested in the Navy's Procurement request and appropriated in Title V (Revolving and Management Funds) of the appropriations bill.

RDT&E funds also have been requested and appropriated as part of DOD's separate funding to support efforts in what the George W. Bush Administration termed the Global War on Terror (GWOT) and what the Obama and Trump Administrations have referred to as Overseas Contingency Operations (OCO). In appropriations bills, the term Overseas Contingency Operations/Global War on Terror (OCO/GWOT) has been used; President Trump's FY2021 budget uses the term Overseas Contingency Operations. Typically, the RDT&E funds appropriated for OCO activities go to specified Program Elements (PEs) in Title IV.

According to the Comptroller of the Department of Defense, the FY2021 OCO request is divided into two requirement categories—direct and enduring war, and OCO for base requirements.[30] For purposes of this report, these categories of OCO funding requests are reported collectively.

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

[29] Department of Defense, https://www.defense.gov/Our-Story/.

[30] "Direct War Requirements" reflect combat or combat support costs that are not expected to continue once combat operations end at major contingency locations. "OCO for Enduring Requirements" reflects enduring in-theater and CONUS costs that will remain after combat operations end. "OCO for Base Requirements" reflects funding for base budget requirements, which support the National Defense Strategy, such as defense readiness, readiness enablers, and munitions, financed in the OCO budget to comply with the base budget defense caps included in current law. Department of Defense, Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *Defense*

In addition, OCO/GWOT-related requests/appropriations have included money for a number of transfer funds. In the past, these have included the Iraqi Freedom Fund (IFF), the Iraqi Security Forces Fund, the Afghanistan Security Forces Fund, and the Pakistan Counterinsurgency Capability Fund. Congress typically has made a single appropriation into each such fund and authorized the Secretary of Defense to make transfers to other accounts, including RDT&E, at his discretion. These transfers are eventually reflected in Title IV prior-year funding figures.

For FY2021, the Trump Administration is requesting $106.555 billion for DOD's Title IV RDT&E PEs (base plus OCO), $1.159 billion (1.1%) above the enacted FY2020 level. (See **Table 8**.) In addition, the FY2021 request includes $562.5 million in RDT&E through the Defense Health Program (DHP; down $1.744 billion, 75.6% from FY2020), $782.2 million in RDT&E through the Chemical Agents and Munitions Destruction program (down $93.7 million, 10.7% from FY2020), and $1.1 million for the Inspector General for RDT&E-related activities (down $1.9 million, 63.0% from FY2020). The FY2021 budget includes no RDT&E funding via the National Defense Sealift Fund, the same as the FY2020 enacted level.

On July 31, the House passed H.R. 7617, the Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021, a consolidated bill that incorporates the Department of Defense Appropriations Act, 2021 as Division A. The House-passed bill would appropriate $104.794 billion in Title IV and OCO R&D funding, a decrease of $601.6 million (0.6%) from the FY2020 enacted level and a decrease of $1.761 billion (1.7%) from the request. In addition, Title VI of the House-passed bill would provide $1.669 billion for the Defense Health Program ($637.4 million (27.6%) less than the FY2020 enacted level and $1.106 billion (196.7%) more than the request); $782.2 million for the Chemical Agents and Munitions Destruction program ($93.7 million (10.7%) less than the FY2020 enacted level and the same as the request); and $1.1 million for the Inspector General for RDT&E ($1.9 million (63.4%) less than the FY2020 enacted level and about the same as the request).

RDT&E funding can be analyzed in different ways. RDT&E funding can be characterized organizationally. Each military department requests and receives its 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 Defense-Wide 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 (S&T) program 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 for which an operational need has been determined and an acquisition program established. Budget activity 6.6 provides management support, including support for test and evaluation facilities. Budget activity 6.7 supports the development of system improvements in existing operational systems. Budget activity 6.8 was added in the FY2021 budget and supports software and digital technology pilot programs.[31]

Budget Overview: Department of Defense Fiscal Year 2020 Budget Request, March 19, 2019, https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2020/fy2020_Budget_Request_Overview_Book.pdf.

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

Many congressional policymakers are particularly interested in DOD S&T program funding, since these funds support the development of new technologies and the science that underlies them. Some in the defense community see ensuring adequate support for S&T activities as imperative to maintaining U.S. military superiority into the future. The knowledge generated at this stage of development may also contribute to advances in commercial technologies. The FY2021 request for Title IV S&T funding (base plus OCO) is $14.070 billion, $1.991 billion (12.4%) below the FY2020 enacted level. Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities, as over half of DOD's basic research budget is spent at universities. The Trump Administration is requesting $2.319 billion for DOD basic research for FY2021, $284.2 million (10.9%) below the FY2020 enacted level. While DOD is not the largest federal funder of basic research, it is a substantial source of federal funds for university R&D in certain fields, such as aerospace, aeronautical, and astronautical engineering (60%); electrical, electronic, and communications engineering (58%); industrial and manufacturing engineering (48%); mechanical engineering (46%); computer and information sciences (44%); metallurgical and materials engineering (39%); and materials science (33%).[32]

Congress also provided the DOD Defense Health Program with $415.0 million in RDT&E funding under the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136).

Table 8. Department of Defense RDT&E

(total obligational authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request			FY2021 House			FY2021 Senate			FY2021 Enacted		
Budget Account	**Base + OCO**	**Base**	**OCO**	**Total**	**Base**	**OCO**	**Total**	**Base**	**OCO**	**Total**	**Base**	**OCO**	**Total**
Army	12,690.7	12,587.3	182.8	12,770.2	13,138.5	175.8	13,314.3						
Navy	20,450.0	21,427.0	59.6	21,486.6	20,186.6	59.6	20,246.1						
Air Force	45,695.2	37,391.8	5.3	37,397.1	36,070.6	$5.3	36,075.9						
Space Force[a]		10,327.6	0.0	10,327.6	10,191.8	0.0	10,191.8						
Defense-wide	26,332.3	24,280.9	82.8	24,363.7	24,675.2	80.8	24,756.0						
Director, Operational Test and Evaluation	227.7	210.1	0.0	210.0	210.1	0.0	210.1						
Total Title IV—By Account	**105,395.9**	**106,224.8**	**330.5**	**106,555.3**	**104,472.8**	**321.5**	**104,794.3**						
Budget Activity													
6.1 Basic Research	2,603.3	2,319.1	0.0	2,319.1	n/a	n/a	n/a						
6.2 Applied Research	6,071.4	5,391.1	5.7	5,396.8	n/a	n/a	n/a						
6.3 Advanced Technology Development	7,386.9	6,331.4	23.1	6,354.6	n/a	n/a	n/a						

[32] CRS analysis of data from NSF, *Higher Education Research and Development Survey, Fiscal Year 2017*, data tables, November 20, 2018, https://ncsesdata.nsf.gov/herd/2017/.

Budget Account	FY2020 Enacted	FY2021 Request			FY2021 House			FY2021 Senate			FY2021 Enacted		
	Base + OCO	Base	OCO	Total	Base	OCO	Total	Base	OCO	Total	Base	OCO	Total
6.4 Advanced Component Development and Prototypes	27,207.1	28,390.6	77.9	28,468.5	n/a	n/a	n/a						
6.5 Systems Dev. and Demonstration	16,778.2	16,426.9	99.0	16,525.8	n/a	n/a	n/a						
6.6 Management Support[b]	7,216.9	6,981.6	5.1	6,986.8	n/a	n/a	n/a						
6.7 Operational Systems Development[c]	38,132.2	39,687.4	119.7	39,807.0	n/a	n/a	n/a						
6.8 Software and Digital Technology Pilot Projects	0.0	696.7		696.7	n/a	n/a	n/a						
Total Title IV—by Budget Activity	**105,395.9**	**106,224.8**	**330.5**	**106,555.3**	**104,472.8**	**321.5**	**104,794.3**						
Title V—Revolving and Management Funds													
National Defense Sealift Fund	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Title VI—Other Defense Programs													
Defense Health Program	2,306.1	562.5	0.0	562.5	1,668.7	0.0	1,668.7						
Chemical Agents and Munitions Destruction	875.9	782.2	0.0	782.2	782.2	0.0	782.2						
Inspector General	3.0	1.1	0.0	1.1	1.1	0.0	1.1						
Grand Total	**108,580.9**	**107,570.6**	**330.5**	**107,901.1**	**106,924.8**	**0.0**	**106,924.8**						
CARES Act (P.L. 116-136)	**415.0[d]**												

Source: CRS analysis of *Department of Defense Budget, Fiscal Year 2021, RDT&E Programs (R-1)*, February 2020; P.L. 116-36.

Notes: n/a = not available. Figures for the columns headed "FY2019 Senate" and "FY2019 Enacted" will be added, if available, as each action is completed. Totals may differ from the sum of the components due to

rounding. According to DOD, "Total Obligation Authority (TOA) is the sum of (1) all budget authority (BA) granted (or requested) from the Congress in a given year, (2) amounts authorized to be credited to a specific fund, (3) BA transferred from another appropriation, and (4) Unobligated balances of BA from previous years which remain available for obligation. In practice, this term is used primarily in discussing the DOD budget, and most often refers to TOA as the 'direct program,' which equates to only (1) and (2) above." DOD defines "budget authority" as "the authority becoming available during the year to enter into obligations that result in immediate or future outlays of Government funds." See DOD 7000.14-R, "Department of Defense Financial Management Regulation," http://comptroller.defense.gov/fmr.aspx.

a. The Space Force was established in December 2019. Its FY2020 RDT&E activities are largely supported by funds appropriated to the Air Force.

b. Includes funding for Director of Test and Evaluation.

c. Includes funding for Classified Programs.

d. Funding provided by the CARES Act (P.L. 116-136) for the Defense Health Program, "to prevent, prepare for, and respond to coronavirus, domestically or internationally."

Department of Health and Human Services

The mission of the Department of Health and Human Services (HHS) is "to enhance and protect the health and well-being of all Americans ... by providing for effective health and human services and fostering advances in medicine, public health, and social services."[33] This section focuses on HHS research and development funded through the National Institutes of Health (NIH), an HHS agency that accounts for nearly 97% of total HHS R&D funding.[34] Other HHS agencies that support R&D include the Centers for Disease Control and Prevention (CDC), Centers for Medicare and Medicaid Services (CMS), Food and Drug Administration (FDA), Agency for Healthcare Research and Quality (AHRQ), Health Resources and Services Administration (HRSA), and Administration for Children and Families (ACF); additional R&D funding is attributed to departmental management.[35]

National Institutes of Health[36]

NIH is the primary agency of the federal government charged with performing and supporting biomedical and behavioral research. It also has major roles in training biomedical researchers and disseminating health information. The NIH mission is "to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability."[37] The agency consists of the NIH Office of the Director (OD) and 27 institutes and centers (ICs). Each IC plans and manages its own research programs in coordination with OD. As shown in **Table 9**, separate appropriations are provided to 24 of the 27 ICs, as well as to OD, the Innovation Account (established by the 21st Century Cures Act in 2016, P.L. 114-255), and an intramural Buildings and Facilities account. The other three

[33] U.S. Department of Health and Human Services, "About," http://www.hhs.gov/about.

[34] CRS analysis of data from OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2020*, 2019, p. 268, https://www.whitehouse.gov/wp-content/uploads/2019/03/spec-fy2020.pdf.

[35] Ibid.

[36] This section was written by Kavya Sekar, Analyst in Health Policy, CRS Domestic Social Policy Division, with support from Isaac Nicchitta, Research Assistant, CRS Domestic Social Policy Division. For background information on NIH, see CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*, by Judith A. Johnson and Kavya Sekar.

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

centers, which perform centralized support services, are funded through transfers from the other ICs.

According to NIH, about 10% of the NIH budget supports intramural research projects conducted by the nearly 6,000 NIH federal scientists, most of whom are located on the NIH campus in Bethesda, MD. All research ICs have an intramural research program of varying sizes. More than 80% of NIH's budget goes to the extramural research community in the form of grants, contracts, and other awards. This funding supports research performed by more than 300,000 nonfederal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions.[38]

Funding for NIH comes primarily from the annual Labor, HHS, and Education (LHHS) appropriations act, with an additional amount for Superfund-related activities from the Interior/Environment appropriations act.[39] Those two appropriations acts provide NIH's discretionary budget authority. In addition, NIH has received mandatory funding of $150 million annually that is provided in Public Health Service Act (PHSA) Section 330B, for the Special Diabetes Program for type 1 diabetes, most recently extended through FY2020 by the CARES Act (P.L. 116-136), with additional partial-year FY2021 funding of $25.1 million to cover the period of October 1, 2020, through November 30, 2020.

Some funding is also pursuant to the PHS Evaluation Set-Aside, also known as the PHS Evaluation Tap transfer authority, under Section 241 of the PHS Act (42 U.S.C. §238j). This provision allows the Secretary of HHS, with the approval of appropriators, to redistribute a portion of eligible PHS agency appropriations across HHS for program evaluation purposes.[40] Although the PHS Act limits the tap to no more than 1% of eligible appropriations, in recent years, annual LHHS appropriations acts have specified a higher amount (2.5% in FY2020, P.L. 116-94). Those acts also have typically directed specific amounts of funding from the tap for transfer to a number of HHS programs, including at NIH—particularly for the National Institute of General Medical Sciences (NIGMS). The House-passed bill would increase the set-aside to 3% (section 204 in Division E of H.R. 7617). Readers should note that funding amounts in this report show amounts "transferred in" to NIH under the PHS evaluation set-aside, but do not show amounts "transferred out" under the same authority.

NIH also receives funding through LHHS appropriations that is subject to different budget enforcement rules than the rest of the NIH funding in the act—appropriations to the NIH Innovation Account created by the 21st Century Cures Act ("the Cures Act," P.L. 114-255) to fund programs authorized by that act. Appropriations of funds in this account are, in effect, not subject to discretionary spending limits.[41] The NIH Director may transfer these amounts from the NIH

[38] NIH, "What We Do: Budget," https://www.nih.gov/about-nih/what-we-do/budget.

[39] The Superfund program was created to carry out the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; P.L. 96-510), which authorized the federal government to prioritize contaminated sites in the United States for cleanup in coordination with the states in which the sites are located and to make the "potentially responsible parties" connected to those sites financially liable for the cleanup costs. The Superfund program is administered by the Environmental Protection Agency. For more information on the Superfund program, see CRS Report R41039, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, by David M. Bearden.

[40] For more information on the PHS evaluation tap, or PHS Evaluation Set-Aside, see discussion in CRS Report R44916, *Public Health Service Agencies: Overview and Funding (FY2016-FY2018)*, coordinated by C. Stephen Redhead and Agata Dabrowska.

[41] See section on 21st Century Cures Act in CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*.

Innovation Account to other NIH accounts but only for the purposes specified in the Cures Act. If the NIH Director determines that the funds for any of the four Innovation Projects are not necessary, the amounts may be transferred back to the NIH Innovation Account. All amounts authorized by the Cures Act have been fully appropriated to the Innovation Account since FY2017, including $492 million for FY2020. For FY2021, $404 million is authorized to be appropriated.[42]

For FY2020, NIH has a program level of $41.915 billion (**Table 9**) and has separately received emergency supplemental appropriations in three coronavirus relief measures totaling over $3.59 billion.[43] President Trump's FY2021 initial budget request (February 10, 2020) would provide NIH with a total program level of $38.694 billion, a decrease of $3.221 billion (-7.7%) from FY2020 enacted levels (regular appropriations). The proposed FY2021 program level would be made up of[44]

- $37.63 billion in LHHS budget authority;
- $741.0 million pursuant to the PHS Evaluation Tap authority;
- $73.69 million for the Superfund Research Program in Interior/Environment appropriations;
- $150.0 million in proposed annual funding for the mandatory type 1 diabetes program; and
- $98.5 million from the mandatory Patient-Centered Outcomes Research Trust Fund (PCORTF).[45]

Under the President's FY2021 request, all existing IC accounts would receive a decrease compared to FY2020 enacted levels, except for the Building and Facilities account, which would receive an increase in terms of LHHS budget authority, from $200 million in FY2020 to $300 million in FY2021(see **Table 9**).[46] In addition, the full amount ($404 million) authorized by the 21st Century Cures Act for FY2021 (P.L. 114-255) would be appropriated to the Innovation Account.

Subsequently, on March 17, 2020, the Office of Management and Budget submitted an amendment to President Trump's original request that would increase funding for the National

[42] P.L. 114-255, Sec. 1001.

[43] CRS Report R43341, *National Institutes of Health (NIH) Funding: FY1995-FY2021*, by Kavya Sekar. FY2020 program level updated based on totals in U.S. Congress, House Committee on Appropriations, Subcommittee on the Departments of Labor, Health and Human Services, Education, and Related Agencies, *Department of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2021*, Report to accompany H.R. 7614, 116th Cong., 2nd sess., July 15, 2020, H.Rept. 116-450 (Washington: GPO, 2020).

[44] U.S. Congress, House Committee on Appropriations, Subcommittee on the Departments of Labor, Health and Human Services, Education, and Related Agencies, *Department of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2021*, Report to accompany H.R. 7614, 116th Cong., 2nd sess., July 15, 2020, H.Rept. 116-450 (Washington: GPO, 2020).

[45] The Patient-Centered Outcomes Research Trust Fund (PCORTF) is a 10-year, multibillion dollar trust fund, established by The Patient Protection and Affordable Care Act of 2010 (ACA, P.L. 111-148), that is used to fund clinical research, specifically those research activities at the Patient-Centered Outcomes Research Institute (PCORI), and would be provided to the proposed NIRSQ. For more information about the Patient Centered Outcomes Research Fund, see CRS Insight IN11010, *Funding for ACA-Established Patient-Centered Outcomes Research Trust Fund (PCORTF) Extended Through FY2029*, by Amanda K. Sarata.

[46] P.L. 116-94 directed a transfer of $225 million from the HHS Nonreccurring Expenses Fund to the NIH Buildings and Facilities account in FY2020 enacted appropriations. While this transfer is reflected in the congressional source documents used in this report, it is not reflected in the budget tables of the NIH FY2021 Congressional Justification.

Institute of Allergy and Infectious Disease (NIAID) by $440 million relative to the original request.[47] The purpose of this additional requested funding was "to ensure [NIAID] has the resources beginning October 1, 2020, to continue critical basic and applied research on coronaviruses and other infectious diseases." This amended budget request amount, if enacted, would result in NIAID receiving the same funding ($5.885 billion) as the FY2020 level. Taking into account this amendment, the FY2021 budget request would provide NIH with a total program level of $39.133 billion, a decrease of $2.78 billion (-6.6%) from FY2020 enacted levels, with a total of $38.811 billion provided by LHHS appropriations. (Readers should note that this report uses the FY2021 House Appropriations Committee reports accompanying the LHHS and Interior bills as its source for the numbers in the analysis and tables below, and the LHHS report does not include the budgetary effects of this amendment.)

The FY2021 budget request proposes consolidating the Agency for Healthcare Research and Quality (AHRQ) into NIH, forming a 28th IC—the National Institute for Research on Safety and Quality (NIRSQ). The creation of a new NIH institute generally would require amendments to the PHSA, especially Section 401(d), which specifies that "[i]n the National Institutes of Health, the number of national research institutes and national centers may not exceed a total of 27." Under the FY2021 request, NISRQ would receive a total appropriation of $355.1 million, including $256.7 million in discretionary LHHS budget authority and $98.5 million in mandatory appropriations from the Patient-Centered Outcomes Research Trust Fund (PCORTF) in Social Security Act Section 1181. Congress did not adopt the Administration's similar proposals to consolidate AHRQ into NIH as NIRSQ in FY2018, FY2019, or FY2020.[48]

In July 2020, the House passed two consolidated appropriations bills with proposed funding levels for NIH accounts: H.R. 7617 with proposed LHHS appropriations in Division E[49] and H.R. 7608 with proposed Interior/Environment appropriations in Division C.[50] In summary, the House-passed legislation would provide NIH FY2021 funding levels made up of:

- $40.647 billion provided through LHHS appropriations (including the full amount authorized by the Cures Act);
- $1.341 billion pursuant to the PHS evaluation transfer directed in the LHHS appropriations bill; and
- $83 million provided through Interior/Environment appropriations for Superfund-related activities

In total, the House legislation discussed above would provide NIH discretionary BA and PHS evaluation tap funding of $42.071 billion—$156 million (+0.4%) more than the FY2020 enacted program level and $3.4 billion (+8.7%) more than the program level proposed by the Administration's FY2021 budget request. The House appropriations bills would provide an

[47] Letter from Michael R. Pence, President of the Senate, to Donald Trump, President of the United States, March 17, 2020, at https://www.whitehouse.gov/wp-content/uploads/2020/03/Letter-regarding-additional-funding-to-support-the-United-States-response-to-COVID-19-3.17.2020.pdf.

[48] See NIH sections of CRS Report R44888, *Federal Research and Development Funding: FY2018*; CRS Report R45150, *Federal Research and Development (R&D) Funding: FY2019*; and CRS Report R45715, *Federal Research and Development (R&D) Funding: FY2020*.

[49] The Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021.

[50] The State, Foreign Operations, Agriculture, Rural Development, Interior, Environment, Military Construction, and Veterans Affairs Appropriations Act, 2021.

increase to all IC accounts compared to FY2020 enacted levels, except for Buildings and Facilities (same funding level as FY2020 of $200 million in LHHS Discretionary BA). Consistent with the FY2021 budget request, the full amount ($404 million) authorized by the 21st Century Cures Act for FY2021 (P.L. 114-255) would be appropriated to the Innovation Account.

With the inclusion of estimated full-year mandatory funding for the Special Diabetes Program for type 1 diabetes at current-law levels ($150 million), the total House-proposed FY2021 NIH program level would be $42.221 billion.[51] With this estimated funding, the House-proposed program level would be $306 million (+0.7%) more than the FY2020 enacted program level and $3.5 billion (9.1%) more than the FY2021 program level proposed by the Administration.

The House did not adopt the Administration's proposal to consolidate the Agency for Healthcare Research and Quality into NIH. The report accompanying the LHHS appropriations bill (H.Rept. 116-450) did not address this proposal.[52]

The House LHHS appropriations bill (in Title VI of Division E) also includes $5 billion in emergency funding "to support biomedical research—including support for current grantees to cover the shutdown costs, startup costs, and other costs related to delays in research in 2020."[53] The $5 billion would be appropriated to the Office of the Director (OD). Of this total, the NIH Director is directed to transfer not less than $2.5 billion to the IC accounts "in proportion to the amounts otherwise made available" in FY2020 enacted LHHS appropriations, and to transfer the full FY2020 enacted amount to the Building and Facilities account.[54] As shown in the House report, this funding would be distributed to all NIH accounts, except the Innovation Account, with funding levels ranging from the lowest amount of $5 million for the Fogarty International Center to the highest amount of $2.275 billion for the Office of the Director account.[55]

Table 9. National Institutes of Health Funding

(budget authority, in millions of dollars)

Institutes/Centers	FY2020 Final	FY2021 Request	FY2021 House	FY2021 Senate
Cancer Institute (NCI)	6,440	5,881	6,494	—
Heart, Lung, and Blood Institute (NHLBI)	3,624	3,298	3,655	—
Dental/Craniofacial Research (NIDCR)	477	435	482	—
Diabetes/Digestive/Kidney (NIDDK)[a]	2,114	1,924	2,132	—
Neurological Disorders/Stroke (NINDS)	2,445	2,245	2,465	—
Allergy/Infectious Diseases (NIAID)	5,885	5,446[d]	6,013	—

[51] $150 million is the funding amount for the Special Diabetes Program for type 1 diabetes, distributed to the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), in the FY2021 House Appropriations Committee Report on H.R. 7614. Full year appropriations for the Special Diabetes Program for type 1 diabetes have not yet been enacted.

[52] U.S. Congress, House Committee on Appropriations, Subcommittee on the Departments of Labor, Health and Human Services, Education, and Related Agencies, *Department of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Bill, 2021*, Report to accompany H.R. 7614, 116th Cong., 2nd sess., July 15, 2020, H.Rept. 116-450 (Washington: GPO, 2020).

[53] Ibid.

[54] H.R. 7617, Division E, Title VI

[55] Ibid.

Institutes/Centers	FY2020 Final	FY2021 Request	FY2021 House	FY2021 Senate
General Medical Sciences (NIGMS)[c]	1,706	1,931	1,631	—
Child Health/Human Development (NICHD)	1,557	1,416	1,582	—
National Eye Institute (NEI)	824	749	831	—
Environmental Health Sciences (NIEHS)[d]	803	730	810	—
National Institute on Aging (NIA)	3,544	3,226	3,609	—
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	625	568	635	—
Deafness/Communication Disorders (NIDCD)	491	446	495	—
National Institute of Mental Health (NIMH)	2,038	1,845	2,060	—
National Institute on Drug Abuse (NIDA)	1,462	1,432	1,477	—
Alcohol Abuse/Alcoholism (NIAAA)	545	497	550	—
Nursing Research (NINR)	169	157	171	—
Human Genome Research Institute (NHGRI)	606	550	612	—
Biomedical Imaging/Bioengineering (NIBIB)	404	368	407	—
Minority Health/Health Disparities (NIMHD)	336	305	349	—
Complementary/Integrative Health (NCCIH)	152	138	153	—
Advancing Translational Sciences (NCATS)	833	788	840	—
Fogarty International Center (FIC)	81	74	86	—
National Library of Medicine (NLM)	457	416	461	—
Office of Director (OD)[e]	2,252	2,099	2,337	—
Innovation Account[f]	157	109	109	—
Buildings and Facilities (B&F)	200	300	200	—
National Institute for Research on Safety and Quality (NIRSQ)	—	257	—	—
Subtotal, NIH (LHHS Discretionary BA)	**40,228**	**37,630**	**40,647**	—
PHS Program Evaluation (provided to NIGMS)	1,231	741	1,341	—
Superfund (Interior approp. to NIEHS)[g]	81	74	83	—
Nonrecurring Expenses Fund (NEF) Transfer (to Buildings and Facilities)[h]	225	—	—	—
Mandatory type 1 diabetes funds (to NIDDK)[i]	150	150	*150*[e]	—
Patient-Centered Outcomes Research Trust Fund (PCORTF, to NIRSQ)	—	98	—	—
NIH Program Level	**41,915**	**38,694**	**42,221**	—
Emergency Funding	not less than 3,587[k]	—	5,000	—

Source: U.S. Congress, House Committee on Appropriations, Subcommittee on the Departments of Labor, Health and Human Services, Education, and Related Agencies, *Department of Labor, Health, and Human Services, and Education, and Related Agencies Appropriations Bill, 2021*, Report to accompany H.R. 7614, 116th Cong., 2nd sess., July 15, 2020, H.Rept. 116-450 (Washington: GPO, 2020), H.R. 7617, Division E as passed by the House,

and NIH, "Budget Request by IC (Summary Table)," https://officeofbudget.od.nih.gov/pdfs/FY21/br/5-SupplementaryTables.pdf, except as noted below.

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 9** do not subtract the amount of transfers to the evaluation tap from the agencies' appropriation. Figures for the column headed "FY2021 Senate" will be added, if available, as the action is completed. Emergency funding is shown in this table presentation to reflect the NIH budget and appropriations process for FY2021.

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 i).

b. This amount does not include the Office of Management and Budget's proposed amendment to add $439.584 million to the original FY2021 Budget request, as per the convention in cited source documents.

c. Amounts for National Institute of General Medical Sciences (NIGMS) do not include funds from PHS Evaluation Set-Aside (§241 of the PHS Act). Though the FY2021 budget request provides an increase to NIGMS through discretionary LHHS budget authority (BA) compared to FY2020, the total amount for NIGMS with the PHS evaluation transfer included is less than FY2020 enacted levels. Similarly, the FY2021 House passed legislation funding for NIGMS is lower than FY2020 in discretionary LHHS BA, but higher than FY2020 with the PHS evaluation transfer included.

d. Amounts for National Institute of Environmental Health Sciences (NIEHS) do not include Interior/Environment Appropriations amount for Superfund research (see note g).

e. Includes $12.6 million for the Gabriella Miller Kids First Research Act.

f. The amount shown for the NIH Innovation Account in each column represents only a portion of the total appropriation to the account ($492 million for the FY2020; $404 million for FY2021). The remaining funds for this account are incorporated, where applicable, into the totals for other ICs. For FY2021, this includes $195 to NCI for cancer research and $50 million to each of NINDS and NIMH for the BRAIN Initiative.

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

h. The nonrecurring expenses fund (NEF) permits HHS to transfer unobligated balances of expired discretionary funds from FY2008 and subsequent years into the NEF account. Congress authorized use of the funds for capital acquisitions including information technology (IT) and facilities infrastructure (42 U.S.C. §3514a).

i. Mandatory funds are available to NIDDK for type 1 diabetes research are under PHSA Sec. 330Bm, most recently extended through FY2020 by the CARES Act (P.L. 116-136), with additional partial-year FY2021 funding of $25.1 million to cover the period of October 1, 2020 through November 30, 2020.

j. Cited House budget documents show an estimated FY2021 funding level of $150 million, though full year appropriations have not yet been enacted.

k. FY2020 emergency funding to NIH was provided in three coronavirus supplemental appropriations measures: $836 million in P.L. 116-123; $945.4 million in P.L. 116-136; and transfers from the Public Health and Social Services Emergency Fund (PHSSEF) directed in P.L. 116-139 to three NIH accounts totaling not less than $1.806 billion.

Department of Energy[56]

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

The Administration's FY2021 budget request for DOE includes about $13.853 billion for R&D and related activities, including programs in three broad categories: science, national security, and energy. This request is about 19.1% less than the comparable enacted FY2020 amount of $17.124 billion. The House bill would provide $17.453 billion for these programs in regular appropriations and an additional $11.125 billion in emergency supplemental appropriations. (See **Table 10** for details.)

The request for the DOE Office of Science is $5.838 billion, a decrease of 16.6% from the FY2020 appropriation of $7.000 billion. Funding would decrease for five of the office's six major research programs. In the largest program, Basic Energy Sciences, almost two-thirds of the proposed 16.6% decrease would result from spending less on facility construction. Most of the remainder would result from spending less on existing scientific user facilities, in some cases by reducing hours of operation. Funding for Biological and Environmental Research would decrease by 31.1%, with reductions concentrated in the Earth and Environmental Systems Sciences subprogram as proposed in other recent Administration budgets. Funding for Fusion Energy Sciences would decrease by 36.6%. Within Fusion Energy Sciences, the U.S. contribution to construction of the International Thermonuclear Experimental Reactor (ITER), a fusion energy demonstration and research facility in France, would be $107 million (down from $242 million in FY2020). The one major research program receiving an increase would be Advanced Scientific Computing Research (up 0.8%). Within Advanced Scientific Computing Research, an increase of $109 million for research would be partly offset by a decrease of $81 million for facilities; the Office of Science Exascale Computing Project would receive $169 million, down from $189 million in FY2020.[57]

The House bill would provide regular appropriations of $7.055 billion for the Office of Science, 20.9% above the request and 0.8% above FY2020. All six of the office's major research programs would receive increases relative to FY2020. In Biological and Environmental Research, the Earth and Environmental Systems Sciences subprogram would receive not less than $355 million, an increase of $10 million from FY2020 and $177 million more than the request. The U.S. contribution to ITER would be $260 million. The House bill would also provide emergency supplementation appropriations of $6.250 billion for the Office of Science, with an emphasis on the High Energy Physics, Basic Energy Sciences, and Fusion Energy Sciences programs.

The request for DOE national security R&D is $5.066 billion, an increase of 6.3% from $4.765 billion in FY2020. In Weapons Activities, the request for Stockpile Research, Technology, and

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

[57] This project is part, but not all, of the DOE-wide Exascale Computing Initiative.

Engineering would be an increase of 9.0% above the comparable FY2020 amount.[58] The bulk of the increase would be for Assessment Science ($773 million, up from $595 million in FY2020) and Weapon Technology and Manufacturing Maturation ($298 million, up from $222 million in FY2020). A proposed increase of 7.2% for R&D in the Defense Nuclear Nonproliferation account reflects $40 million requested for a program in National Technical Nuclear Forensics R&D, formerly funded in DHS.

The House bill would provide regular appropriations of $5.021 billion for national security R&D, 0.9% below the request and 5.4% above FY2020. In Weapons Activities, the bill would provide $65 million less than the request for Engineering and Integrated Assessments, $13 million less than the request for Assessment Science, and $64 million less than the request for Weapon Technology and Manufacturing Maturation. Funding for R&D in the Defense Nuclear Nonproliferation account would be $70 million more than the request; it would include funds for National Technical Nuclear Forensics R&D at the requested level. The emergency supplemental appropriations in the House bill do not include DOE national security R&D.

The request for DOE energy R&D is $2.949 billion, a decrease of 45.0% from $5.360 billion in FY2020. Many of the proposed reductions in this category are similar to the Administration's FY2019 and FY2020 budget proposals. Funding for energy efficiency and renewable energy R&D would decrease by 70.1%, with reductions in all major research areas and a shift in emphasis toward early-stage R&D rather than later-stage development and deployment. In the Fossil Energy R&D account, an increase of $172 million for Advanced Energy Systems would be largely offset by decreases for carbon capture, utilization, and storage ($123 million, down from $218 million in FY2020), natural gas technologies ($15 million, down from $51 million), and oil technologies ($17 million, down from $46 million). The request for nuclear fuel cycle R&D is $187 million (down from $305 million), and nuclear energy as a whole would decrease by 20.1%, with no funding requested for the Integrated University Program ($5 million in FY2020) or the Supercritical Transformational Electric Power (STEP) R&D initiative ($5 million in FY2020). The Advanced Research Projects Agency-Energy (ARPA-E), which is intended to advance high-impact energy technologies that have too much technical and financial uncertainty to attract near-term private-sector investment, would be terminated.

The House bill would provide regular appropriations of $5.376 billion for DOE energy R&D, 82.3% above the request and 0.3% above FY2020. The allocation to major program areas would be similar to FY2020. ARPA-E would not be terminated; the committee report directs DOE not to "use any appropriated funds to plan or execute the termination of ARPA-E" and to "disburse funds appropriated for ARPA-E within a reasonable time period." The House bill would also provide emergency supplementation appropriations of about $4.875 billion for energy R&D activities in Energy Efficiency and Renewable Energy, Fossil Energy, Nuclear Energy, Electricity, and ARPA-E.

[58] The structure of the Weapons Activities account has been reorganized in the FY2021 budget. This item is not directly comparable to any single item in the FY2020 enacted appropriation, but the FY2021 budget justification provides a crosswalk for comparison purposes.

Table 10. Department of Energy R&D and Related Activities

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House (Reg.)	FY2021 House (Supp.)	FY2021 Senate	FY2021 Enacted
Science	**7,000**[k]	**5,838**	**7,055**	**6,250**		
Basic Energy Sciences	2,213	1,936	2,242	1,301		
High Energy Physics	1,045	818	1,050	2,271		
Biological and Environmental Research	750	517	760	150		
Nuclear Physics	713	653	715	48		
Advanced Scientific Computing Research	980	988	1,020	877		
Fusion Energy Sciences	671	425	680	309		
Other	628	501	588	1,293		
National Security	**4,765**	**5,066**	**5,021**	**—**		
Weapons Activities Stockpile RT&E	2,553[b]	2,782	2,660	—		
Naval Reactors	1,648	1,684	1,684	—		
Defense Nuclear Nonproliferation R&D	533	572[c]	642[c]	—		
Def. Environmental Cleanup Technol. Devel.	30	28	35	—		
Energy	**5,360**	**2,949**	**5,376**	**4,875**		
Energy Efficiency and Renewable Energy[d]	2,406[e]	720	2,472	1,625		
Fossil Energy R&D	750	731	735	1,250		
Nuclear Energy	1,493	1,180	1,436	1,250		
Electricity	190	195	195	500		
Cybersec., En. Secy., and Emerg. Response R&D	95	103	104	—		
Advanced Research Projects Agency-Energy	425	21[f]	435	250		
DOE, Total	**17,124**	**13,853**	**17,453**	**11,125**		

Source: FY2020 enacted from P.L. 116-94 and explanatory statement, *Congressional Record*, December 17, 2019, Book III. FY2021 request from DOE FY2021 congressional budget justification, https://www.energy.gov/cfo/downloads/fy-2021-budget-justification. FY2021 House from H.R. 7617 as passed by the House and H.Rept. 116-449 (on H.R. 7613). Columns currently blank will be added as Congress acts.

Notes: Totals may differ from the sum of the components due to rounding. The House bill would provide emergency supplemental appropriations separately from regular appropriations in Title VI, "Additional Infrastructure Investments." The R&D portion of these additional amounts is estimated by CRS based on descriptions in the bill text.

a. Does not include additional $99.5 million appropriated by the CARES Act (P.L. 116-136).

b. FY2020 enacted amount is as given in the FY2021 budget justification for comparison with FY2021. Stockpile Research, Technology, and Engineering is part of a new budget structure for FY2021.

c. Includes $40 million for National Technical Nuclear Forensics R&D.

d. Excluding Weatherization and Intergovernmental Activities.

e. Reduced for $71 million in rescissions of prior-year unobligated balances. Some of that rescission may be of funds appropriated for non-R&D activities.

f. The request also proposes to cancel $332 million provided to ARPA-E in prior years.

National Aeronautics and Space Administration[59]

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

The Administration has requested about $22.243 billion for NASA R&D in FY2021. This would be 14.4% more than the FY2020 level of about $19.439 billion. The House bill would provide about $19.448 billion. For a breakdown of these amounts, see **Table 11**. NASA R&D funding comes through five accounts: Science; Aeronautics; Space Technology (called Exploration Technology in the Administration's budget request); Exploration (Deep Space Exploration Systems in the request); and the ISS, Commercial Crew, and Commercial Low Earth Orbit (LEO) Development portions of Space Operations (called LEO and Spaceflight Operations in the request). The OMB figures presented in **Table 1** indicate a substantially smaller amount for NASA R&D than the figures presented in this section, and a decrease in the FY2021 request relative to FY2020 rather than an increase. The main reason for this appears to be that OMB treats only about half of the Exploration account as R&D (somewhat more than half in FY2020, somewhat less than half in FY2021). As systems being developed under that account move from R&D to testing and ultimately operations, the share of the account spent on R&D may decrease. In order to allow consistent tracking as Congress acts on FY2021 appropriations legislation, this section treats the entirety of the Exploration account as R&D.

The FY2021 request for Science is $6.307 billion, a decrease of 11.7% from FY2020. Within this total, funding for Earth Science would decrease by $204 million (10.4%) and funding for Astrophysics would decrease by $475 million (36.4%). In Earth Science, the Administration proposes to terminate the Pre-Aerosol, Clouds, and Ocean Ecosystem (PACE) and Climate Absolute Radiance and Refractivity Observatory (CLARREO) Pathfinder missions ($131 million and $26 million respectively in FY2020). In Astrophysics, it proposes to terminate the Wide Field Infrared Space Telescope (WFIRST) and Stratospheric Observatory for Infrared Astronomy (SOFIA) missions ($511 million and $85 million in FY2020). PACE and CLARREO Pathfinder were also proposed for termination in the FY2018 through FY2020 budgets, and WFIRST was also proposed for termination in the FY2019 and FY2020 budgets, but in each case they were funded by Congress. The Planetary Science request includes $404 million (down from $593 million in FY2020) for a mission to orbit Jupiter's moon Europa. Despite direction otherwise in the FY2020 explanatory statement, the Europa mission would be launched on a commercial rocket and would not include a lander.

The House bill would provide $7.098 billion for Science, 12.5% more than the request but 0.6% less than the FY2020 appropriation. Within this total, funding for Earth Science would be more than either the request or the FY2020 amount, and funding for Astrophysics would be the same as in FY2020. The House rejected the proposed terminations of PACE (which would receive $145 million), CLARREO Pathfinder ($25 million), WFIRST ($505 million), and SOFIA ($85 million). In Planetary Science, the House bill would provide the requested amount for a Europa mission; it would provide no funding for a Europa lander, but the committee report "strongly

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

encourage[d] NASA to proceed with plans to use the [Space Launch System]" rather than a commercial rocket.

The FY2021 request for Aeronautics is $819 million, an increase of 4.5% from $784 million in FY2020. As projected in prior budgets, the request includes $79 million for the Low Boom Flight Demonstrator program, intended to demonstrate quiet supersonic flight. The House bill would provide the requested amount.

The FY2021 request for Exploration Technology (currently Space Technology) is $1.578 billion, an increase of 43.5% from FY2020. The combined RESTORE-L/SPIDER mission to demonstrate in-space satellite servicing and robotic manufacturing would receive $134 million (down from $227 million in FY2020). A newly integrated Space Nuclear Technologies portfolio would receive $100 million for development of space nuclear power and propulsion technologies. The budget justification emphasizes Exploration Technology's support of NASA's Artemis human exploration initiative and its plans for a human lunar landing in 2024. In contrast, FY2020 congressional report language emphasized "broad technology development goals … independent of mission-specific needs" (H.Rept. 116-101) and technologies that "can serve all NASA mission directorates and are not solely focused on enabling human spaceflight" (S.Rept. 116-127).

The House bill would provide $1.100 billion for Space Technology, the same as the FY2020 appropriation. RESTORE-L would receive $227 million. Instead of the integrated Space Nuclear Technologies proposal, the House bill would provide $110 million for continued development and demonstration of a nuclear thermal propulsion system. The House committee report reaffirmed the committee's support for "the independence of the Space Technology Mission Directorate" and directed NASA to "preserve the Directorate's focus across NASA and in support of each of the mission directorates."

The FY2021 request for Deep Space Exploration Systems (currently Exploration) is $8.762 billion, an increase of 45.6% from FY2020. Within this account, the request for Exploration Systems Development includes $1.401 billion for the Orion crew capsule (down from $1.407 billion in FY2020) and $2.257 billion for the Space Launch System heavy-lift rocket (SLS, down from $2.586 billion in FY2020). The proposed 228.9% increase for Exploration R&D reflects a request for $3.370 billion for development of a human lunar landing system. Exploration R&D funding would also include $739 million (up from $450 million in FY2020) for development of the Gateway lunar-orbiting platform, intended to support human and robotic missions to the lunar surface.

The House bill would provide $6.018 billion for Exploration, the same as the FY2020 appropriation. This total would include the requested amount for Orion and $2.600 billion for the SLS. It would include $1.557 billion for Exploration R&D, up 8.5% from FY2020 but 67.0% less than the request. The House committee report described the human lunar landing system and related activities in Exploration R&D as "being rushed to meet a politically motivated timeline."

In the LEO and Spaceflight Operations account (currently Space Operations), the request includes $1.401 billion for the ISS; $100 million for the Commercial Crew program (down from $102 million in FY2020); and $150 million for Commercial LEO Development (up from $15 million in FY2020). Commercial crew activities are transitioning from development to operations (which is funded separately). The first crewed demonstration flight to the ISS launched in May 2020 and returned to Earth in August 2020; the first post-certification flight is expected as soon as October 2020. The Commercial LEO Development program, intended to stimulate a commercial space economy in low Earth orbit, was initiated in the FY2019 budget. The Administration has requested $150 million for it each year since then; Congress has so far appropriated a total of $55 million.

The House committee report does not explicitly state its funding recommendations for the ISS and the Commercial Crew program, but it appears to include the Administration-requested amounts for both programs. It recommends $15 million for Commercial LEO Development, the same as in FY2020.

Table 11. National Aeronautics and Space Administration R&D

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Science	**7,139**[d]	**6,307**	**7,098**		
Earth Science	1,972	1,768	2,022		
Planetary Science	2,713	2,660	2,713		
Astrophysics	1,306	831	1,306		
James Webb Space Telescope	423	415	423		
Heliophysics	725	633	633		
Aeronautics	**784**	**819**	**819**		
Space Tech. / Exploration Tech.	**1,100**	**1,578**	**1,100**		
Exploration / Deep Sp. Exp. Sys.	**6,018**	**8,762**	**6,018**		
Exploration Systems Development	4,583	4,042	4,460		
Exploration R&D	1,435	4,719	1,557		
Space Ops. / LEO and Spaceflight Ops.[b]	**~1,575**[b]	**1,650**	**~1,515**[b]		
International Space Station	n/s	1,401	n/s		
Commercial Crew	102	100	n/s		
Commercial LEO Development	15	150	15		
Subtotal R&D	**16,616**	**19,116**	**16,550**		
Non-R&D Programs[c]	2,727	2,581	2,707		
Safety, Security, and Mission Services	2,913[e]	3,010	2,953		
Associated with R&D[d]	*2,503*	*2,652*	*2,538*		
Construction & Environmental C&R	373	539	419		
Associated with R&D[d]	*321*	*475*	*360*		
NASA, Total (R&D)	**19,439**[de]	**22,243**	**19,448**		
NASA, Total	**22,629**[de]	**25,246**	**22,629**		

Sources: FY2020 enacted from P.L. 116-93 and explanatory statement, *Congressional Record*, December 17, 2019, Book II. FY2021 request from NASA FY2021 congressional budget justification, http://www.nasa.gov/news/budget/. FY2021 House from H.R. 7617 as passed by the House and H.Rept. 116-455 (on H.R. 7667).

Notes: Totals may differ from the sum of the components due to rounding. LEO = Low Earth Orbit. C&R = Compliance and Remediation. n/s = not specified. Columns currently blank will be added as Congress acts.

a. Does not reflect rescission of $70 million in unobligated prior-year balances.

b. Excluding non-R&D activities: Space and Flight Support and Space Transportation other than Commercial Crew. FY2020 enacted total assumes the requested FY2020 amount for International Space Station ($1,458 million) in order to allow calculation of a total for R&D. FY2021 House total similarly assumes the requested FY2021 amounts for International Space Station and Commercial Crew.

c. Non-R&D activities in Space Operations / LEO and Spaceflight Operations (see note b); STEM Engagement (formerly Education); and Inspector General.

d. CRS estimates the allocation between R&D and non-R&D in proportion to the underlying program amounts in order to allow calculation of a total for R&D.

e. Does not include additional $60 million appropriated by the CARES Act (P.L. 116-136).

National Science Foundation[60]

The National Science Foundation supports basic research and education in the nonmedical 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."[61] The NSF is a primary source of federal support for U.S. university research, especially in computer science, biology, mathematics and the social and psychological sciences. 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.

NSF has six appropriations accounts: Research and Related Activities (RRA, the main research account), Education and Human Resources (EHR, the main education account), Major Research Equipment and Facilities Construction (MREFC), Agency Operations and Award Management (AOAM), the National Science Board (NSB), and the Office of Inspector General (OIG). Appropriations are generally provided at the account level, while program-specific direction may be included in appropriations acts, or accompanying conference reports or explanatory statements.

Funding for R&D is included in the RRA, EHR, and MREFC accounts. (The RRA and EHR accounts also include non-R&D funding.) Together, these three accounts comprise over 95% of the total requested funding for NSF. Actual R&D obligations for each account are known after NSF allocates funding appropriations to specific activities and reports those figures.[62] The budget request specifies R&D funding for the conduct of research, including basic and applied research, and for physical assets, including R&D facilities and major equipment. Funding amounts for FY2019 actual and FY2021 requested levels are reported by account, including amounts for R&D conduct and physical assets where applicable, in **Table 12**.

Funding for NSF for FY2020 was enacted on December 20, 2019.[63] Funding details below the account level were not available at the time the FY2021 budget request was prepared. Therefore, at the account level, the FY2021 request amounts are compared to the FY2020 enacted amounts, as well as to the FY2019 actual amounts in this analysis; below the account level and for R&D totals, the FY2021 request amounts are compared to FY2019 actual amounts. This section will be updated when FY2020 R&D breakouts and subaccount funding amounts are available for comparison. FY2019 actual, FY2020 enacted, and FY2021 requested amounts are reported by account in **Table 12**; funding for R&D conduct and facilities and equipment is included for FY2021 requested and FY2019 actual amounts.

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

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

[62] R&D actual (FY2019) and requested (FY2021) amounts are reported in the "Quantitative Data Tables" section of the FY2021 *NSF Budget Request to Congress*, February 10, 2020, pp. QDT-1–QDT-7.

[63] The Consolidated Appropriations Act, 2020 (P.L. 116-93); and Explanatory Statement, Consolidated Appropriations Act, 2020, Division B (Commerce, Justice, Science, and Related Agencies Appropriations Act, 2020), *Congressional Record*, vol. 165, no. 204—Book II (December 17, 2020), p. H10971.

On July 31, the House passed H.R. 7617, the Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021. H.R. 7617 is a consolidated bill that incorporates the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2021 as Division B. Division B would provide funding for the NSF accounts.

Overall. The Administration is requesting $7.741 billion for the NSF in FY2021, $537 million (6.5%) less than the FY2020 enacted amount, and $409 million (5.0%) less than the FY2019 actual amount. The request would decrease budget authority in all three of the R&D accounts relative to the FY2020 enacted level: RRA by $524 million (7.8%), EHR by $9.1 million (1.0%), and MREFC by $13.5 million (5.5%). Overall, NSF estimates that, under the FY2021 request, agency-wide funding rates (i.e., the percentage of submitted proposals that are successfully awarded funding) would decrease slightly from 27% to 25%, with 500 fewer new competitive awards, compared to FY2019.

As a proportion of NSF's total funding, R&D activities account for approximately 80%. For FY2021, $6.33 billion is requested for R&D activities, a 4.8% decrease from FY2019 actual funding for R&D of $6.65 billion. The total request includes $5.80 billion (92%) for the conduct of R&D, and $523 million (8%) for R&D facilities and major equipment. Of funding requested for the conduct of R&D, 86% is requested for basic research, and 14% for applied research. Overall funding for R&D facilities and major equipment supports not only the construction and acquisition phases, funded through MREFC ($230 million requested), but also the planning, design, and postconstruction operations and maintenance, funded through RRA ($293 million requested).

The House-passed bill would provide $8.55 billion for NSF for FY2021, $270 million (3.3%) more than the enacted FY2020 level, and $807 million (10.4%) more than the request.

Research. The Administration seeks $6.21 billion for RRA in FY2021, a $524 million (7.8%) decrease compared to the FY2020 enacted funding, and a $365 million (5.6%) decrease compared to FY2019 actual funding. Compared to the FY2019 actual levels, the FY2021 request includes decreases for 8 of the 10 RRA subaccounts. The largest percentage decrease would go to the Office of Polar Programs (14.1%, down $69 million). The Computer and Information Science and Engineering (CISE) subaccount would receive the largest dollar increase (7.8%, up $77 million). The FY2021 request also includes $164 million for the RRA Established Program to Stimulate Competitive Research (EPSCoR) program, a $12 million (6.8%) decrease compared to FY2019 actual funding.

Within the RRA account, the FY2021 request includes $5.61 billion for R&D, a decrease of $284 million (4.8%) compared to the FY2019 actual amount. Of this amount, the majority ($5.32 billion, 95%) is requested for the conduct of research, including $4.85 billion for basic research and $469 million for applied research.

The House-passed bill would provide $6.97 billion for RRA for FY2021, $230 million (3.4%) more than the enacted FY2020 level, and $754 million (12.1%) more than the request.

Education. The FY2021 request for the EHR account is $931 million, $9.1 million (1.0%) less than the FY2020 enacted amount and $3.6 million (0.4%) less than the FY2019 actual level. By program division, the Division of Graduate Education would receive an increase of $28.7 million (11.3%) over the FY2019 actual level. The Divisions of Research on Learning in Formal and Informal Settings, and Undergraduate Education would receive decreases of 2.1% ($224 million requested), and 10.7% ($237 million requested), respectively. The Division on Human Resource Development would receive approximately the same amount of funding ($189 million requested).

EHR programs of particular interest to congressional policymakers include the Graduate Research Fellowship Program (GRFP) and National Research Traineeship (NRT) programs. The FY2021 request for GRFP is $275 million, a reduction of $9.27 million (3.3%) from the FY2019 actual level. The FY2021 request for NRT is $61.9 million, a $7.78 million increase (14.4%) from FY2019.

Within EHR, requested funding for R&D is $485 million, which is $17.9 million (3.8%) more than the FY2019 actual funding amount and accounts for approximately 7.7% of the agency's total R&D request. All of the requested funding would support the conduct of R&D, including $167 million for basic research and $318 million for applied research.

The House-passed bill would provide $970 million for EHR for FY2021, $30 million (3.2%) more than the enacted FY2020 level, and $39 million (4.2%) more than the request.

Construction. The MREFC account supports large construction projects and scientific instruments, with all of the funding supporting R&D facilities. The construction phases of such large-scale projects tend to span multiple years; therefore, NSF provides out-year estimates of funding for major facilities for the duration of the anticipated timeline, which are updated annually. This section of the analysis includes comparisons to FY2020 estimated funding, based on these projections. The Administration is seeking $230 million for MREFC in FY2021, $13.5 million (5.5%) less than the FY2020 enacted amount, and $55.5 million (19.5%) less than the FY2019 actual amount.

Requested MREFC funding would support continued construction of the Vera C. Rubin Observatory ($40.8 million requested, down 12.1% from the FY2020 estimate)—previously called the Large Synoptic Survey Telescope (LSST)—and the Antarctic Infrastructure Modernization for Science project (AIMS, $90.0 million requested, down 8.1% from FY2020 estimate). The request includes $33.0 million for upgrades to the Large Hadron Collider in Switzerland, which would represent the second year of a five-year project. Additionally, $65.0 million is requested for Mid-scale Research Infrastructure projects (those projects with funding amounts in the $20 million to $70 million range); this was a new funding line-item in the MREFC account as of FY2020, meant to manage support for upgrades to major facilities and stand-alone projects in this range as a portfolio.

The House-passed bill would provide $243 million for MREFC for FY2021, equal to the enacted FY2020 level, and $13 million (5.8%) more than the request.

Other initiatives. The FY2021 NSF budget request includes funding for multiple agency-wide investments, including the Big Ideas and Convergence Accelerator, as well as three multiagency initiatives. This funding is included in multiple NSF appropriations accounts, and R&D amounts are not separately provided.

The Big Ideas, which include six Research and three Enabling Big Ideas, first proposed in 2016, "endeavor to break down the silos of conventional scientific research … to define and push the frontiers of global science and engineering leadership and to invest in fundamental research."[64] Requested funding amounts for each of the Big Ideas compared to the FY2019 actual amounts include the following:

- Harnessing the Data Revolution for 21st-Century Science and Engineering (HDR): $45 million requested, up $15 million (50%) from FY2019.

[64] NSF, *FY2021 Budget Request to Congress*, February 10, 2020, pp. Overview-9 – Overview-10.

- The Future of Work at the Human Technology Frontier (FW-HTF): $45 million requested, up $15 million (50%) from FY2019.
- The Quantum Leap (QL): Leading the Next Quantum Revolution: $50 million requested, up $20 million (67%) from FY2019.
- Navigating the New Arctic (NNA): $30 million requested, equal to FY2019.
- Understanding the Rules of Life (URoL): Predicting Phenotype: $30 million requested, equal to FY2019.
- Windows on the Universe (WoU): The Era of Multi-Messenger Astrophysics: $30 million requested, equal to FY2019.
- Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES): $18.9 million requested, down $1.3 million (6.3%) from FY2019.
- Growing Convergence Research at NSF (GCR): $15.2 million requested, down $0.6 million (3.8%) from FY2019.
- Mid-Scale Research Infrastructure: $97.7 million requested, up $37.6 million (62.7%) from FY2019.

The Convergence Accelerator (CA)

> is an organizational framework that stands separately from the NSF research directorates, with its own budget, staff, and initiatives. Each CA research track will be a time-limited entity focused on specific research topics and themes. Therefore, CA research tracks will evolve over time and will be informed by external stakeholder input. The CA will reward high-risk, innovative thinking by multidisciplinary teams of researchers who want to accelerate discovery and innovation. The CA is a way of achieving rapid lab-to-market or research outcomes.[65]

The initial CA research tracks have focused on a subset of the Big Ideas, though the CA investments "are distinguished from the corresponding Big Ideas by the nature of the research, the time scale of the activities supported, and the more hands-on, agile approach to project management and support that is envisioned [by the CA program]." NSF has requested $70 million for the CA in FY2021, which is $28.6 million more than the FY2019 actual amount. The budget request states that NSF anticipates financial contributions from external partners to begin in FY2021 (amount unspecified).

The budget request also includes three multi-agency initiatives. The National Nanotechnology Initiative would receive $454 million, $67.2 million (12.9%) less than in FY2019. The Networking and Information Technology Research and Development program would receive $1.57 billion, an increase of $151 million (10.7%). The U.S. Global Change Research Program would receive $217 million, $24 million (9.8%) less than in FY2019.[66]

[65] Ibid, p. Overview-10.

[66] For additional information on these initiatives, see "Multiagency R&D Initiatives."

Table 12. National Science Foundation Funding

(budget authority, in millions of dollars)

Account	FY2019 Actual	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Research and Related Activities (RRA)	**6,578.1**	**6,737.2**	**6,213.0**	**6,967.1**		
R&D, RRA Total	5,896.1	n/a	5,612.3	*n/a*		
Conduct of R&D	*5,529.5*	*n/a*	*5,319.5*	*n/a*		
R&D Facilities and Major Equipment	*366.7*	*n/a*	*292.8*	*n/a*		
Education and Human Resources (EHR)	**934.5**	**940.0**	**930.9**	**970.0**		
R&D, EHR Total	466.9	n/a	484.8	*n/a*		
Conduct of R&D	*466.7*	*n/a*	*484.8*	*n/a*		
R&D Facilities and Major Equipment	*0.2*	*n/a*	*0.0*	*n/a*		
Major Research Equipment and Facilities Construction (MREFC)	**285.3**	**243.2**	**229.8**	**243.2**		
R&D, MREFC Total	285.3	n/a	229.8	*n/a*		
Conduct of R&D	*0.0*	*n/a*	*0.0*	*n/a*		
R&D Facilities and Major Equipment	*285.3*	*n/a*	*229.8*	*n/a*		
Agency Operations and Award Management (AOAM)[a]	**332.7**	**336.9**	**345.6**	**345.6**		
Office of the Inspector General (OIG)	**15.3**	**16.5**	**17.9**	**17.9**		
[a]**National Science Board (NSB)**[a]	**4.3**	**4.5**	**4.2**	**4.5**		
NSF, Total Discretionary[b]	**8,150.2**	**8,278.3**	**7,741.4**	**8,548.3**		
R&D, NSF Total	6,648.3	n/a	6,326.9	*n/a*		
Total, Conduct of R&D	*5,996.1*	*n/a*	*5,804.4*	*n/a*		
Total, R&D Facilities & Major Equipment	*652.1*	*n/a*	*522.5*	*n/a*		

Sources: Data in the columns titled "FY2019 Actual" and "FY2021 Request" are from the FY2021 *NSF Budget Request to Congress*. Data in the "FY2020 Enacted" column are from P.L. 116-93. Data in the "FY2021 House" column are from H.R. 7617, as passed by the House.

Notes: Appropriations accounts are in bold. NSF total may differ from the sum of the accounts due to rounding. Nonbold R&D funding amounts are a subset of funding for the specified accounts. Funding amounts in the "FY2021 Senate" and "FY2021 Enacted" columns will be added as Congress completes the action. The term "n/a" = not available.

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

b. In addition to discretionary funding, NSF reports mandatory funding from H-1B visa and donation sources, which are not included in this total.

Department of Agriculture[67]

The U.S. Department of Agriculture (USDA) was created in 1862 to support agricultural research in an expanding, agriculturally dependent country. Today, USDA conducts intramural research at

[67] This section was written by Genevieve K. Croft, Analyst in Agricultural Policy, CRS Resources, Science, and Industry Division.

federal facilities with federally employed scientists, and supports extramural research at universities and other facilities through competitive grants and capacity (formula-based) funding. The breadth of contemporary USDA research spans traditional agricultural production practices, organic and sustainable agriculture, bioenergy, nutritional needs and food composition, food safety, animal and plant health, pest and disease management, economic decisionmaking, and other social sciences affecting consumers, farmers, and rural communities.

The four agencies of USDA's Research, Education, and Economics (REE) mission area carry out the Department's research and education activities. These agencies are the Agricultural Research Service (ARS), the principal intramural research agency; the National Institute of Food and Agriculture (NIFA), the principal extramural research agency; the National Agricultural Statistics Service (NASS), which undertakes a variety of surveys to capture relevant data; and the Economic Research Service (ERS), which applies economic analysis to a wide range of topics related to food and agriculture. In addition to the four REE agencies, the Office of the Chief Scientist (OCS), a staff office within the Office of the Under Secretary of REE, coordinates science activities across the department.

On July 24, the House passed H.R. 7608, the State, Foreign Operations, Agriculture, Rural Development, Interior, Environment, Military Construction, and Veterans Affairs Appropriations Act, 2021. H.R. 7608 is a consolidated bill that incorporates the Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2021 as Division B. Division B would provide funding for USDA accounts.

The House-passed FY2021 appropriations bill would provide a total of $3,310.3 million in discretionary spending for the four agencies in FY2021,[68] a decrease of $89.2 million (-2.6%) from the FY2020 amount ($3,399.5 million) enacted in P.L. 116-94. Most of that year-over-year reduction is attributable to a decrease in funding for the ARS buildings and facilities account ($192.7 million provided in P.L. 116-94, versus $11.0 million recommended in H.R. 7608). The House-passed levels for FY2021 discretionary appropriations and the Administration's FY2021 request are discussed below for the four research agencies and the Office of the Under Secretary of REE. Funding amounts are presented in **Table 13**. In addition to discretionary appropriations, agricultural research is funded by certain mandatory funding authorized by the 2018 farm bill (P.L. 115-334) as well as state matching contributions and private donations or grants.[69]

Agricultural Research Service

ARS is USDA's in-house basic and applied research agency, and has major responsibilities for conducting and leading the national agricultural research effort. ARS operates approximately 90 laboratories in the United States and abroad, with about 5,000 permanent employees, including approximately 2,000 research scientists. ARS laboratories include a focus on efficient and sustainable 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. ARS also operates the National Agricultural Library (NAL). NAL is the world's largest agricultural research library, and is a primary information repository for food, agriculture, and natural resource sciences.

[68] The committee report for the House-passed FY2021 appropriations bill for agriculture (H.R. 7608) is H.Rept. 116-446. This report remains associated with the original bill reported for agriculture (H.R. 7610). The committee report associated with H.R. 7608 (H.Rept. 116-444) does not address agriculture.

[69] For additional information, see CRS Report R45974, *Agriculture and Related Agencies: FY2020 Appropriations*, by Jim Monke.

For FY2021, H.R. 7608 would provide $1,453.7 million for ARS salaries and expenses, a 2.8% increase over the FY2020 appropriation ($1,414.4 million), and 3.3% more than the Administration's FY2021 request ($1,367.9 million). The House-passed bill would provide $11.2 million for ARS buildings and facilities, a 94.2% decrease from the FY2020 appropriation ($192.7 million) and 77.6% less than the Administration's FY2021 request ($50.0 million, **Table 13**). The Administration explains its requested decrease in funding for ARS buildings and facilities by noting that fully-funded construction projects for ARS co-located facilities are complete.[70]

ARS is coordinating with the Department of Homeland Security (DHS) on the new National Bio and Agro-Defense Facility (NBAF), which DHS is constructing to replace the outdated Plum Island Animal Disease Center (PIADC).[71] In January 2019, USDA and DHS signed a Memorandum of Agreement to govern the transition of NBAF from DHS to USDA, with ownership to transfer upon its completion and commissioning, at the time expected in December 2022.[72] The House-passed FY2021 bill would provide ARS with $8.0 million in NBAF research funds, as requested by the Administration, in addition to $66.0 million for operations and maintenance, as reported by USDA.[73]

National Institute of Food and Agriculture

The National Institute of Food and Agriculture (NIFA) is USDA's principal extramural research agency. It provides federal funding for research, education, and extension projects conducted in partnership with land-grant colleges and universities (LGUs), State Agricultural Experiment Stations, the Cooperative Extension System, other research and education institutions, private organizations, and individuals. NIFA partnerships include the three types of LGUs—1862 (original) Institutions, 1890 (historically black) Institutions, and 1994 (tribal) Institutions—as well as other higher education institutions.[74] Federal funds awarded through NIFA capacity (formula-based) and competitive grants enhance research capacity at these institutions.[75] NIFA headquarters are located in Washington, DC. In October 2019, USDA relocated the majority of NIFA staff positions to Kansas City, MO.[76]

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[70] USDA, "Agricultural Research Service," *2021 USDA Budget Explanatory Notes for Committee on Appropriations*, 2020, p. 20-66.

[71] For additional information, see CRS In Focus IF11492, *National Bio and Agro-Defense Facility: Purpose and Status*, by Genevieve K. Croft.

[72] USDA and DHS, *Memorandum of Agreement Between the U.S. Department of Agriculture Marketing and Regulatory Programs, the U.S. Department of Agriculture Research, Education, and Economics, and the Department of Homeland Security Science and Technology Directorate*, June 20, 2019, at https://www.usda.gov/sites/default/files/documents/usda-dhs-moa.pdf. The U.S. Government Accountability Office (GAO) reports that progress towards these goals has been delayed due to the COVID-19 pandemic. See GAO, *DHS and USDA Are Working to Transfer Ownership and Prepare for Operations, but Critical Steps Remain*, July 2020, https://www.gao.gov/assets/710/708025.pdf.

[73] USDA, "Agricultural Research Service," *2021 USDA Budget Explanatory Notes for Committee on Appropriations*, 2020, p. 20-14.

[74] 1862, 1890, and 1994 refer to the years of enactment of the laws that created these institutional classifications. For more information on land-grant colleges and universities and other institutions that NIFA funds support, see CRS Report R45897, *The U.S. Land-Grant University System: An Overview*, by Genevieve K. Croft.

[75] The National Agricultural Research, Extension, and Teaching Policy Act of 1977 designated USDA as the lead federal agency for higher education in the food and agricultural sciences.

[76] For further information, see CRS In Focus IF11527, *Relocation of the USDA Research Agencies: NIFA and ERS*, by Genevieve K. Croft.

The House-passed bill recommends $1,575.3 million in discretionary spending for NIFA activities in FY2021. This is $47.9 million more (3.1%) than was enacted in FY2020 and $15.5 million less (-1.0%) than the Administration request (**Table 13**).

Research and Education. Hatch Act and Evans-Allen Act funds support capacity grants for research and education activities at 1862 and 1890 Institutions, respectively. For Hatch Act programs, the enacted House-passed FY2021 bill provides $259.0 million, $15.8 million more (6.1%) than the Administration request ($243.2 million). For Evans-Allen programs, H.R. 7608 would provide $73.0 million, 26.3% more than the Administration request ($53.8 million).

For competitive research grants at 1994 Institutions, the FY2021 House-passed bill would provide $4.5 million, 30.9% more than the Administration request ($3.4 million). For education grant programs for the insular areas and for Alaska native and native Hawaiian-serving institutions, the Administration request proposes to combine these programs into a single program with requested funding of $5.0 million. The FY2021 House-passed bill does not adopt this proposal, and would provide $2.0 million and $3.2 million for the separate programs.

The McIntire-Stennis program provides capacity funds for forestry research at LGUs and state colleges of forestry. For FY2021, H.R. 7608 would provide $38.0 million for this program, $2.0 million more than in FY2020. The Administration is requesting $28.9 million for FY2021.

The Agriculture and Food Research Initiative (AFRI) is USDA's flagship competitive research grants program, and represents about 31% of NIFA's total discretionary budget. The House-passed bill would provide $435 million for AFRI. This is $10 million more (2.4%) than FY2020. The Administration is requesting $600.0 million for FY2021, a 41.2% increase over FY2020. This request includes $100 million for research on artificial intelligence, machine learning, and predictive science, and $400 million for NIFA's Foundational and Applied Science program and interagency partnerships on technologies. NIFA also funds the Sustainable Agriculture Research and Education (SARE) program. For FY2021, the House-passed bill provides $39.0 million for SARE, an increase of $2.0 million over FY2020 funding. The Administration requests $37.0 million for SARE in FY2021.

Extension. Smith-Lever Act 3(b) and 3(c) programs provide capacity grants to 1862 Institutions to support cooperative extension. The House-passed bill recommends $315.0 million for FY2020, the same amount as enacted for FY2020. The Administration requests $299.4 million for these programs in FY2021.

Smith-Lever 3(d) programs provide competitive grants to 1862, 1890, and 1994 Institutions to support several cooperative extension programs. These programs include grants for food and nutrition education; new technologies for agricultural extension; federally recognized tribes; children, youth, and families at risk; and farm safety education. The House-passed bill recommends $89.8 million for Smith-Lever 3(d) programs in FY2021, of which $70.0 million would support the Expanded Food and Nutrition Education Program (EFNEP), and $3.2 would support the Federally Recognized Tribes Extension Program (FRTEP). The Administration is requesting $83.6 million, of which $69.0 million would support EFNEP, and $3.0 million would support FRTEP.

National Agricultural Statistics Service

The National Agricultural Statistics Service (NASS) conducts the quinquennial Census of Agriculture and provides official statistics on agricultural production and farm sector indicators. It is one of the 13 principal statistical agencies of the Federal Statistical System of the United States.

The House-passed bill recommends $183.4 million for NASS in FY2021, $46.3 million of which would support the Census of Agriculture. The Committee rejects eliminations or reductions of ongoing activities proposed by the Administration, and directs NASS to resume related reports. The Administration is requesting $177.5 million for NASS in FY2021. This includes $46.3 million for the Census of Agriculture and $10 million for a NASS Pilot Study, which is proposed to use combinations of available data to improve timely predictions of harvested acres and production. The Committee does not recommend providing funding for the proposed NASS Pilot Study, citing insufficient information in the budget justification.

Economic Research Service

The Economic Research Service supports economic and social science analysis about agriculture, rural development, food, commodity markets, and the environment. It also collects and disseminates data concerning USDA programs and policies. Like NASS, ERS is one of the principal statistical agencies of the Federal Statistical System of the United States. ERS headquarters is located in Washington, DC. In October 2019, USDA relocated the majority of ERS staff positions to Kansas City, MO.[77]

For FY2021, H.R. 7608 recommends $86.7 million for ERS, an increase of $1.9 million (2.3%) over FY2020, and $24.6 million more (28.4%) than the Administration's FY2021 request. The Committee rejects the Administration request to significantly reduce research activities at ERS.

Office of the REE Under Secretary and Office of the Chief Scientist

Congress created the Office of the Chief Scientist (OCS) in 2008 when it established the dual role of the Under Secretary for REE as the USDA Chief Scientist (7 U.S.C. §6971). OCS coordinates research programs and activities across USDA. Administratively, it is a component of the Office of the Under Secretary of REE.

In recent years, Congressional appropriations for the Office of the Under Secretary of REE have included funds for the Under Secretary and a few staff.[78] Congress has not provided direct appropriations for OCS since its establishment. It has been funded via interagency agreement among the REE agencies. For the first time, the President's FY2021 budget request for the Office of the Under Secretary for REE included a request for OCS, in the amount of $6.0 million and 29 staff years. The House-passed bill notes that the Committee does not provide the requested funds for OCS "as it has been historically funded through inter-agency agreements with the agencies in the mission area."[79] It does provide $6.1 million for the Office of the Under Secretary for REE, including funding for the office and for three new initiatives: $4.0 million for a new "Farm of the Future" competitive grant program in collaboration with NIFA, ARS, and the Office of the Chief Economist; $1.0 million to develop a public-private partnership on open data standards; and $300,000 to convene a blue-ribbon panel focused on enhancing land-grant coordination.

[77] See CRS In Focus IF11527, *Relocation of the USDA Research Agencies: NIFA and ERS*, by Genevieve K. Croft.

[78] Table OSEC-5 of USDA's FY2021 explanatory notes identifies $800,000 and three staff years for the Office of the Under Secretary for REE. USDA, "Office of the Secretary," *2021 USDA Budget Explanatory Notes for Committee on Appropriations*, 2020, p. 1-9.

[79] H.Rept. 116-446, p. 15.

Table 13. U.S. Department of Agriculture R&D

(budget authority, in millions of dollars)

Agency or Major Program	FY2020 Enacted P.L. 116-94	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Agricultural Research Service					
Salaries and Expenses	1,414.4	1,367.9	1,453.7		
Buildings and Facilities	192.7	50.0	11.2		
Subtotal, ARS	**1,607.1**	**1,417.9**	**1,464.9**		
National Institute of Food and Agriculture (NIFA)					
Research and Education					
AFRI (competitive grants)	425.0	600.0	435.0		
Hatch Act (1862 institutions)	259.0	243.2	259.0		
Evans-Allen (1890 institutions)	67.0	53.8	73.0		
McIntire-Stennis (forestry)	36.0	28.9	38.0		
Other	175.9	142.1	192.7		
Subtotal	**962.9**	**1,068.0**	**997.7**		
Extension					
Smith-Lever (b) and (c)	315.0	299.4	315.0		
Smith-Lever (d)	87.8	86.6	89.8		
1890 Extension Activities	57.0	48.6	62.0		
1994 Extension Activities	8.0	6.4	8.5		
Other	58.8	43.7	63.3		
Subtotal	**526.6**	**484.8**	**538.6**		
Integrated Activities	***38.0***	***38.0***	**39.0**		
Subtotal, NIFA	**1,527.4**	**1,590.8**	**1,575.3**		
National Agricultural Statistics Service (NASS)	**180.3**	**177.5**	**183.4**		
Economic Research Service (ERS)	**84.8**	**62.1**	**86.7**		
Total, USDA Research, Education, and Economics Agencies	**3,399.5**	**3,248.3**	**3,310.3**		
Office of the Under Secretary of REE	**0.8**	**6.8**	**6.1**		
Office of the Chief Scientist	-	6.0	0.0		

Sources: CRS, compiled from P.L. 116-94; *Consolidated Appropriations Act, 2020 Explanatory Statement, Division B*; H. Rept. 116-107, S. Rept. 116-110; *2021 USDA Budget Justification Notes*; H.R. 7608; and H.Rept. 116-446. Figures for the columns headed "FY2021 Senate" and "FY2021 Enacted" will be added when completed.

Department of Commerce

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

National Institute of Standards and Technology[80]

The mission of the National Institute of Standards and Technology is "to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life."[81] NIST research provides measurement, calibration, and quality assurance methods and techniques that support U.S. commerce, technological progress, product reliability, manufacturing processes, and public safety. NIST's responsibilities include the development, maintenance, and custodial retention of the national standards of measurement; providing the means and methods for making measurements consistent with those standards; and ensuring the compatibility of U.S. national measurement standards with those of other nations.[82]

Regular appropriations for NIST are provided through the annual Commerce, Justice, Science, and Related Agencies Appropriations Act (CJS Act).

The President is requesting $737.5 million for NIST in FY2021, a decrease of $296.5 million (28.7%) from the FY2020 enacted appropriation of $1,034.0 million. (See **Table 14**.) NIST discretionary funding is provided through three accounts: Scientific and Technical Research and Services (STRS), Industrial Technology Services (ITS), and Construction of Research Facilities (CRF).

The President's FY2021 request includes $652 million for R&D, standards coordination, and related services in the STRS account, a decrease of $102.0 million (13.5%) from the FY2020 enacted level.[83] According to NIST, the reductions would be necessary to address the President's priorities:

> To meet the topline funding levels proposed in the FY 2021 President's Budget request and support the Administration's stated priorities for Industries of the Future (IoTF) in quantum information science, artificial intelligence, advanced communications, advanced manufacturing, and biotechnology … NIST will have to make substantial reductions to its current R&D and program portfolio that impact work in advanced materials, physical infrastructure and resilience, and areas across NIST. The funding for the NIST laboratory programs will be reduced by $115.5 million and this reduction proposes the elimination of 391 employees.[84]

In particular, the budget proposes funding reductions in the following areas:

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

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

[82] 15 U.S.C. §272.

[83] CRS analysis of data from U.S. Department of Commerce, National Institute of Standards and Technology, National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2021 Budget Submission to Congress, p. NIST-5, https://www.commerce.gov/sites/default/files/2020-02/fy2021_nist_ntis_congressional_budget_justification.pdf.

[84] Ibid., p. NIST-31.

- Advanced Manufacturing and Material Measurements, down $37.5 million (31.3%) from FY2020, including a reduction of 178 positions.
- Fundamental Measurement, Quantum Science, and Measurement Dissemination, down $17.8 million (9.3%) from FY2020, including a reduction of 73 positions. According to NIST, "to prioritize work focused on advancing quantum science (including efforts focused on quantum networking) and transforming how NIST disseminates measurements through the NIST-on-A-Chip program, NIST will discontinue several measurement service and dissemination activities that are currently provided to our stakeholders in industry, government and academia."
- Advanced Communications, Networks, and Scientific Data Systems, down $35.8 million (52%) from FY2020, including 83 positions.
- Health and Biological Systems Measurements, down $3 million (8.6%) from FY2020.
- Physical Infrastructure and Resilience, down $16.4 million (28%) from FY2020, including 42 positions.
- NIST User Facilities, down $5 million (9.2%) from FY2020, including 15 positions.

NIST is requesting $27.4 million for its Measurement Tools and Testbeds to Power the Industries of the Future (IotF) efforts, to create measurement tools and testbeds to support deployment of IotF technologies at scale. Of these funds, $25 million would support acceleration of the development and adoption of artificial intelligence, $1.4 million would support 5G standards development for telecommunication, and $1 million would support acceleration of efforts to develop profiles for Position, Navigation, and Timing.

On July 31, the House passed H.R. 7617, the Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021. H.R. 7617 is a consolidated bill that incorporates the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2021 as Division B. Division B would provide funding for the NIST accounts. The House-passed bill would provide $789.0 million for the STRS account, $35.0 million (4.6%) more than the FY2020 enacted level and $137.0 million (21.0%) more than the President's request.

H.Rept. 116-455 accompanying H.R. 7667, the Commerce, Justice, Science, and Related Agencies Appropriations Act, 2021, rejected the President's proposed reductions to Advanced Manufacturing and Material Measurements; Fundamental Measurement, Quantum Science, and Measurement Dissemination; Advanced Communications, Networks, and Scientific Data Systems; Health and Biological Systems Measurements; Physical Infrastructure and Resilience; NIST User Facilities; Office of Special Programs; Standards Coordination Office; and the NIST Center of Excellence Program and instead recommended no less than the FY2020 level for these programs. Within the STRS account, the report also recommended: no less than $8.0 million for basic and applied quantum information science and technology R&D related to measurement science and standards; no less than $10.0 million for artificial intelligence; $2.0 million for testing for the presence of excessive pyrrhotite in concrete; $5.0 million to improve measurement assurance and standards coordination for regenerative therapies; $22.5 million for forensic science research, including $3.1 million for support of the Organization of Scientific Area Committees; $1.4 million more than the FY2020 level for 5G technologies; $3.5 million for direct air carbon capture and removal; and $2.5 million for the Malcolm Baldrige Performance Excellence Program to expand e-learning.

The FY2021 request would provide $25.3 million for the ITS account, down $136.7 million (84.4%) from the FY2020 enacted level. Within the ITS account, the request would provide no funding for the Manufacturing Extension Partnership (MEP) program, a reduction of $146.0 million from the FY2020 enacted level; MEP centers in each state would be required to become entirely self-supporting. In his FY2019 and FY2020 requests, President Trump also proposed ending federal funding for MEP; in his FY2018 request, the President sought $6.0 million "for an orderly shutdown of the program." The FY2021 request for ITS consists of $25.3 million for Manufacturing USA (also referred to as the National Network for Manufacturing Innovation or NNMI), $9.3 million (58.1%) higher than the FY2020 enacted level of $16.0 million. Of these funds, $11.2 million would be for continued support of NIST's first Manufacturing USA institute, the National Institute for Innovation in Manufacturing Biopharmaceuticals (NIIMBL); $9.1 million would be for the award of a second Manufacturing USA institute; and $5.0 million would be for coordination of the Manufacturing USA network.[85]

For the ITS account, the House-passed bill would provide $153.0 million for the MEP program, $7.0 million (4.8%) more than the FY2020 level and $153.0 million more than the request. The bill would also provide $17 million for Manufacturing USA, $1.0 million (6.3%) more than the FY2020 level and $8.3 million (32.8%) less than the request.

H.Rept. 116-455 rejected the proposed elimination of the MEP program, instead recommending a $7.0 million increase, in part to increase cybersecurity technical training for small manufacturers.

The President is requesting $60.2 million for the NIST CRF account for FY2021, down $57.8 million (49.0%) from the FY2020 enacted level.[86] Part of the decrease ($36.5 million) in requested FY2021 funding is due to a proposed deferral of safety, capacity, maintenance, and major repairs projects from FY2021 to FY2022. The balance of the decrease would result from the effect of the Administration's proposed new funding approach on the renovation of NIST Building 1, in Boulder, CO.[87]

The House-passed bill would provide $85.0 million for the CRF account, $33.0 million (28.0%) less than the FY2020 level and $24.8 million (41.2%) more than the request.

H.Rept. 116-455 recommended an $85 million increase for CRF, $75 million of which to be used to address the agency's most pressing safety, capacity, maintenance, and major repair projects.

Congress also provided $6 million in R&D funding under the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136) for the NIST STRS account for the conduct of research and measurement science to support testing and treatment of coronavirus. The act also

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[85] Ibid., p. NIST-87.

[86] Ibid., p. NIST-5.

[87] Ibid., p. NIST-4. According to NIST,

> The FY 2021 budget request proposes: (1) to create a Federal Capital Revolving Fund (FCRF) to fund large-dollar, federally-owned, civilian real property capital projects; and (2) to provide specific budget enforcement rules for the FCRF that would allow it to function, in effect, like State and local government capital budgets. The FCRF will be housed in the General Services Administration (GSA). This proposal incorporates principles that are central to the success of capital budgeting at the State and local level: a limit on total funding for capital investment, annual decisions on the allocation of funding for capital projects and spreading the acquisition cost over 15 years in the discretionary operating budgets of agencies that purchase the assets. The FY 2021 budget request proposes to use the FCRF to fund the completion of the $294 million renovation of NIST Building One in Boulder, Colorado. In accordance with the principles and design of the FCRF, the FY 2021 budget requests appropriations language designating the renovation as a project to be funded out of the FCRF along with 1/15 of the renovation costs, or $19.6 million, for the first-year repayment back to the FCRF.

provided $70 million in funding for the ITS account of which $60 million was for the MEP program and $10 million for the NIST Manufacturing USA institute, NIIMBL.

Table 14. National Institute of Standards and Technology Funding

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Scientific and Technical Research and Services	754.0	652.0	789.0		
Industrial Technology Services	162.0	25.3	170.0		
Manufacturing Extension Partnership	*146.0*	*0*	*153.0*		
Manufacturing USA / National Network for Manufacturing Innovation	*16.0*	*25.3*	*17.0*		
Construction of Research Facilities	118.0	60.2	85.0		
NIST, Total[a]	1,034.0	737.5	1,044.0		
CARES Act (P.L. 116-136)	76.0				

Source: U.S. Department of Commerce, National Institute of Standards and Technology, National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2021 Budget Submission to Congress, February 2020, https://www.commerce.gov/sites/default/files/2020-02/fy2021_nist_ntis_congressional_budget_justification.pdf; H.R. 7617; and H.Rept. 116-455.

Notes: Figures for the columns headed "FY2021 Senate" and "FY2021 Enacted" will be added, if available, as action is completed.

a. The NIST FY2021 budget justification notes, "The NIST Public Safety Communications Research Fund will continue to obligate funds over several fiscal years (through FY 2022)." These funds (not included in the table) were provided to help develop wireless technologies for public safety users, as part of the National Wireless Initiative included in the Middle Class Tax Relief and Job Creation Act of 2012 (P.L. 112-96). The act provided mandatory funds for NIST from spectrum auction proceeds to help industry and public safety organizations conduct research and develop new standards, technologies, and applications to advance public safety communications in support of the initiative's efforts to build an interoperable nationwide broadband network for first responders. The act provided NIST a total of $300 million, though rescissions reduced this amount to $285 million. Currently, the Wireless Innovation (WIN) Fund has $158.5 million in total resources, with $66.1 million anticipated for obligation in FY2020 and $92.4 million to be apportioned for subsequent years.

National Oceanic and Atmospheric Administration[88]

The National Oceanic and Atmospheric Administration (NOAA) conducts scientific research in areas such as ecosystems, atmosphere, global climate change, weather, and oceans; collects and provides data on the oceans and atmosphere; and manages coastal and marine organisms and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[89] The reorganization was intended to unify elements of the nation's environmental programs and to provide a systematic approach for monitoring, analyzing, and protecting the environment.

NOAA's administrative structure is organized into six line offices: the National Ocean Service (NOS); National Marine Fisheries Service (NMFS); National Environmental Satellite, Data, and Information Service (NESDIS); National Weather Service (NWS); Office of Oceanic and Atmospheric Research (OAR); and the Office of Marine and Aviation Operations (OMAO). The

[88] This section was written by Eva Lipiec, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

[89] "Reorganization Plan No. 4 of 1970," 35 *Federal Register* 15627-15630, October 6, 1970.

line offices are supported by an additional office, Mission Support, which provides cross-cutting administrative functions related to education, planning, information technology, human resources, and infrastructure. Congress provides most of the discretionary funding for the line offices and Mission Support through two accounts: (1) Operations, Research, and Facilities, and (2) Procurement, Acquisition, and Construction.

In 2010, NOAA published its *Next Generation Strategic Plan*.[90] The strategic plan is organized into four categories of long-term goals: (1) climate adaptation and mitigation, (2) a weather-ready nation, (3) healthy oceans, and (4) resilient coastal communities and economies.[91] The strategic plan also lists three groups of enterprise objectives related to (1) stakeholder engagement, (2) data and observations, and (3) integrated environmental modeling.[92] The strategic plan serves as a guide for NOAA's R&D plan. The most recent R&D plan was published in June 2020, and identifies R&D priorities within three vision areas: (1) reducing societal impacts from hazardous weather and other environmental phenomena, (2) sustainable use and stewardship of ocean and coastal resources, and (3) a robust and effective research, development, and transition enterprise.[93]

For FY2021, President Trump requested $670.3 million in direct obligations for NOAA R&D funding, $301.6 million (31.0%) below the FY2020 enacted level of $972.0 million.[94] According to Congress, direct obligations include annual appropriations, transfers, and recoveries from prior year obligations.[95] The President's budget request and NOAA's estimate of R&D funding amounts in the House-passed bill include discretionary direct obligations and a relatively small amount of mandatory direct obligations.[96] The FY2021 House-passed amount of $1.025 billion for NOAA R&D is $52.7 million (5.4%) above the FY2020 enacted amount and $354.3 million (52.9%) above the FY2021 request.[97] The President's FY2021 request for NOAA R&D was 13.8% of the total FY2021 NOAA requested direct obligations of $4.86 billion.[98] The House-passed amount for NOAA R&D is 17.8% of the total FY2021 amount of $5.7 billion.

The FY2021 request includes $378.6 million for research (56.5% of the total requested for NOAA R&D), $94.9 million for development (14.1%), and $197.0 million (29.4%) for R&D equipment and facilities.[99] The FY2021 House-passed bill would provide $621.5 million for research (60.7%

[90] National Oceanic and Atmospheric Administration (NOAA), *NOAA's Next-Generation Strategic Plan*, Silver Spring, MD, December 2010, at https://www.performance.noaa.gov/wp-content/uploads/NOAA_NGSP.pdf.

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

[92] NOAA defines the enterprise objectives as "cross-cutting requirements for addressing NOAA's strategic goals as a whole." NOAA, *NOAA's Next-Generation Strategic Plan*, Silver Spring, MD, December 2010, p. 32.

[93] NOAA, *NOAA Research and Development Vision Areas: 2020-2026*,June 2020, at https://nrc.noaa.gov/LinkClick.aspx?fileticket=z4iHSl3P4KY%3d&portalid=0.

[94] Email correspondence with the NOAA Budget Office, February 28, 2020.

[95] As used in H.R. 7617. For further descriptions of what types of obligations are direct versus reimbursable, see Office of Management and Budget, *Circular No. A-11, Preparation, Submission, and Execution of the Budget*, July 2020, p. 3 of Section 83, at https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf.

[96] R&D funding amounts in the House-passed bill are estimated by NOAA because the House-passed bill and accompanying committee report do not provide a breakout of R&D funding and only include discretionary direct obligations. Telephone conversation with NOAA Budget Office, September 3, 2020.

[97] Email correspondence with the NOAA Budget Office, February 28, 2020, and August 21, 2020.

[98] NOAA, *Budget Estimates Fiscal Year 2021*, 2020, at https://www.noaa.gov/sites/default/files/atoms/files/fy2021_noaa_congressional_budget_justification.pdf, p. 54. Hereinafter referred to as NOAA, *Budget Estimates Fiscal Year 2021*.

[99] Email correspondence with the NOAA Budget Office, February 28, 2020.

of the total R&D amount), $153.2 million for development (15.0%), and $249.9 million for equipment and facilities (24.4%).[100] **Table 15** provides R&D amounts enacted in FY2020, requested by the Administration for FY2021, and included in the House-passed bill for FY2021.

OAR accounts for the majority of NOAA R&D in most years, including FY2021. The Administration requested $352.7 million for OAR R&D in FY2021, which is $199.9 million (36.2%) below the FY2020 enacted funding level of $552.6 million. The FY2021 House-passed amount of $590.2 million is $37.6 million (6.8%) above the FY2020 enacted amount and $237.5 million (67.3%) above the FY2021 request.[101] OAR conducts research in three major areas: (1) weather and air chemistry; (2) climate; and (3) oceans, coasts, and the Great Lakes. A significant portion of these efforts is implemented through OAR's laboratories and cooperative research institutes. The President requested $167.6 million for OAR labs and cooperative institutes in FY2021, $16.5 million (8.9%) less than the FY2020 enacted amount of $184.0 million. The FY2021 House-passed amount of $204.0 million is $20 million (10.9%) above the FY2020 enacted amount and $36.5 million (21.8%) above the FY2021 request.[102]

Among other R&D activities, the Administration's FY2021 request would terminate federal support of the National Sea Grant College Program and its related Marine Aquaculture Research program in FY2021, as the Administration had requested in FY2020.[103] The National Sea Grant College Program is composed of 33 university-based state programs and supports scientific research and stakeholder engagement to identify and solve problems faced by coastal communities. In FY2020, Congress provided $74 million to the National Sea Grant College Program and $13 million to the Marine Aquaculture Research program.[104] The FY2021 House-passed bill would provide $71 million to the National Sea Grant College Program and $13 million to the Marine Aquaculture Research program.[105]

[100] Email correspondence with the NOAA Budget Office, August 21, 2020.

[101] Email correspondence with the NOAA Budget Office, February 28, 2020, and August 21, 2020.

[102] NOAA, Budget Estimates Fiscal Year 2021 and U.S. Congress, House Committee on Appropriations, Report together with Minority Views, To accompany H.R. 7667, 116th Cong., 2nd sess., July 16, 2020, H.Rept. 116-455, pp. 38-39. H.Rept. 116-455 is referred to in Division B of H.R. 7617 as passed by the House.

[103] NOAA, *Budget Estimates Fiscal Year 2021* and H.Rept. 116-455.

[104] "Explanatory Statement Submitted by Mrs. Lowey, Chairwoman of the House Committee on Appropriations Regarding H.R. 1158, Consolidated Appropriations Act, 2020," *Congressional Record*, vol. 165, no. 204, part II (December 17, 2019), p. 351.

[105] H.Rept. 116-455.

Table 15. National Oceanic and Atmospheric Administration R&D

(direct obligations, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
National Ocean Service (NOS)	105.4	49.5	116.4		
National Marine Fisheries Service (NMFS)	68.8	57.2	68.0		
National Weather Service (NWS)	19.5	17.4	18.7		
National Environmental Satellite, Data, and Information Service (NESDIS)	28.4	27.9	28.9		
Office of Marine and Aviation Operations (OMAO)[a]	175.2	165.7	202.5		
Office of Oceanic and Atmospheric Research (OAR)	552.6	352.7	590.2		
Mission Support	22.0	0	0		
Total R&D	**972.0**	**670.3**	**1,024.6**		
NOAA, Total R&D and Non-R&D	5,565.5	4,857.1	5,745.3		

Sources: "Explanatory Statement Submitted by Mrs. Lowey, Chairwoman of the House Committee on Appropriations Regarding H.R. 1158, Consolidated Appropriations Act, 2020," *Congressional Record*, vol. 165, no. 204, part II (December 17, 2019), p. 365; email correspondence with the NOAA Budget Office, February 28, 2020; NOAA, Budget Estimates Fiscal Year 2021, 2020, https://www.noaa.gov/sites/default/files/atoms/files/fy2021_noaa_congressional_budget_justification.pdf, p. 55; email correspondence with the NOAA Budget Office, August 21, 2020, and U.S. Congress, House Committee on Appropriations, *Report together with Minority Views*, To accompany H.R. 7667, 116th Cong., 2nd sess., July 16, 2020, H. Rept. 116-455, p. 180.

Notes: Direct obligations include annual appropriations, transfers, and recoveries from prior year obligations. Congress and NOAA use several different budgetary terms, such as direct obligations, budget authority, and appropriations. For more information, see CRS In Focus IF11518, National Oceanic and Atmospheric Administration (NOAA) FY2021 Budget Request and Appropriations, by Eva Lipiec.

The President's budget request and NOAA's estimate of R&D funding amounts in the House-passed bill include discretionary direct obligations and a relatively small amount of mandatory direct obligations. The House-passed bill and accompanying committee report do not breakout R&D funding and only include discretionary direct obligations. For example, the House-passed bill does not include mandatory direct obligations of approximately $13.0 million (comprised of the Saltonstall-Kennedy (S-K) grant program and Gulf Coast Ecosystem Restoration Science, Observation, Monitoring and Technology Fund).

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

The Senate-passed amounts and the FY2021 enacted amount columns will be updated when the information becomes available.

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

Department of Veterans Affairs[106]

The Department of Veterans Affairs operates and maintains a national health care delivery system to provide eligible veterans with medical care, benefits, and social support. As part of the

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

agency's mission, it seeks to advance medical R&D in areas most relevant to the diseases and conditions that affect the health care needs of veterans.[107]

The President is proposing $1.456 billion for VA R&D in FY2021, an increase of $58 million (4%) from FY2020 enacted levels. (See **Table 16**.) According to the President's request, FY2021 strategic priorities for VA R&D include increasing the access of veterans to clinical trials; increasing the transfer and translation of VA R&D; and the effective use of VA data for veterans. Additionally, crosscutting priorities for VA R&D include efforts to treat veterans at risk of suicide and research to address chronic pain and opioid addiction, posttraumatic stress disorder, traumatic brain injury, precision oncology, and Gulf War illness and military exposures.[108]

VA R&D is funded through two accounts—the Medical and Prosthetic Research account and the Medical Care Support account. The Medical Care Support account also includes non-R&D funding, and the amount of funding that will be allocated to support R&D through appropriations legislation is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels from the Medical Care Support account are only known after the VA allocates its appropriations to specific activities and reports those figures.

The FY2021 request includes $787 million for VA's Medical and Prosthetic Research account, a decrease of $37 million (5%) compared to FY2020 enacted levels. The request includes $669 million in funding for research supported by the agency's Medical Care Support account, an increase of $21 million (3%) compared to FY2020. The Medical Care Support account provides administrative and other support for VA researchers and R&D projects, including infrastructure maintenance.

The Medical and Prosthetics R&D program is an intramural program managed by the Veteran Health Administration's Office of Research and Development (ORD) and conducted at VA Medical Centers and VA-approved sites nationwide. According to ORD, the mission of VA R&D is "to improve Veterans' health and well-being via basic, translational, clinical, health services, and rehabilitative research and to apply scientific knowledge to develop effective individualized care solutions for Veterans."[109] ORD consists of four main research services, each headed by a director:

- Biomedical Laboratory R&D conducts preclinical research to understand life processes at the molecular, genomic, and physiological levels.
- Clinical Science R&D supports clinical trials and other human subjects research to determine the feasibility and effectiveness of new treatments such as drugs, therapies, or devices; compare existing therapies; and improve clinical care and practice.
- Health Services R&D conducts studies to identify and promote effective and efficient strategies to improve the quality and accessibility of the VA health system and patient outcomes, and to minimize health care costs.
- Rehabilitation R&D conducts research and develops novel approaches to improving the quality of life of impaired and disabled veterans.

[107] Department of Veterans Affairs, *FY2018 – 2024 Strategic Plan*, May, 31, 2019, p. 5, https://www.va.gov/oei/docs/VA2018-2024strategicPlan.pdf.

[108] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2021*, p. VHA-426.

[109] Department of Veterans Affairs, "Office of Research and Development," https://www.research.va.gov/about/default.cfm.

In addition to intramural support, VA researchers are eligible to obtain funding for their research from extramural sources, including other federal agencies, private foundations and health organizations, and commercial entities. According to the President's FY2021 budget request, these additional R&D resources are estimated at $540 million in FY2021. However, unlike other federal agencies, such as the National Institutes of Health and the Department of Defense, VA does not have the authority to support extramural R&D by providing research grants to colleges, universities, or other non-VA entities.

On July 24, 2020, the House passed the State, Foreign Operations, Agriculture, Rural Development, Interior, Environment, Military Construction, and Veterans Affairs Appropriations Act, 2021 (H.R. 7608). Division D would provide $840 million for the Medical and Prosthetic Research account, an increase of $90 million (12%) above the FY2020 enacted level and $53 million (7%) above the request.

Table 16 summarizes R&D program funding for VA in the Medical and Prosthetic Research and the Medical Care Support accounts. **Table 17** details amounts to be spent in Designated Research Areas (DRAs), which VA describes as "areas of importance to our veteran patient population."[110] Funding for research projects that span multiple areas may be included in several DRAs; thus, the amounts in **Table 17** total to more than the appropriation or request for VA R&D.

Table 16. Department of Veterans Affairs R&D

(budget authority, in millions of dollars)

Account	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Medical and Prosthetic Research	750.0[a]	787.0	840.0		
Medical Care Support	647.7	669.0	[b]		
Veterans Affairs, Total R&D	**1,397.7**	**1,456.0**	[b]		

Source: Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2021*, p. VHA-425, https://www.va.gov/budget/docs/summary/fy2021VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns headed "FY2021 House," "FY2021 Senate," and "FY2021 Enacted" will be added, if available, as each action is completed. VA researchers also receive grants from other federal and non-federal resources, including the National Institutes of Health, the Department of Defense, and the Centers for Disease Control and Prevention; these resources are estimated at $540 million in FY2020 and $540 million in FY2021. Additionally, the VA estimates reimbursements associated with agency R&D at $55 million in FY2020 and $55 million in FY2021, increasing the total amount of R&D performed at VA to $1.99 billion in FY2020 and $2.05 billion in the FY2021 request.

a. The Further Consolidated Appropriations Act, 2020 (P.L. 116-94) included a rescission of $50 million from the Medical and Prosthetic Research account; the enacted amount was $800 million.

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

[110] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2021*, p. VHA-460.

Table 17. Department of Veterans Affairs R&D by Designated Research Area

(in millions of dollars)

Designated Research Area	FY2020 Estimate	FY2021 Request
Acute and Traumatic Injury	30.4	30.4
Aging	150.3	150.3
Autoimmune, Allergic, and Hematopoietic Disorders	35.3	35.3
Cancer	64.7	64.7
Central Nervous System Injury and Associated Disorders	110.8	110.8
Degenerative Diseases of Bones and Joints	41.8	41.8
Dementia and Neuronal Degeneration	36.8	36.8
Diabetes and Major Complications	48.8	48.8
Digestive Diseases	25.1	25.1
Emerging Pathogens/Bio-Terrorism	1.9	1.9
Gulf War Veterans Illness	16.0	16.0
Health Systems	69.0	69.0
Heart Disease/Cardiovascular Health	73.2	73.2
Infectious Disease	34.0	34.0
Kidney Disorders	19.3	19.3
Lung Disorders	27.4	27.4
Mental Illness	116.9	116.9
Military Occupations and Environmental Exposures	23.2	23.2
Other Chronic Diseases	5.3	5.3
Prosthetics	24.1	24.1
Sensory Loss	20.5	20.5
Special Populations	30.7	30.7
Substance Abuse	32.0	32.0

Source: Department of Veterans Affairs, Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2021, p. VHA-460, https://www.va.gov/budget/docs/summary/fy2021VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Notes: Projects that span multiple areas may be included in several Designated Research Areas (DRAs); therefore, the amounts depicted in this table total to more than the FY2020 amount and the FY2021 request for Medical and Prosthetic Research. Columns for "FY2021 House," "FY2021 Senate," and "FY2021 Enacted" are not included in this table as these figures will only be available after Congress completes the appropriations process and VA determines how much of the appropriated funds will be allocated to each DRA.

Department of Transportation[111]

The Department of Transportation was established by the Department of Transportation Act (P.L. 89-670) on October 15, 1966. The primary purposes of DOT research and development activities as defined by Section 6019 of the Fixing America's Surface Transportation Act (P.L. 114-94) are improving mobility of people and goods; reducing congestion; promoting safety; improving the durability and extending the life of transportation infrastructure; preserving the environment; and preserving the existing transportation system.

Funding for DOT R&D is generally included in appropriations line items that also include non-R&D activities. The amount of funding provided by appropriations legislation that is allocated to R&D is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOT agencies allocate their final appropriations to specific activities and report those figures.

In FY2021, the Administration is requesting a total of $593.8 million for DOT R&D activities and facilities at the Federal Aviation Administration (FAA), the National Highway Traffic Safety Administration (NHTSA), the Federal Railroad Administration (FRA), the Pipeline and Hazardous Materials Safety Administration (PHMSA), and the Office of the Secretary (OST) (see **Table 18**). The Administration is not requesting funding for DOT R&D activities and facilities associated with the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), or the Federal Motor Carrier Safety Administration (FMCSA), citing the need for surface transportation reauthorization legislation.[112] In FY2020, three DOT agencies—FAA, NHTSA, and FHWA—accounted for nearly 90% of DOT R&D funding.

Federal Aviation Administration

The President's FY2021 request of $446.9 million for R&D activities and facilities at FAA would be a decrease of $86 million (16.1%) from the FY2020 enacted amount. The request includes $170 million for the agency's Research, Engineering, and Development (RE&D) account, a reduction of $22.7 million (11.8%) from FY2020. Funding within the RE&D account seeks to improve aircraft safety through research in fields such as fire safety, advanced materials, propulsion systems, aircraft icing, and continued airworthiness, in addition to safety research related to unmanned aircraft systems and the integration of commercial space operations into the national airspace.

On July 31, 2020, the House passed the Defense, Commerce, Justice, Science, Energy and Water Development, Financial Services and General Government, Labor, Health and Human Services, Education, Transportation, Housing, and Urban Development Appropriations Act, 2021(H.R. 7617). Division F would provide $192.7 million for FAA's RE&D account, the same as the FY2020 enacted level and $22.7 million above the request.

National Highway Traffic Safety Administration

The President is requesting $62.9 million in R&D and R&D facilities funding in FY2021 for NHTSA, $15.0 million (19.3%) below FY2020. NHTSA R&D focuses on automation and the study of human machine interfaces, advanced vehicle safety technology, ways of improving

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

[112] U.S. Department of Transportation, *Fiscal Year 2021 Budget Estimates*, https://www.transportation.gov/mission/budget/fiscal-year-2021-budget-estimates.

vehicle crashworthiness and crash avoidance, reducing unsafe driving behaviors, and alternative fuels vehicle safety.

Other DOT Components

R&D activities are also supported by several other DOT components or agencies (see **Table 18**). The President's FY2021 request includes DOT R&D activities and facilities funding for:

- the Federal Railroad Administration, totaling $41.0 million, $0.4 million (1.0%) above the FY2020 enacted level of $40.6 million;
- the Pipeline and Hazardous Materials Safety Administration, totaling $24.5 million, the same amount as FY2020; and
- the Office of the Secretary, totaling $18.4 million, $8.5 million (31.7%) below the FY2020 level of $27.0 million.

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

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Federal Aviation Administration	532.9	446.9	b		
Research, Engineering, and Development	*192.7*	*170.0*	*192.7*		
Federal Highway Administration	383.0	a	b		
Highway Research and Development	*113.3*	a	b		
Intelligent Transportation Systems	*90.6*	a	b		
National Highway Traffic Safety Administration	78.0	62.9	b		
Federal Railroad Administration	40.6	41.0	41.0		
Federal Transit Administration	36.5	a	b		
Pipeline and Hazardous Materials Safety Administration	24.5	24.5	b		
Office of the Secretary	27.0	18.4	19.8		
Federal Motor Carrier Safety Administration	9.1	a	b		
DOT, R&D Total	**$1,131.4**	**$593.8**a	b		

Sources: U.S. Department of Transportation, *Fiscal Year 2021 Budget Estimates*, https://www.transportation.gov/mission/budget/fiscal-year-2021-budget-estimates.

Notes: Amounts include R&D and R&D facilities. Components may not add to total due to rounding. Lines in italics are components of the agency lines above them and are not counted separately in the total. Figures for the columns headed "FY2021 House," "FY2021 Senate," and "FY2021 Enacted" will be added, if available, as each action is completed.

a. The President's FY2021 budget request does not request funding for R&D activities and facilities associated with the Federal Highway Administration, the Federal Transit Administration, or the Federal Motor Carrier Safety Administration, citing the need for surface transportation reauthorization legislation. Therefore, the "DOT, R&D Total" does not include any requested funding for those agencies.

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

Department of the Interior[113]

The Department of the Interior (DOI) was created to conserve and manage the nation's natural resources and cultural heritage, to provide scientific and other information about those resources, and to uphold "the nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper." DOI has a wide range of responsibilities, including, among other things, mapping, geological, hydrological, and biological science; migratory bird, wildlife, and endangered species conservation; surface-mined lands protection and restoration; and historic preservation.[114] The Administration is requesting $12.8 billion in net discretionary funding for DOI in FY2021.[115] Of that amount, $725 million is proposed for R&D, $248 million (25%) below the FY2020 estimated level of $973 million.[116] The Administration is proposing that the U.S. Geological Survey (USGS) be the only DOI component that conducts basic research.[117]

Funding for DOI R&D is generally included in appropriations line items that also include non-R&D activities. How much of the funding provided in appropriations legislation is allocated to R&D specifically is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOI components allocate their appropriations to specific activities and report those figures.

On July 24, the House passed H.R. 7608, the State, Foreign Operations, Agriculture, Rural Development, Interior, Environment, Military Construction, and Veterans Affairs Appropriations Act, 2021. H.R. 7608 is a consolidated bill that incorporates the Department of the Interior, Environment, and Related Appropriations Act as Division C. Division C would provide funding for DOI R&D.

U.S. Geological Survey

The USGS accounts for approximately two-thirds of all DOI R&D funding. A single appropriations account, Surveys, Investigations, and Research (SIR), provides all USGS funding. USGS R&D is conducted under seven SIR activity/program areas: Ecosystems; Land Resources; Energy, Minerals, and Environmental Health; Natural Hazards; Water Resources; Core Science Systems; and Science Support.

The President's total FY2021 budget request for USGS is $971 million, down $300 million (24%) from $1.271 billion in FY2020. Of the proposed FY2021 total, $725 million would be for R&D, a decrease of $248 million (25%) from the FY2020 estimated level of $973 million.[114]

As passed by the House, H.R. 7608 would provide $1.295 billion for USGS, $324 million (33%) more than the FY2020 requested amount and $24 million (2%) more than the FY2020 enacted amount. This amount includes both R&D and non-R&D funding.

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

[114] Department of the Interior, *Strategic Plan for Fiscal Years 2018-2022* and *Strategic Plan for Fiscal Years 2014-2018*, available at https://www.doi.gov/performance/strategic-planning.

[115] Department of the Interior, *Fiscal Year 2021: The Interior Budget in Brief*, February 10, 2020, p. DH-5.

[116] Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development*, February 10, 2020, p. 234, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

[117] Email correspondence between the DOI and CRS, April 11, 2019.

Other DOI Components

The President's FY2021 request also includes R&D funding for the following DOI components, none of which would receive an increase:[118]

- Bureau of Reclamation (BOR): $76 million for FY2021, down $39 million (34%) from the FY2020 estimate.
- Bureau of Ocean Energy Management (BOEM): $93 million for FY2021, down $7 million (7%) from the FY2020 estimate.
- Fish and Wildlife Service (FWS): $15 million for FY2021, equal to the FY2020 estimate.
- National Park Service (NPS): $26 million for FY2021, equal to the FY2020 estimate.
- Bureau of Safety and Environmental Enforcement (BSEE): $25 million for FY2021, down $2 million (7%) from the FY2020 estimate.
- Bureau of Land Management (BLM): $21 million for FY2021, equal to the FY2020 estimate.
- Bureau of Indian Affairs (BIA): $5 million for FY2021, equal to the FY2020 estimate.
- Wildland Fire Management (WFM): No funding requested for R&D for FY2021.[119]
- Office of Surface Mining Reclamation and Enforcement (OSMRE): $1 million for FY2021, equal to the FY2020 estimate.

Table 19 summarizes FY2020 estimated R&D funding and the President's FY2021 R&D funding request for DOI components.

[118] Office of Management and Budget, *Analytical Perspectives*, p. 234. In addition to these components, the OMB lists a request of $3 million for "Department-Wide Programs," which is equal to the FY2020 estimate.

[119] The FY2021 budget request for the Wildland Fire Management Program is $1.0 billion (non-R&D funding), an increase of $51 million over the FY2020 enacted amount.

Table 19. Department of the Interior R&D

(budget authority, in millions of dollars)

	FY2020 Estimate	FY2021 Request	FY2020 House	FY2020 Senate	FY2020 Enacted
U.S. Geological Survey (USGS)	660	460	n/s		
Bureau of Reclamation (BOR)	115	76	n/s		
Bureau of Ocean Energy Management (BOEM)	100	93	n/s		
Fish and Wildlife Service (FWS)	15	15	n/s		
National Park Service (NPS)	26	26	n/s		
Bureau of Safety and Environmental Enforcement (BSEE)	27	25	n/s		
Bureau of Land Management (BLM)	21	21	n/s		
Bureau of Indian Affairs (BIA)	5	5	n/s		
Wildland Fire Management (WFM)	0	0	n/s		
Office of Surface Mining Reclamation and Enforcement (OSMRE)	1	1	n/s		
Department of the Interior, R&D Total	**973**	**725**	n/s		

Source: Office of Management and Budget, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, p. 234.

Notes: Totals may differ from the sum of the components due to rounding. Additionally, the OMB lists a request of $3 million for DOI "Department-Wide Programs," which is equal to the FY2020 estimate, and not listed in this table. Figures for the column headed "FY2021 House," "FY2021 Senate," and "FY2020 Enacted" will be added, if available, as the action is completed. n/s = not specified.

Department of Homeland Security[120]

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

The President's FY2021 budget request for DHS includes $439 million for activities identified as R&D. This would be a reduction of 19.6% from $546 million in FY2020. The total includes $340 million for the R&D account in the S&T Directorate and smaller amounts for four other DHS components. See **Table 20**.

The S&T Directorate 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

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

other technology-related activities in support of acquisitions by other DHS components. The Administration's FY2021 request of $340 million for the S&T Directorate R&D account would be a decrease of 19.5% from $422 million in FY2020. Five of the six thrust areas in the S&T Directorate's Research, Development, and Innovation budget line would decrease, by amounts ranging from 18.3% (Cyber Security/Information Analysis) to 32.4% (Chemical, Biological, and Explosives Defense), while funding for the sixth thrust area, Innovative Research and Foundational Tools, would increase by 35.2%. Funding for university centers of excellence would decrease from $37 million in FY2020 to $18 million in FY2021 (Congress rejected a similar proposal in the FY2020 budget).

In addition to its R&D account, the S&T Directorate receives funding for laboratory facilities and other R&D-related expenses through two other accounts (not shown in the table). The total request for the directorate is $644 million, a decrease of 12.7% from $737 million in FY2020. The directorate's Procurement, Construction, and Improvements account would receive $19 million in the Administration's request (versus zero in FY2020) for closure of the Plum Island Animal Disease Center—which is being replaced by the National Bio and Agro-Defense Facility (NBAF)—and for preparation of Plum Island itself for sale.[121]

The request for R&D in the Countering Weapons of Mass Destruction Office is $58 million, down from $69 million in FY2019. No funding is requested for the National Technical Nuclear Forensics program ($7 million in FY2020), which the Administration is proposing to transfer to the DOE National Nuclear Security Administration.

Table 20. Department of Homeland Security R&D Accounts

(budget authority, in millions of dollars)

	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Science and Technology Directorate	422	340			
Countering Weapons of Mass Destruction Office	69	58			
Transportation Security Administration	23	30			
U.S. Coast Guard	5	5			
Cybersecurity and Infrastructure Security Agency	14	6			
U.S. Secret Service	12	—[a]			
Total, DHS R&D	**546**	**439**			

Sources: FY2020 enacted from P.L. 116-93. FY2021 request from DHS congressional budget justification, https://www.dhs.gov/publication/congressional-budget-justification-fy-2021.

Notes: Table includes accounts titled "Research and Development" in each DHS component. Some other accounts may also fund R&D-related activities. Some amounts may not add to totals due to rounding. Columns currently blank will be added as Congress acts.

a. The FY2021 budget proposes to transfer the Secret Service from DHS to the Department of the Treasury.

[121] The S&T Directorate is building NBAF using previously appropriated funds and will transfer it to the USDA once it becomes operational.

Environmental Protection Agency[122]

The U.S. Environmental Protection Agency (EPA), the federal regulatory agency responsible for administering a number of environmental pollution control laws, funds a broad range of R&D activities to provide scientific tools and knowledge that support decisions relating to preventing, regulating, and abating environmental pollution. Since FY2006, Congress has funded EPA through the Interior, Environment, and Related Agencies appropriations acts.

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

The agency's Science and Technology (S&T) appropriations account[123] funds much of EPA's scientific research activities, which include R&D conducted by the agency at its own laboratories and facilities, and R&D and related scientific research conducted by universities, foundations, and other nonfederal entities that receive EPA grants. The S&T account receives a base appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account for research on more effective methods for remediating contaminated sites.[124]

EPA's Office of Research and Development (ORD) is the primary manager of R&D at EPA headquarters and laboratories around the country, as well as EPA supported R&D external to the agency. A large portion of the S&T account funds EPA R&D activities managed by ORD, including research grants. Programs implemented by other offices within EPA also may have a research component, but the research component is not necessarily the primary focus of the program. EPA's ORD restructuring and reorganization strategies adopted September 30, 2019,[125] impacting certain aspects of ORD's organization and the operations, including the EPA Office of the Science Advisor (OSA), as well as current EPA laboratories, were of interest to some Members of Congress.

As passed July 24, 2020, Division C of H.R. 7608 includes the Department of the Interior, Environment, and Related Agencies Appropriations Act, 2021. Titles II and V in Division C of H.R. 7608 would provide a total of $22.88 billion for EPA (after rescissions); $9.38 billion in Title II, and $13.5 billion designated as emergency funding in Title V, "Additional Infrastructure Investments." Division C of H.R. 7608 incorporates H.R. 7612 (H.Rept. 116-448), the Interior,

[122] This section was written by Robert Esworthy, Specialist in Environmental Policy, CRS Resources, Science, and Industry Division. For an overview of the EPA FY2021 appropriations, President's FY2021 budget request and FY2020 enacted appropriations for EPA, see CRS In Focus IF11563, *U.S. Environmental Protection Agency FY2021 Appropriations*, by Robert Esworthy and David M. Bearden, and CRS In Focus IF11276, *U.S. EPA FY2020 Appropriations*, by Robert Esworthy.

[123] In 1995, Congress established eight statutory accounts for EPA, including the S&T account. The 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. Currently, including the S&T account, discretionary funding is annually appropriated to EPA among 10 statutory accounts established by Congress over time in annual appropriations acts. Because of the differences in the scope of the activities included in these accounts, comparisons before and after FY1996 are not readily available.

[124] See footnote 39 for more information on Superfund.

[125] See U.S. EPA, "About the Office of Research and Development (ORD)," https://www.epa.gov/aboutepa/about-office-research-and-development-ord, and "EPA's Office of Research and Development Reorganizes to Better Support EPA's Mission," April 8, 2019, press release, https://www.epa.gov/sciencematters/epas-office-research-and-development-reorganizes-better-support-epas-mission.

Environment and Related Agencies Appropriations Act, 2021 as reported July 14, 2020. EPA's total appropriation for FY2021 in Division C of H.R. 7608 would be $16.22 billion more than the President's FY2021 request of $6.66 billion for EPA (after rescissions[126]) and $13.51 billion more than the total $9.37 billion FY2020 enacted appropriations (no rescissions[127]). The FY2020 total includes funding provided in in the Further Consolidated Appropriations Act, FY2020 (P.L. 116-94, Division D, Title II), the United States-Mexico-Canada Agreement Implementation Act (P.L. 116-113, Title IX),[128] and the Coronavirus Aid, Relief, and Economic Security (CARES) Act (P.L. 116-136, Division B, Title VII).[129]

H.R. 7608 would not include the President's requested reductions and eliminations proposed for FY2021 distributed across various EPA operational functions and program activities as well as certain grants throughout EPA's accounts, including the S&T account.[130] Requested reductions in total EPA funding annually since FY2018 have not been adopted by Congress in annual appropriations.[131] Some Members of Congress expressed concerns regarding proposed reductions of funding for EPA scientific research programs during hearings on the President's FY2021 budget request.[132] Similar proposed reductions in the FY2020 budget request were generally not included in the FY2020 enacted appropriations.[133]

Including a transfer of $30.8 million from the EPA Superfund account, Title II in Division C of H.R. 7608 would provide $778.1 million for EPA's S&T account for FY2021.[134] No appropriations were included in Title V in Division C for the S&T account. The total for the S&T

[126] The President's FY2021 request proposed a $159.1 million "cancellation of funds" (rescission) for EPA across-the-board but did not specify a rescission within the S&T account.

[127] P.L. 116-94 did not include account-specific (including the S&T account) rescissions of unobligated balances for EPA for FY2020 as in FY2019 and prior recent fiscal years' enacted appropriations. For FY2019, Title II of Div. E, P.L. 116-6, rescinded $210.5 million of prior-year funds specifying proportional allocations from EPA's S&T account as well as the Environmental Programs and Management (EPM) and the State and Tribal Assistance Grants (STAG) accounts.

[128] An additional $304.0 million in FY2020 supplemental appropriations was provided for EPA in Title IX of P.L. 116-113 enacted January 29, 2020. The supplemental appropriations did not include any FY2020 funding for the S&T account.

[129] Title VII in Division B of P.L. 116-136 enacted March 27, 2020, provided a total of $7.23 million within four of EPA's 10 appropriations accounts including $2.25 million within the EPA S&T account. See CRS Insight IN11331, *U.S. Environmental Protection Agency Funding in the CARES Act (P.L. 116-136)*, by Robert Esworthy.

[130] Reductions proposed in the President's FY2021 request were distributed across EPA operational functions and activities as well as grants for states, tribes, and local governments. With the exception of the Building and Facilities account, the President's FY2021 request proposes funding reductions below FY2020 enacted levels for the nine other EPA appropriations accounts, although funding for some program areas within the accounts would remain constant or increase. U.S. EPA, *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriation, February 2020*, https://www.epa.gov/planandbudget/cj.

[131] See Figure 1 in CRS In Focus IF11276, *U.S. EPA FY2020 Appropriations*, by Robert Esworthy.

[132] House Committee on Appropriations, Subcommittee on Interior, Environment and Related Agencies, *U.S. Environmental Protection Agency Budget Request for FY2021*, hearing March 4, 2020, https://appropriations.house.gov/events/hearings/us-environmental-protection-agency-budget-request-for-fy2021; House Committee on Energy and Commerce, Subcommittee on Environment and Climate Change, *Hearing on "The Fiscal Year 2021 EPA Budget,"* hearing, February 27, 2020, https://energycommerce.house.gov/committee-activity/hearings/hearing-on-the-fiscal-year-2021-epa-budget.

[133] See the Explanatory Statement accompanying P.L. 116-94, published in *Congressional Record*, vol. 165, no. 204—Book III (December 17, 2019); see pp. H11281-11297; Funding Tables, pp. H11298-11360. https://www.govinfo.gov/content/pkg/CREC-2019-12-17/pdf/CREC-2019-12-17-house-bk3.pdf.

[134] An amendment adopted during the floor debate on H.R. 7608 increased the total of $776.1 million as reported and as proposed in H.R. 7612 for the S&T account by $2.0 million.

account including transfers from the Superfund account would be an increase of $274.3 million (54.4%) above the President's FY2021 budget request of $503.8 million for the account ($19.1 million transfer),[135] and $28.7 million (3.8%) more than the $749.4 million enacted level provided in P.L. 116-94 ($30.7 million transfer) and the CARES Act (P.L. 116-136) for the S&T account.[136]

Table 21 presents a comparison of the FY2021 appropriations proposed in H.R. 7608 to the President's FY2021 request and FY2020 enacted appropriations for program areas and activities within EPA's S&T account. As noted previously, Division C of H.R. 7608 as passed July 24, 2020, incorporated H.R. 7612 as reported July 14, 2020, that included appropriations for EPA. Funding amounts below the account level presented in **Table 21** are generally as reported in H.Rept. 116-448[137] accompanying H.R. 7612. In instances where H.Rept. 116-448 did not specify the funding levels for a program or activity, CRS referred to EPA's *FY2021 Congressional Budget Justification*, the Explanatory Statement accompanying P.L. 116-94,[138] and FY2020 appropriations included in the CARES Act (P.L. 116-136).

House and Senate Appropriations Committee reports and explanatory statements accompanying recent fiscal year EPA proposed and enacted appropriations have not specified funding for all subprogram areas reported in EPA's budget justifications. S&T subprogram areas not directly reported in House and Senate Appropriations Committee reports are noted in **Table 21** as "NR" (not reported). Additionally, the President's FY2018 through FY2021 budget requests and EPA's associated congressional budget justifications have modified the titles for some of the program areas relative to previous Administrations' budget requests and congressional committee reports' presentations. The House and Senate Appropriations Committees have generally adopted the modified program area titles as presented in the recent budget requests.

As shown in **Table 21**, with few exceptions funding included in H.R. 7608 for individual EPA program area and activity line items within the S&T account would generally be the same or and increase above the FY2021 requested and FY2020 enacted appropriations. The President's FY2021 request did not propose to completely eliminate funding for the broader S&T program areas; however, eliminations (i.e., no funding requested for FY2021) were proposed for line-item activities below the program areas as indicated in **Table 21**. These program areas included

- Atmospheric Protection Program (formerly GHG [greenhouse gas] Reporting Program and Climate Protection Program),
- Indoor Air Radon Program, and
- Reduce Risks from Indoor Air.

For other program areas, proposed reductions in funding included eliminations of certain activities within those program areas. For example, the proposed reduction in funding for Research: Air and Energy, Research: Safe and Sustainable Water Resources, Research: Sustainable and Healthy Communities, and Research: Chemical Safety and Sustainability

[135] U.S. EPA, *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriations*, February 2020; https://www.epa.gov/planandbudget/cj. See "Science and Technology" on pp. 63-164, 803-804, and "Eliminated Programs" on pp. 813-817.

[136] See footnote 129.

[137] "Any reference to a "report accompanying this Act" contained in division C of this act shall be treated as a reference to H.Rept. 116-448." (H.R. 7608, sec. 3(c)).

[138] See footnote 133.

program areas for FY2021[139] included the proposed elimination of funding for the Science to Achieve Results (STAR) program.[140]

H.R. 7608 would include $7.0 million for Research: National Priorities within the S&T account for FY2021 to fund competitive grants[141] for not-for-profit organizations that focus on "high-priority water quality and availability research." The proposed FY2021 amount would be an increase compared to the $6.0 million FY2020 enacted appropriations and $5.0 million included for FY2019. As in the previous Administration's fiscal year requests, the President's FY2021 budget request did not include funding for Research: National Priorities.[142]

In addition to clarifying certain FY2021 funding allocations within the EPA S&T account and consistent with the prior fiscal year appropriations, H.Rept. 116-448 accompanying H.R. 7612 as reported July 14, 2020, and incorporated in Division C of H.R. 7608, provides additional guidance for program areas and activities within the S&T account for FY2021.[143] Topics expressly referenced in H.Rept. 116-448 include

- Coronavirus Health Outcomes and Links to Pollution;
- Eliminating Air Emissions from Animal Operations;
- Harmful Algal Blooms;
- Maintaining Integrated Risk Information System (IRIS) Program Integrity;
- Operation of Aircraft for Research and Development Activities;
- Public Access to Agency Research;
- Science to Achieve Results (STAR) Grants;
- Slash and Precommercial Thinnings (use of low-grade and low-value forest biomass);
- Water Distribution Systems; and
- Water Security Test Beds.

[139] For a description of these program areas within EPA's S&T account, see U.S. EPA, *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriation*, February 2020, pp. 122-151.

[140] See discussion under the heading "FY 2020 Change from FY 2020 Annualized Continuing Resolution (Dollars in Thousands)*"* within these program areas in U.S. EPA, *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriation*, February 2020, pp. 127, 135, 143, and 150. See also, discussion under "Eliminated Programs" on p. 817.

[141] The grants would be independent of the Science to Achieve Results (STAR) grant program. The grants would be subject to a 25% matching funds requirement as stipulated in H.Rept. 116-448 accompanying H.R. 7612 as reported July 14, 2020, p. 85.

[142] Referred to as "Congressional Priorities" in U.S. EPA *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriation*, February 2020.

[143] See footnote 137.

Table 21. U.S. Environmental Protection Agency Science and Technology (S&T) Account

(appropriations, in millions of dollars)

S&T Program Areas/Activities	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Clean Air [and Climate][a]	116.1	90.4	123.5		
Clean Air Allowance Trading Program	*NR*	*5.7*	*NR*		
Atmospheric Protection Program [GHG (greenhouse gas) Reporting Program; and Climate Protection Program][a]	*7.8*	*0.0*	*8.0*		
Federal Support for Air Quality Management	*NR*	*3.7*	*NR*		
Federal Vehicle and Fuel Standards and Certification	*NR*	*80.9*	*NR*		
Enforcement (*Forensics Support*)	13.6	11.7	14.5		
Homeland Security	33.1	33.8	35.5		
Critical Infrastructure Protection	*NR*	*7.7*	*NR*		
Preparedness, Response, and Recovery	*NR*	*25.5*	*NR*		
Protection of EPA Personnel and Infrastructure	*NR*	*0.5*	*NR*		
Indoor Air and Radiation	5.1	5.2	5.1		
Indoor Air: Radon Program	*NR*	*0.0*	*NR*		
Radiation: Protection	*NR*	*1.0*	*NR*		
Radiation: Response Preparedness	*NR*	*4.2*	*NR*		
Reduce Risks from Indoor Air	*NR*	*0.0*	*NR*		
Information Technology/Data Management/Security	3.1	2.9	2.9		
Operations and Administration	65.4	67.9	67.9		
Facilities Infrastructure and Operations	*NR*	*67.9*	*NR*		
Pesticide Licensing	5.9	5.7	5.7		
Protect Human Health from Pesticide Risk	*NR*	*2.4*	*NR*		
Protect the Environment from Pesticide Risk	*NR*	*2.6*	*NR*		
Realize the Value of Pesticide Availability	*NR*	*0.7*	*NR*		
Research: Air [Climate] and Energy[a]	94.5	33.5	98.0		
Research: Chemical Safety and Sustainability	126.3	91.6	130.8		
[Human] Health and Environmental Risk Assessment	*NR*	*24.7*	*NR*		
Research: Computational Toxicology	*21.4*	*18.2*	*21.4*		
Research: Endocrine Disruptor	*16.3*	*10.8*	*16.3*		
Research: Other Activities	*NR*	*38.0*	*NR*		
Research: Safe and Sustainable Water Resources	110.9	78.9	114.5		

S&T Program Areas/Activities	FY2020 Enacted	FY2021 Request	FY2021 House	FY2021 Senate	FY2021 Enacted
Research: Sustainable and Healthy Communities	132.5	58.6	137.5		
Water: Human Health Protection (Drinking Water Programs)	4.1	4.4	4.4		
Research: National/Congressional Priorities (Water Quality and Support Grants)[b]	6.0	0.0	7.0		
Subtotal Base Appropriations	**716.4**	**484.7**	**747.3**		
Transfer in from Hazardous Substance Superfund Account	**30.7**	**19.1**	**30.8**		
Total Appropriations Prior to Rescissions	**747.2**	**503.8**	**778.1**		
S&T Account Specific Rescission	**0.0**[c]	**NR**[d]	**0.0**[d]		
CARES Act (P.L. 116-136)	**2.3**[e]	**NA**	**NA**		
Total (Net Appropriations)	**749.4**	**503.8**	**778.1**		

Source: Prepared by CRS. Amount in the table are generally as presented in H.R. 7608, the H.Rept. 116-448 accompanying H.R. 7612, U.S. EPA, *Fiscal Year 2021 Justification of Appropriations Estimates for the Committee on Appropriations*, February 2020, the Explanatory Statement accompanying P.L. 116-94, and the CARES Act P.L. 116-136.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns headed "FY2021 Senate," and "FY2021 Enacted" will be added, if available, as each action is completed. NR (not reported) indicates those instances where funding or rescission ("cancelled") amounts were not specified.

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

b. Referred to as "Congressional Priorities" in the FY2021 and previous Administrations' budget justifications.

c. No account specific rescission was included for the S&T account or other EPA appropriations accounts in the Further Consolidated Appropriations Act, 2020 (P.L. 116-94). For FY2019, P.L. 116-6 had included a rescission of $11.3 million in the S&T account, as well as rescissions in the Environmental Programs and Management (EPM) and the state and Tribal Assistance Grants (STAG) accounts.

d. The President's FY2021 request included a $159.1 million rescission of unobligated balances for EPA appropriations ("cancellation of funds") overall but did not specify a proportional allocation of the rescission by EPA accounts. The FY2020 request had proposed a $377.0 million across-the-board rescission for EPA.

e. H.R. 7608 as passed does not include an account-specific rescission for the S&T account but would rescind $70.0 million in unobligated balances of appropriations prior to FY2020 in the EPA's Water Infrastructure Finance and Innovation (WIFIA) Program Account as an "administrative provision" in Title II of Division C.

f. Title VII in Division B included $2.25 million within the S&T account; $1.5 million for research on methods to reduce the risks from environmental transmission of coronavirus via contaminated surfaces or materials, and $750,000 for cleaning and disinfecting EPA equipment and facilities. See CRS Insight IN11331, *U.S. Environmental Protection Agency Funding in the CARES Act (P.L. 116-136)*, by Robert Esworthy.

Appendix A. Acronyms and Abbreviations

Acronym/ Abbreviation	Organization/Term
ACF	Administration for Children and Families
AFRI	Agriculture and Food Research Initiative
AHRQ	Agency for Healthcare Research and Quality
AI	Artificial Intelligence
AIMS	Arctic Infrastructure Modernization for Science
AOAM	Agency Operations and Award Management
ARPA-E	Advanced Research Projects Agency-Energy
ARS	Agricultural Research Service
B&F	Buildings and Facilities
BA	Budget Authority
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BOR	Bureau of Reclamation
BSEE	Bureau of Safety and Environmental Enforcement
CA	Convergence Accelerator
CDC	Centers for Disease Control and Prevention
CISE	Computer and Information Science and Engineering
CLARREO	Climate Absolute Radiance and Refractivity Observatory
CMS	Centers for Medicare and Medicaid Services
COVID-19	Coronavirus Disease 2019
CR	Continuing Resolution
CRF	Construction of Research Facilities
DHP	Defense Health Program
DHS	Department of Homeland Security
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DRA	Designated Research Area
EFNEP	Expanded Food and Nutrition Education Program
EHR	Education and Human Resources
EOP	Executive Office of the President
EPA	Environmental Protection Agency

Acronym/ Abbreviation	Organization/Term
EPM	Environmental Programs and Management
EPSCoR	Experimental Program to Stimulate Competitive Research –or– Established Program to Stimulate Competitive Research
ERS	Economic Research Service
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FHWA	Federal Highway Administration
FIC	Fogarty International Center
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FTE	Full-Time Equivalent
FW-HTF	Future of Work at the Human Technology Frontier
FWS	Fish and Wildlife Service
FY	Fiscal Year
GCR	Growing Convergence Research
GCRA	Global Change Research Act of 1990 (P.L. 101-606)
GDP	Gross Domestic Product
GHG	greenhouse gas
GRFP	Graduate Research Fellowship Program
GWOT	Global War on Terror
HBCU	Historically Black Colleges and Universities
HHS	Department of Health and Human Services
HRSA	Health Resources and Services Administration
ICs	Institutes and Centers
IotF	Industries of the Future
IFF	Iraqi Freedom Fund
INCLUDES	Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
ISS	International Space Station
IT	Information technology
ITER	International Thermonuclear Experimental Reactor
ITS	Industrial Technology Services
JWST	James Webb Space Telescope
LEO	Low Earth Orbit
LGUs	Land-Grant Colleges and Universities
LHHS	Labor, HHS, and Education appropriations act

Acronym/ Abbreviation	Organization/Term
LSST	Large Synoptic Survey Telescope
MEP	Manufacturing Extension Partnership
MREFC	Major Research Equipment and Facilities Construction
MSI	Minority Serving Institutions
NAL	National Agricultural Library
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service
NBAF	National Bio and Agro-Defense Facility
NCATS	National Center for Advancing Translational Sciences
NCCIH	National Center for Complementary and Integrative Health
NCI	National Cancer Institute
NEF	Nonrecurring Expenses Fund
NEI	National Eye Institute
NESDIS	National Environmental Satellite, Data, and Information Service
NHGRI	National Human Genome Research Institute
NHLBI	National Heart, Lung, and Blood Institute
NHTSA	National Highway Traffic Safety Administration
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIAID	National Institute of Allergy and Infectious Diseases
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NIBIB	National Institute of Biomedical Imaging and Bioengineering
NICHD	National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDCD	National Institute on Deafness and Other Communication Disorders
NIDCR	National Institute of Dental and Craniofacial Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS	National Institute of Environmental Health Sciences
NIFA	National Institute of Food and Agriculture
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIIMBL	National Institute for Innovation in Manufacturing Biopharmaceuticals
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

Acronym/ Abbreviation	Organization/Term
NIRSQ	National Institute for Research on Safety and Quality
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development
NLM	National Library of Medicine
NMFS	National Marine Fisheries Service
NNA	Navigating the New Arctic
NNI	National Nanotechnology Initiative
NNMI	National Network for Manufacturing Innovation
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPS	National Park Service
NRT	NSF Research Traineeships
NSB	National Science Board
NSET	Nanoscale Science, Engineering, and Technology (NSTC Subcommittee)
NSF	National Science Foundation
NSTC	National Science and Technology Council
NWS	National Weather Service
OAR	Oceanic and Atmospheric Research
OCO	Overseas Contingency Operations
OCS	Office of the Chief Scientist (USDA)
OD	NIH Office of the Director
OIG	Office of the Inspector General
OMAO	Office of Marine and Aviation Operations
OMB	Office of Management and Budget
ORD	Office of Research and Development
OSEC	Office of the Secretary (USDA)
OSMRE	Office of Surface Mining Reclamation and Enforcement
OST	Office of the Secretary of Transportation
OSTP	Office of Science and Technology Policy
PACE	Pre-Aerosol, Clouds, and Ocean Ecosystem
PCORTF	Patient-Centered Outcomes Research Trust Fund
PE	Program Element
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHS	Public Health Service
PHSA	Public Health Service Act
PIADC	Plum Island Animal Disease Center

Acronym/ Abbreviation	Organization/Term
QIS	Quantum Information Science
QL	Quantum Leap
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
RE&D	Research, Engineering, and Development
REE	Research, Education, and Economics
RRA	Research and Related Activities
SARE	Sustainable Agriculture Research and Education
S&T	Science and Technology
SLS	Space Launch System
SOFIA	Stratospheric Observatory for Infrared Astronomy
STAG	State and Tribal Assistance Grants
STAR	Science to Achieve Results
STEM	Science, Technology, Engineering, and Mathematics
STEP	Supercritical Transformational Electric Power
STRS	Scientific and Technical Research and Services
TOA	Total Obligational Authority
URoL	Understanding the Rules of Life
USDA	Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VA	Department of Veterans Affairs
WFIRST	Wide Field Infrared Space Telescope
WFM	Wildland Fire Management
WIN Fund	Wireless Innovation Fund
WoU	Windows on the Universe

Appendix B. CRS Contacts for Agency R&D

The following table lists the primary CRS experts on R&D funding for the agencies covered in this report.

Agency	CRS Contact
Department of Agriculture	Genevieve K. Croft Analyst in Agricultural Policy
Department of Commerce	
National Institute of Standards and Technology	John F. Sargent Jr., Coordinator Specialist in Science and Technology Policy
National Oceanic and Atmospheric Administration	Eva Lipiec Analyst in Natural Resources Policy
Department of Defense	John F. Sargent Jr., Coordinator Specialist in Science and Technology Policy
Department of Energy	Daniel Morgan Specialist in Science and Technology Policy
Department of Health and Human Services National Institutes of Health	Kavya Sekar Analyst in Health Policy
Department of Homeland Security	Daniel Morgan Specialist in Science and Technology Policy
Department of the Interior	Laurie A. Harris Analyst in Science and Technology Policy
Department of Transportation	Marcy E. Gallo Analyst in Science and Technology Policy
Department of Veterans Affairs	Marcy E. Gallo Analyst in Science and Technology Policy
Environmental Protection Agency	Robert Esworthy Specialist in Environmental Policy
National Aeronautics and Space Administration	Daniel Morgan Specialist in Science and Technology Policy
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