Review of Research & Development in the Final FY 2021 Omnibus

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On December 27, President Trump signed the Consolidated Appropriations Act, 2021 (H.R. 133), completing appropriations for the 2021 fiscal year (FY) in addition to providing another round of emergency COVID-19 funding. This report surveys the final annual appropriations for major departments and agencies that fund federal R&D. Visit www.aaas.org/rd for additional information.

Note: *The R&D figures contained in this report are AAAS estimates based on OMB, agency, and appropriations data. The official figures have been revised to include spending in the Defense Department's "6.6" account, for RDT&E Management Support, as R&D. This account, worth roughly $7 billion to $9 billion per year, was excluded from OMB's R&D estimates in the FY 2021 budget request. AAAS has added this account back into the R&D totals to better accord with OMB Circular A-11 and past practice.*

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Overview and Context

Congress ensured FY 2021 was going to be a tight year for appropriations in summer of 2019, when they adopted into law the Bipartisan Budget Act of 2019. That legislation raised the discretionary caps in FY 2020 and FY 2021, thereby preventing a large budget drop due to the expiration of the previous cap deal. But while it avoided a major spending crunch, it added somewhat more funding to the FY 2020 bottom line compared to FY 2021. As a result, appropriators worked with a more than $40 billion increase in FY 2020, but only a $10 billion increase in FY 2021, a less than 1% year-over-year (see table, following page).

This constrained fiscal environment was reflected in very modest figures for research funders emerging from House and Senate appropriations bills this year. Many large R&D agencies and offices received annual increases of less than three percent in this legislation, with some exceptions (perhaps most notably, another $2 billion increase for the National Institutes of Health [NIH] in the Senate Labor, HHS, and Education spending bill). In the ultimate omnibus, legislators employed some fiscal maneuvers to carve out an additional $15 billion in nondefense cap space, which pushed

The Discretionary Caps in FY 2021

Billions of nominal dollars

	FY 2019 Actual	FY 2020 Actual	**FY 2021 Current**	Change from FY20 Amount	Percent
Nondefense	$597	$622	$627	$5	0.8%
White House-proposed change			*-$37*		
White House-proposed FY21 cap			*$590*	*-$32*	*-5.1%*
Defense	$647	$667	$672	$5	0.8%

Excludes OCO, $2.5 billion in FY 2020 for Census, and other emergency spending not subject to caps. | AAAS

the de facto year-over-year nondefense increase into the neighborhood of 3%. Still, many of the figures in the final omnibus package reflect the constrained funding environment, as recapped in the following pages.

Of course, the White House disagreed with the contours of the 2019 spending cap deal, and again recommended another batch of funding cuts for nondefense programs, including research, in their FY 2021 budget request.[1] But Congressional leadership of both parties and chambers quickly rejected this approach.

Complicating matters this year was the COVID-19 pandemic. Ordinarily, appropriations bills begin to appear in the House in April or May, but the pandemic disrupted Congressional operations and forced a re-focusing to deal with the emergency. Congress enacted four separate emergency spending bills over March and April amounting to over $2 trillion in net expenditures, including at least a few billion for R&D expenditures in FY 2020 for NIH and others.

Note that the R&D estimates presented in this report only refer to annual appropriations and do *not* include any emergency COVID-19 R&D. Official estimates of emergency R&D are not yet available. Readers seeking data on emergency discretionary funding by agency may visit the AAAS FY 2021 appropriations dashboard and see the "COVID" tab.[2]

Due to these disruptions, regular House appropriations had to wait until July. That month, House appropriators set an astonishingly rapid pace, moving ten out of twelve annual spending bills through subcommittee, full committee, and floor votes over the course of four weeks.

The Senate Appropriations Committee, meanwhile, never did get things rolling. Due to election-year jockeying and conflict over amendments, appropriators in the upper chamber put off September subcommittee markups, and ultimately just released draft text and report language a week after the November elections, foregoing committee and floor votes entirely.

With these materials in hand, and operating under a two-month continuing resolution, Congress pursued negotiations that resulted in the final 5,000-page bill (H.R. 133). The package included the omnibus, a nearly $1 trillion emergency supplemental, and other authorizing legislation. The final bill was adopted in Congress in December 21 and, after an extended delay featuring surprise legislative

[1] For a review of these proposals, see the AAAS Guide to the President's FY 2021 Budget: https://www.aaas.org/news/guide-presidents-budget-research-development-fy-2021

[2] https://www.aaas.org/page/fy-2021-rd-appropriations-dashboard

R&D in FY 2021 Appropriations by Type
(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	**FY 2021 Final***	FY20 Change Amount	FY20 Change Percent	Request Change Amount	Request Change Percent
Basic Research	39,352	43,351	40,573	**45,515**	2,164	5.0%	4,942	12.2%
Applied Research	45,692	46,911	40,839	**48,245**	1,334	2.8%	7,405	18.1%
Development	60,574	67,788	66,036	**66,937**	-851	-1.3%	902	1.4%
R&D Facilities	4,359	6,005	3,818	**4,766**	-1,239	-20.6%	947	24.8%
Total R&D	149,977	164,056	151,267	**165,463**	1,408	0.9%	14,197	9.4%
Defense R&D**	72,004	80,506	76,478	**80,773**	268	0.3%	4,296	5.6%
Nondefense R&D	77,973	83,550	74,789	**84,690**	1,140	1.4%	9,901	13.2%

*AAAS estimates based on OMB and appropriations data. **Includes Defense Dept., NNSA, and DHS CISA
The above figures do not reflect emergency COVID-19 R&D or the amended FY 2021 budgets for NIH/CDC.
Note: The projected inflation rate between FY 2020 and FY 2021 is 2.0 percent.
All figures rounded to the nearest million. Changes calculated from unrounded figures.

demands and new shutdown fears, was signed by President Trump into law on December 27.

Overall Research and Development

AAAS R&D estimates are based on Office of Management and Budget (OMB) and agency data by bureau or account and adjusted for appropriations. These estimates follow the recent OMB guidance that narrows the definition of "development" to "experimental development." In practice, the most significant consequence of this is the exclusion of Department of Defense (DOD) operational systems development, contained in the department's "6.7" funding account.[3] This account was worth $38 billion in FY 2020. AAAS estimates also exclude DOD's new "6.8" account, for software pilot programs.

Lastly, AAAS estimates include DOD's R&D management support funding, the "6.6" account, as R&D. Over summer 2020, AAAS discovered that DOD had been excluding this account in their R&D reporting to OMB during budget preparation. Thus, DOD "6.6" spending was not included in the R&D figures that appeared in the FY 2021 budget request (or in the subsequent reviews of R&D in the budget). For this report, AAAS has kept "6.6" spending as R&D to maintain consistency with past practice, with guidance in OMB's A-11 circular, and with R&D figures published by the National Center for Science and Engineering Statistics, a federal statistics office.[4]

Estimates for R&D in annual appropriations are shown in the above table. These initial estimates suggest Congress increased federal R&D by $1.4 billion in the omnibus. This increase was achieved entirely through increases to basic and applied research, which together increased by an estimated $3.5 billion or 3.9% above FY 2020 levels excluding emergency COVID-19 R&D spending. See the appendix section of this report for detailed estimates by agency and type of R&D.

[3] For background on this issue, see "The Federal Government is Tweaking What Counts as R&D: Q&A," AAAS, June 2018: https://www.aaas.org/news/federal-government-tweaking-what-counts-rd-qa

[4] For more information, see CRS report R44711 on DOD's RDT&E structure, especially the chart on page 6: https://fas.org/sgp/crs/natsec/R44711.pdf

The estimated 3.9% research increase is in accord with the varying discretionary increases provided to the largest research funders. These include, for example a 5.2% increase for Defense Science and Technology, and roughly 3% increases for both the National Institutes of Health (NIH) and the National Science Foundation.

The estimated decline in development spending is somewhat surprising and likely related to agencies reclassifying their R&D activities. For instance, the FY 2021 budget request indicated an 8.6% decline NASA development, even with a massive proposed increase in what would seem to be exploration-relevant technology development. The Office of Fossil Energy also reclassified much of its spending from development to research in the Department of Energy (DOE) budget request.

Further, the estimated decline in R&D facilities is in reality due to a spike in DOD spending in FY 2020 for laboratory revitalization projects,

*Under OMB guidance, beginning in FY 2017, late-stage development, testing, and evaluation programs are no longer counted as R&D. Excludes COVID-19 emergency R&D in FY 2020. Based on OMB, agency, CBO, and appropriations data. | AAAS

including R&D centers and test and evaluation facilities. This appears to have been a one-time spike, and no such DOD funding was requested in FY 2021. Excluding DOD, estimated R&D facilities spending in the omnibus actually increased by over $600 million.

Suffice to say these issues should serve as a warning of the potential vagaries of R&D accounting by federal agencies.

It's also difficult to situate FY 2021 R&D in historical context. Total historical spending is shown on the previous page, and the same data as a share of GDP is shown on the following page.

As a share of GDP, estimated research spending would reach 0.45%, the highest point in several years (see graph below). However, this is primarily due to the recent drop in GDP estimated by the Congressional Budget Office (CBO) in its July 2020 baseline. Current development spending is no longer directly comparable with historical data due to the DOD "6.7" issue described earlier, which pushes total R&D spending lower.

While the ultimate spending changes were modest, there are a handful of areas worth noting. The White House had made **artificial intelligence and quantum information science** (QIS) major priorities in their budget request, pledging to double funding for related research over two years. This pledge was mostly centered on the National Science Foundation (NSF) and the DOE Office of Science, but other agencies were involved as well.

Appropriations have mostly reflected these priorities. For research on AI and machine learning, Congress provided NSF with $868 million, a 76% increase above FY 2020 levels. The Office of Science received not less than $100 million, a $29 million or 40.8% boost, though shy of the $125 million request. For QIS, NSF received its funding request of $226 million, $100 million above the current year, while the Office of Science received $245 million, a $50 million increase.

At other agencies, the National Institute of Standards and Technology (NIST) received a $6.5 increase above FY 2020 each for AI and quantum science. NIH received $105 million for

machine learning and data science activities. Congress also provided an $840 million increase to DOD science and technology programs, where AI and quantum are among the research priorities. This included some targeted increases, such as a $10 million boost for the Air Force Research Lab's quantum science center, and several others for AI.

Amid another billion-dollar increase for NIH, Congress continued its prioritization of **Alzheimer's disease research** within the life sciences portfolio. NIH Alzheimer's research funding received a $300 million increase above FY 2020, pushing total expenditures above $3 billion.

A handful of other areas received moderate increases but are notable for having been singled out for some of the deepest cuts in the FY 2021 budget request. This included energy technology R&D, climate science, advanced manufacturing programs, and STEM education.

In addition, several programs supporting minority institutions – including historically black colleges and others – received marginal preference over certain other education programs. For instance, Hatch Act funding for agricultural experiment stations at the original 1862 land-grant universities received flat funding, while research capacity funds at historically black colleges (the 1890 land-grants) were increased by $6 million. At DOD, support for activities under the broad National Defense Education Program was reduced, while funding to support minority-focused institutions was increased by $29 million or 54%. At NIH, the National Institute on Minority Health and Health Disparities received a 16.4% year-over-year increase, the largest of any institute in a year where most received under 3% increases. Visit the Department of Agriculture, Department of Defense, and NIH entries in this report for details.

A table showing R&D estimates by agency is on the next page, followed by agency R&D highlights and tables. The appendix section has more detail on R&D by agency and by type (basic, applied, development, or R&D facilities).

*Includes renewables and efficiency, nuclear, fossil, grid research, cybersecurity, ARPA-E. **Includes ARS, NIFA, ERS, NASS, Forest Service. | AAAS

FY 2021 Total R&D by Agency
(estimated budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	**FY 2021 Final***	FY 2020 Change Amount	FY 2020 Change Percent	Request Change Amount	Request Change Percent
Defense	64,685	72,739	67,844	**71,998**	-741	-1.0%	4,153	6.1%
S&T (6.1-6.3)	15,317	16,062	14,070	**16,902**	840	5.2%	2,832	20.1%
All Other DOD	49,368	56,677	53,774	**55,096**	-1,581	-2.8%	1,322	2.5%
Health and Human Svcs	38,459	40,750	37,825	**41,874**	1,123	2.8%	4,049	10.7%
NIH	37,094	39,485	36,915	**40,663**	1,177	3.0%	3,748	10.2%
All Other HHS	1,365	1,265	910	**1,211**	-54	-4.3%	301	33.1%
Energy	18,223	19,217	16,793	**21,413**	2,196	11.4%	4,620	27.5%
Atomic Defense	7,306	7,752	8,627	**8,766**	1,014	13.1%	139	1.6%
Office of Science	6,517	6,923	5,760	**7,221**	298	4.3%	1,461	25.4%
Energy Programs	4,400	4,542	2,406	**5,426**	884	19.5%	3,020	125.5%
NASA	10,698	14,057	13,334	**12,836**	-1,221	-8.7%	-498	-3.7%
Nat'l Science Foundation	6,648	6,752	6,327	**6,987**	235	3.5%	660	10.4%
Agriculture	3,025	2,940	2,769	**2,844**	-96	-3.3%	75	2.7%
Commerce	1,957	1,940	1,498	**1,947**	7	0.4%	449	30.0%
NOAA	1,064	972	670	**997**	25	2.6%	327	48.7%
NIST	763	805	652	**822**	17	2.2%	170	26.1%
Transportation	1,033	1,097	979	**1,029**	-68	-6.2%	50	5.1%
Homeland Security	600	534	462	**579**	45	8.4%	117	25.3%
Veterans Affairs	1,370	1,313	1,351	**1,399**	86	6.6%	48	3.6%
Interior	958	974	726	**986**	12	1.3%	260	35.8%
US Geological Survey	640	661	461	**671**	10	1.6%	210	45.6%
EPA	490	493	319	**499**	6	1.2%	180	56.3%
Others	1,830	1,250	1,041	**1,075**	-175	-14.0%	34	3.2%
Total R&D	149,977	164,056	151,267	**165,463**	1,408	0.9%	14197	9.4%
Defense R&D**	72,004	80,506	76,478	**80,773**	268	0.3%	4296	5.6%
Nondefense R&D	77,973	83,550	74,789	**84,690**	1,140	1.4%	9901	13.2%
By Type								
Basic Research	39,352	43,351	40,573	**45,515**	2,164	5.0%	4942	12.2%
Applied Research	45,692	46,911	40,839	**48,245**	1,334	2.8%	7405	18.1%
Development	60,574	67,788	66,036	**66,937**	-851	-1.3%	902	1.4%
Facilities & Equipment	4,359	6,005	3,818	**4,766**	-1,239	-20.6%	947	24.8%

*AAAS estimates based on OMB and appropriations data. **Includes Defense Dept., NNSA, and DHS CISA

Source: OMB and agency R&D data and appropriations data. Does not include emergency R&D spending for COVID-19.

The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

Highlights: Department of Defense

As the tables in the following pages show, DOD science and technology received an $840 million or 5.2% boost above FY 2020, including a $68 million boost for basic research programs in the 6.1 account. These figures are actually higher than DOD received from initial House and Senate appropriations: the House recommended a smaller increase for basic research and cuts for applied research (6.2) and advanced technology development (6.3), while the draft Senate legislation proposed a nearly $200 million cut to basic science amid other ranging cuts.

But in the end, these cuts were mostly dodged with a few exceptions. For instance, Air Force Defense Research Sciences program element was reduced by 8.6%, while Navy university programs were reduced by nearly 14% below FY 2020 (see basic research table). As always, research funding increases above the request were wide-ranging and covered AI, unmanned aerial vehicles, advanced manufacturing, hypersonics, materials, microelectronics, biotechnology, and other topics.

Space Force applied technology research received an $86 million increase above the request. The final agreement added $10 million for the Navy Defense University Research Instrumentation Program, and $17 million each for the Minerva social science initiative and for Defense EPSCoR. Appropriators also provided $1 million for a National Academies study of China's controversial Confucius Institutes.

Elsewhere, the Defense-Wide Manufacturing Science and Technology Program was spared from proposed cuts and given a $48 million or 24.5% increase above FY 2020, and $152 million above the request. Among the various programmatic increases were $25 million for hypersonics manufacturing technology and $17 million for high performance computing-enabled manufacturing R&D.

Defense Innovation Unit (DIU) funding will rise by 44% to $67 million. The National Security Innovation Network had been recommended for no funding, but ultimately was appropriated $40 million, the same as FY 2020. Nearly $20 million was provided to the Strategic Environmental R&D Program for PFAS activities.

As mentioned above, DOD support for STEM at minority institutions will see a sharp increase (see basic research table). The Congressionally Directed Medical Research Program, which funds extramural peer-reviewed research, received a $105 million increase above FY 2020 to $1.5 billion total.

DOD Science & Technology and Medical Research FY 1990-2021

billions of constant FY 2020 dollars

Source: DOD and approproations data. Medical Research is appropriated outside RDT&E title, appropriated as applied research pre-1999. | AAAS

Department of Defense FY 2021 R&D Appropriations

(Total Obligational Authority [TOA] in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Research, Development, Test, and Evaluation (RDT&E)								
Basic Research (6.1)	2,476	2,603	2,319	**2,671**	68	2.6%	352	15.2%
Applied Research (6.2)	5,912	6,071	5,397	**6,452**	380	6.3%	1,055	19.5%
Adv Tech Development (6.3)	6,929	7,387	6,355	**7,779**	392	5.3%	1,424	22.4%
Total Science & Technology	15,317	16,062	14,070	**16,902**	840	5.2%	2,832	20.1%
Adv Component Dev (6.4)	21,454	27,207	28,468	**28,101**	894	3.3%	-368	-1.3%
System Dev and Demonstr (6.5)	15,447	16,778	16,526	**15,917**	-861	-5.1%	-609	-3.7%
Management Support (6.6)	9,074	7,217	6,987	**7,295**	78	1.1%	308	4.4%
Total R&D within RDT&E	61,292	67,264	66,052	**68,215**	951	1.4%	2,163	3.3%
Total RDT&E 1/	*96,206*	*105,396*	*106,555*	***107,457***	*2,061*	*2.0%*	*901*	*0.8%*
Medical Research 2/	2,180	2,306	562	**2,393**	86	3.8%	1,830	325.4%
Chem Agents Destruction 2/	667	876	782	**942**	67	7.6%	160	20.5%
Other Appropriations 3/	546	2,293	448	**448**	-1,845	-80.5%	0	0.0%
Total DOD R&D Estimate	64,685	72,739	67,844	**71,998**	-741	-1.0%	4,153	6.1%
Science & Technology Programs by Military Branch								
Army	3,607	3,365	2,590	**4080**	714	21.2%	1,490	57.5%
Navy	2,496	2,618	2,317	**2675**	57	2.2%	358	15.4%
Air Force	2,904	3,272	2,681	**3103**	-169	-5.2%	422	15.8%
Space Force	0	0	131	**217**	217	- -	86	65.7%
Defense Agencies	6,311	6,806	6,353	**6828**	22	0.3%	475	7.5%
DARPA (total budget)	3,426	3,458	3,566	**3502**	44	1.3%	-65	-1.8%

1/ Under OMB guidance, operational systems development (6.7) is no longer included as R&D spending.
2/ Appropriated outside RDT&E title.
3/ R&D support in military personnel, construction, and other non-RDT&E programs.
Includes Overseas Contingency Operation funding. Excludes emergency COVID-19 spending.
Source: OMB R&D data and documents, DOD R-1, and appropriations bills and reports.
All figures rounded to the nearest million. Changes calculated from unrounded figures.
Character of work ("6.x") categories are expressed in total obligational authority (TOA).

Department of Defense Basic Research (6.1)

(TOA in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Budget	**FY 2021 Final**	Change FY 20-21 Amount	Change FY 20-21 Percent	Change Request Amount	Change Request Percent
Army								
In-House Lab Indep Research	11	0	0	**0**	0	- -	0	- -
Defense Research Science	306	354	303	**367**	13	3.7%	64	21.2%
Univ Research Initiatives	63	88	67	**97**	9	10.6%	30	44.7%
Univ and Industry Res Ctrs	111	127	88	**122**	-5	-4.2%	34	38.7%
Cyber Collab Alliance	- -	5	5	**5**	0	1.9%	0	0.0%
Total Army	491	574	463	**592**	17	3.0%	128	27.7%
Navy								
In-House Lab Indep Research	19	19	19	**19**	0	0.0%	0	0.0%
Defense Research Science	487	464	467	**490**	26	5.6%	23	4.9%
Univ Research Initiatives	156	168	117	**145**	-23	-13.7%	28	24.0%
Total Navy	662	651	603	**654**	3	0.5%	51	8.4%
Air Force								
Defense Research Science	374	356	315	**325**	-31	-8.6%	10	3.2%
Univ Research Initiatives	159	179	162	**197**	18	10.1%	35	21.6%
High Energy Laser Res Init	12	15	15	**15**	0	2.0%	0	0.0%
Total Air Force	545	550	492	**537**	-12	-2.3%	45	9.1%
Defense Agencies								
DTRA Basic Research Initiative	36	26	15	**15**	-11	-43.8%	0	0.0%
Defense Research Sciences 1/	424	432	480	**476**	44	10.1%	-4	-0.8%
Basic Research Initiatives	55	71	36	**76**	5	6.6%	40	112.5%
HBCUs / Minority Institutions	39	53	31	**81**	29	54.2%	50	162.5%
Basic Op Medical Research 1/	50	54	54	**54**	0	-0.7%	0	0.0%
Nat Def Edu Program	133	144	100	**137**	-7	-4.7%	37	36.9%
Chem and Bio Def Program	41	48	45	**50**	2	4.3%	5	11.0%
Total Defense Agencies	777	828	760	**889**	60	7.3%	128	16.9%
DOD Totals								
In-House Lab Indep Research	31	19	19	**19**	0	0.0%	0	0.0%
Defense Research Sciences	1592	1607	1566	**1659**	52	3.2%	93	5.9%
Univ Research Initiatives	377	435	346	**439**	4	1.0%	93	26.9%
All Other	476	543	388	**555**	12	2.2%	166	42.8%
Total DOD Basic Research	2476	2603	2319	**2671**	68	2.6%	352	15.2%

1/ DARPA program elements.

Source: DOD R-1 and appropriations.

All figures rounded to the nearest million. Changes calculated from unrounded figures.

Highlights: National Institutes of Health (NIH)

NIH was provided with yet another annual increase of over $1 billion, the sixth consecutive year of such an increase. Since FY 2015, when this current streak began, the NIH budget has grown by $12.6 billion or 39%. At the same time, final appropriations this year represent the lowest growth of that stretch in either dollar or percentage terms. With the Biomedical Research and Development Price Index suggesting a 2.4% rate of inflation in FY 2021, most NIH institutes received a sub-inflation increase in the omnibus (see table on the following page).

Congress continues to prioritize Alzheimer's disease research, adding $300 million to an already robust investment that now surpasses $3.1 billion on total. Relatedly, Congress also continues to prioritize the BRAIN Initiative, providing funding of $560 million, a $60 million increase from FY 2020.

As mentioned previously, the National Institute on Minority Health and Health Disparities (NIMHD) was another particular focus. With a $55 million or 16.4% increase, appropriators directed NIMHD to establish a "comprehensive center initiative aimed at a wide variety of chronic diseases and their links to health disparities," and also provided a $5 million increase for Research Centers in Minority Institutions.

Other priorities include:

- $500 million for the All of Us Precision Medicine Initiative
- $541 million for the HEAL Initiative to address opioid addiction
- $220 million for a universal flu vaccine, a $20 million increase
- $61 million for Centers for AIDS Research, a $10 million increase

*NIMH rejoined NIH beginning in FY 1993.

Source: Agency budget documents and appropriations. Adjusted for biomedical R&D inflation rate (BRDPI). © 2020 AAAS

- $50 million for machine learning-focused grants, and $55 million for the Office of Data Science Strategy
- $12.5 million for gun violence research
- A $10 million increase for research on premature births

Appropriators also included, as part of the overall package, legislative language to extend the mandatory Special Type I Diabetes program through FY 2023. The program continues its recent funding at $150 million per year, as the White House had requested.

Appropriators continued to show concern with Chinese involvement and influence over NIH-funded researchers, following NIH findings that a substantial number of investigators have received undisclosed support from the Chinese government. The omnibus directs NIH to again transfer $5 million to the HHS Inspector General to continue investigations into foreign influence on U.S. research.

In addition to the FY 2021 appropriation, NIH has also received $4.8 billion in emergency spending for COVID-19-related research as of the time of this writing.[5]

Adjusted for purchasing power, the FY 2021 base appropriation gives NIH a slight year-over-year increase and leaves it roughly even with FY 2006 levels (see graph, previous page).

[5] See the AAAS appropriations dashboard for a breakdown of NIH emergency COVID-19 appropriations, https://www.aaas.org/page/fy-2021-rd-appropriations-dashboard

National Institutes of Health in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Enacted	Request	**Final**	Amount	Percent	Amount	Percent
Cancer	6,121	6,440	5,881	**6,560**	119	1.9%	679	11.5%
Allergy and Infect Diseases 1/	5,545	5,885	5,885	**6,070**	184	3.1%	184	3.1%
Heart, Lung, and Blood	3,482	3,624	3,298	**3,665**	41	1.1%	367	11.1%
General Medical Sciences	2,822	2,937	2,672	**2,991**	54	1.8%	319	12.0%
Diabetes, Digest, and Kidney 2/	2,176	2,264	2,074	**2,282**	18	0.8%	208	10.0%
Neurological Disorders	2,246	2,445	2,245	**2,513**	69	2.8%	268	11.9%
Mental Health	1,872	2,038	1,845	**2,104**	65	3.2%	259	14.0%
Child Health & Human Dev	1,501	1,557	1,416	**1,590**	33	2.1%	174	12.3%
NCATS	816	833	788	**855**	23	2.7%	68	8.6%
Office of the Director 3/	2,104	2,409	2,208	**2,533**	123	5.1%	325	14.7%
Aging	3,080	3,544	3,226	**3,899**	356	10.0%	673	20.9%
Drug Abuse	1,408	1,462	1,432	**1,480**	18	1.2%	48	3.3%
Environmental Health Scis	851	884	804	**896**	13	1.4%	92	11.5%
Eye	794	824	749	**836**	12	1.4%	87	11.6%
Arthritis / Musculoskeletal	603	625	568	**634**	9	1.5%	66	11.6%
Human Genome	575	606	550	**616**	9	1.6%	66	11.9%
Alcohol Abuse and Alcoholism	525	545	497	**555**	10	1.8%	58	11.6%
Deafness and Communication	473	491	446	**498**	7	1.5%	52	11.6%
Dental Research	461	477	435	**485**	7	1.6%	50	11.6%
National Library of Medicine	441	457	416	**464**	7	1.5%	48	11.6%
Biomed / Bioengineering	388	404	368	**411**	7	1.8%	43	11.6%
Minority Health / Disparities	313	336	305	**391**	55	16.4%	85	27.9%
Nursing Research	163	169	157	**175**	6	3.5%	18	11.6%
Complementary and Int Health	146	152	138	**154**	2	1.6%	16	11.6%
Buildings and Facilities 4/	199	200	300	**200**	0	0.0%	-100	-33.3%
Fogarty International Center	78	81	74	**84**	3	4.1%	11	14.3%
Total NIH Budget	39,184	41,690	39,133	**42,941**	1,251	3.0%	3,807	9.7%
Emergency COVID-19 Spending (as of January 2021)		*3,587*		*1,250*				

1/ FY 2021 request included budget amendment of additional $439.6 million.
2/ Includes mandatory diabetes research funding of $150 million across all years.
3/ Trans-NIH initiatives and Precision Medicine Initiative are consolidated in director's office.
4/ Also provided $225 million from non-recurring expenses fund.
Source: OMB and agency budget documents and data, and appropriations bills and reports.
All figures rounded to the nearest million. Changes calculated from unrounded figures.

Agency Highlights: Department of Energy (DOE)

As seen in the following tables, changes in DOE R&D program appropriations were fairly minimal, with Congress again rejecting steep White House cuts.

Office of Science. The Office of Science (SC) received only a $26 million increase atop a $7 billion FY 2020 budget. Within this constrained funding, Congress backed the White House's priorities in AI and quantum information science. For AI, SC received not less than $100 million, a $29 million or 40.8% boost, though shy of the $125 million request. For quantum, the office received $245 million, a $50 million increase above FY 2020. In addition, SC was provided the requested $475 million for exascale computing activities. STEM education and workforce development funding was protected from cuts.

Several funding line items were held flat in the final omnibus, including the Argonne and Oak Ridge Leadership Computing Facilities, the Energy Sciences Network (ESNet), the National Energy Research Scientific Computing Center (NERSC), the Energy Frontier Research Centers, the Nanoscale Science Centers, the BioEnergy Research Centers, and the energy storage and artificial photosynthesis innovation hubs. U.S. support for the international fusion project ITER also was held flat. Support for SC's light sources and neutron sources ended up at around 1% increases for each.

Within the Biological and Environmental Research (BER) program, legislators mandated a very slight shift from biological to environmental research amid a nearly flat budget. The Joint Genome Institute would receive a $3 million increase. About $20 million was shifted from High Energy Physics (HEP) research funding to construction, primarily for Proton Improvement Project II (PIP-II) design and construction at Fermilab. On the other hand, savings from the construction funding ramp down for the Facility for Rare Isotope Beams (FRIB) at Michigan State University were shifted into Nuclear Physics research. Legislators also provided the requested $12 million for the Stable Isotope Production and Research Center at Oak Ridge Lab.

Energy Technology Offices. The full package includes a large energy policy bill (Division Z) with authorizations that set aggressive funding targets for energy R&D programs.[6] However, the actual appropriations contained in the bill feature only very modest changes from FY 2020 levels (see following table). This includes flat or nearly flat overall funding for the fossil and nuclear energy offices, and for the Advanced Research Projects Agency-Energy or ARPA-E, which was yet again spared from elimination.

The Office of Energy Efficiency and Renewable Energy (EERE) received a net increase of $84 million or 3%, but mainly because in FY 2020 the office saw a rescission of $70 million in previously appropriated but unobligated budget authority. For program activities excluding this rescission, EERE received only a $14 million year-over-year increase in new budget authority, less than 1%.

Within this limited funding, offshore wind technology R&D received a $10.7 million or 20% increase above FY 2020, with a mandated programmatic focus on materials research and manufacturing methods. Within the Advanced Manufacturing office, Congress protected the desalination hub, the Critical Materials

[6] For details see the Senate Energy & Natural Resources summaries, https://www.energy.senate.gov/2020/12/murkowski-manchin-house-colleagues-reach-agreement-on-energy-package-for-year-end-appropriations-bill

Institute, and the manufacturing institutes from de-funding, instead receiving flat funding. Congress also provided $14 million for a new manufacturing innovation institute. Hydropower technology received a $2 million increase.

Congress protected the Integrated University Program and Supercritical Transformational Electric Power (STEP) R&D from de-funding, instead sustaining both at FY 2020 levels of $5 million. Funding for the Advanced Reactor Demonstration Program was increased by $20 million above FY 2020 to $250 million, and small modular reactor RD&D was provided a $15 million increase to $115 million. The Versatile Fast Test Reactor project was provided only $45 million versus the requested $295 million. Congress flat-funded the nuclear modeling and simulation program, light water reactor sustainability activities, and the Nuclear Science User Facilities.

Congress also provided $23 million for the Office of Electricity's Grid Storage Launchpad, a new energy storage R&D facility based at Pacific Northwest Laboratory. The Administration had requested $40 million for FY 2021, the first year of facility construction.

Source: historical DOE budget data and FY 2020 appropriations. | AAAS

Department of Energy Office of Science in FY 2021 Appropriations
(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Adv Sci Computing (ASCR)	936	980	988	**1,015**	35	3.6%	27	2.7%
Research	703	791	819	**846**	55	6.9%	27	3.3%
Construction	233	189	169	**169**	-20	-10.5%	0	0.0%
Basic Energy Sciences (BES)	2,166	2,213	1,936	**2,245**	32	1.4%	309	16.0%
Research	1,758	1,853	1,752	**1,856**	3	0.2%	104	6.0%
Construction	408	360	184	**389**	29	8.1%	205	111.4%
Bio and Environ Research (BER)	705	750	517	**753**	3	0.4%	236	45.7%
Fusion Energy Sciences (FES)	564	671	425	**672**	1	0.1%	247	58.1%
Research	432	414	313	**415**	1	0.2%	102	32.5%
Construction	132	257	112	**257**	0	0.0%	145	129.5%
High-Energy Physics (HEP)	980	1,045	818	**1,046**	1	0.1%	228	27.9%
Research	800	814	698	**794**	-20	-2.5%	96	13.8%
Construction	180	231	121	**252**	21	9.1%	132	109.1%
Nuclear Physics (NP)	690	713	653	**713**	0	0.0%	60	9.1%
Research	615	660	635	**691**	31	4.7%	56	8.8%
Construction	75	53	18	**22**	-31	-57.9%	4	21.9%
Workforce Development	23	28	21	**29**	1	3.6%	9	41.5%
Science Labs Infrastructure	233	301	174	**240**	-61	-20.3%	66	37.8%
Other	289	299	306	**313**	14	4.7%	7	2.3%
Total Science	6,585	7,000	5,838	**7,026**	26	0.4%	1,188	20.4%

Source: OMB R&D data, agency budget documents, and appropriations bills and reports.
Figures rounded to nearest million. Changes calculated from unrounded figures.

Department of Energy Technology Programs in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Energy Efficiency & Renewable Energy	2,379	2,777	720	**2,862**	84	3.0%	2,142	297.7%
Hydrogen & Fuel Cell Tech	120	150	42	**150**	0	0.0%	108	257.1%
Bioenergy Technologies	226	260	45	**255**	-5	-1.7%	211	473.0%
Solar Energy	247	280	67	**280**	0	0.0%	213	317.9%
Wind Energy	92	104	22	**110**	6	5.8%	88	397.7%
Geothermal Technology	84	110	26	**106**	-4	-3.6%	80	307.7%
Water Power	105	148	45	**150**	2	1.4%	105	233.3%
Vehicle Technologies	344	396	74	**400**	4	1.0%	326	437.6%
Building Technologies	226	285	61	**290**	5	1.8%	229	375.4%
Advanced Manufacturing	320	395	95	**396**	1	0.3%	301	318.6%
Office of Electricity	156	190	195	**212**	22	11.4%	17	8.5%
R&D Programs	132	165	168	**187**	22	13.2%	18	10.9%
Nuclear Energy	1,326	1,493	1,180	**1,508**	14	1.0%	328	27.8%
Reactor Concepts RD&D*	259	202	112	**208**	6	3.0%	97	86.5%
Nuclear Enabling Technology	153	113	116	**123**	9	8.3%	7	5.9%
Fuel Cycle R&D	264	305	187	**309**	4	1.4%	122	65.4%
Adv Reactor Demonstration	0	230	20	**250**	20	8.7%	230	1150.0%
Fossil Energy R&D	740	750	731	**750**	0	0.0%	19	2.7%
Advanced Coal and CCUS	486	491	546	**447**	-44	-9.0%	-99	-18.2%
CCUS	199	218	123	**228**	11	4.8%	105	85.6%
Other Advanced Coal R&D	287	273	423	**219**	-55	-20.0%	-205	-48.4%
Natural Gas Technologies	51	51	15	**57**	6	11.8%	42	280.0%
Unconventional Technologies	46	46	17	**46**	0	0.0%	29	170.6%
Cybersecurity and Emergency Response	120	156	185	**156**	0	0.0%	-29	-15.5%
ARPA-E**	366	425	-311	**427**	2	0.5%	738	-237.4%
Energy Information Admin	125	127	129	**127**	0	0.0%	-2	-1.5%

*Adjusted for comparability, excluding Versatile Fast Test Reactor.

**The Administration recommended cancellation of $332 million in unobligated budget authority.

Source: OMB R&D data, agency budget documents, and appropriations bills and reports.

Figures rounded to nearest million. Changes calculated from unrounded figures.

Department of Energy Atomic Defense

(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Budget	**FY 2021 Final**	Change FY 20-21 Amount	Change FY 20-21 Percent	Change Request Amount	Change Request Percent
National Nuclear Security Administration (NNSA)								
Weapons Activities	11,100	12,457	15,602	**15,345**	2,888	23.2%	-257	-1.6%
RDT&E	2,174	2,553	2,782	**2,814**	261	10.2%	32	1.1%
Science	469	595	773	**769**	175	29.3%	-4	-0.5%
Engineering	251	325	337	**337**	12	3.8%	0	0.0%
IC Fusion	536	557	555	**575**	18	3.3%	20	3.7%
Adv Sim & Computing	659	768	732	**732**	-36	-4.7%	0	0.0%
Manufacturing	185	222	298	**298**	76	34.0%	0	0.0%
Academic Programs	73	86	87	**102**	15	17.8%	15	17.3%
Defense Nuclear Nonproliferation	1,930	2,164	2,031	**2,260**	96	4.4%	229	11.3%
Nonproliferation and Forensics R&D	576	533	572	**642**	109	20.4%	70	12.3%
Naval Reactors	1,789	1,648	1,684	**1,684**	36	2.2%	0	0.0%
Office of the Administrator	410	435	454	**443**	9	2.0%	-11	-2.4%
Total NNSA	**15,229**	**16,705**	**19,771**	**19,732**	**3,028**	**18.1%**	**-39**	**-0.2%**
Def Environmental Cleanup	6,024	6,255	4,984	**6,426**	171	2.7%	1,442	28.9%
Other Defense Activities	860	906	1,055	**920**	14	1.5%	-135	-12.8%
Total Atomic Defense Budget	**22,113**	**23,866**	**25,809**	**27,078**	**3,213**	**13.5%**	**1,269**	**4.9%**

Source: OMB R&D data, agency budget documents, and appropriations bills and reports.

Figures rounded to nearest million. Changes calculated from unrounded figures.

Agency Highlights: National Science Foundation (NSF)

NSF research and education programs received a $208 million or 2.5% year-over-year increase in the omnibus, $745 million above the requested level.

Legislators backed the White House's continued prioritization of quantum information science and AI. Quantum science received the requested level of $226 million, a $100 million increase from the current year, while AI-related research received $868 million, a 76% increase above FY 2020 levels. At the same time, appropriators mandated the agency sustain other core research at least at FY 2020 levels.

The Innovation Corps entrepreneurship program was provided with a $2.2 million or 6% increase above FY 2020 levels to $40 million. EPSCoR was provided a $10 million increase to $200 million.

Part of the 3% increase for the Directorate for Education and Human Resources is aimed at programs for minorities, including $1.5 million to $2 million increases for the Louis Stokes Alliances for Minority Participation, HBCU undergraduate support, the Tribal Colleges and Universities Program, and the Hispanic-Serving Institutions program. Other programs including Noyce Teacher Scholarships, graduate fellowships, and Improving Undergraduate STEM Education were sustained at FY 2020 levels. Cybercorps was funded at $60 million, an approximately $5 million increase.

Legislators provided $76.3 million for mid-scale infrastructure, $11 million above the request.

Based on agency data and appropriations. © 2020 AAAS

National Science Foundation in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Research and Related Activities	6,578	6,737	6,213	**6,910**	173	2.6%	697	11.2%
Education & Human Resources	935	940	931	**968**	28	3.0%	37	4.0%
Major Res Equip & Facilities	285	243	230	**241**	-2	-0.9%	11	4.9%
Agency Operations	333	337	346	**346**	9	2.6%	0	0.0%
National Science Board	4	5	4	**5**	0	0.0%	0	6.9%
Inspector General	15	17	18	**18**	1	8.2%	0	0.0%
Total NSF Budget	8,150	8,278	7,741	**8,487**	208	2.5%	745	9.6%

Source: Agency budget justification and appropriations bills and reports.

All figures rounded to the nearest million. Changes calculated from unrounded figures.

Agency Highlights: National Aeronautics and Space Administration (NASA)

Space exploration was a major priority of the Trump Administration's FY 2021 request, with the Artemis program slated for a $3.5 billion increase above FY 2020 with the stated goal of returning U.S. astronauts to the moon by 2024. The bulk of this requested increase was for a human lander system, which would have received $2.7 billion above the FY 2020 spend plan level.

But in the final omnibus Congress largely turned down most of this request, instead providing the human lander with $850 million, a less than $200 million year-over-year increase. Congress provided the Lunar Gateway with a larger increase, though still $41 million below the request. The Space Technology Directorate received flat funding, rather than the requested $478 million increase (see following table).

Instead, legislators restored funding for the Science Mission Directorate, Space Launch System development, and the STEM Engagement Office, the latter of which had again been proposed for elimination. As part of the year-over-year increase for STEM Engagement, Congress provided Space Grant a $3 million increase and NASA EPSCoR and the Minority University Research Education Project with $2 million increases each.

In the Space Technology Directorate, Congress provided a $47 million increase above FY 2020 for RESTORE-L, and $100 million for nuclear thermal propulsion.

Science Mission Directorate (SMD). While Congress was unwilling to provide the requested multi-billion-dollar increase for human lunar exploration, legislators did provide the requested $152 million or 50.5% increase for robotic lunar exploration funded through Planetary Science. This included $22 million to continue the Lunar Reconnaissance Orbiter and the requested increase for Commercial Lunar Payload Services. In addition, Congress provided a $46 million increase for New Horizons, a $6 million increase for Planetary Defense, and the requested funding amount for the Europa Clipper mission, to be launched via a commercial vehicle and with no lander funding.

In Earth Science, Congress rejected the proposed cancellations to the PACE and CLARREO Pathfinder, and provided at least $335 million for research and analysis, $14 million above FY 2020 levels. Congress also provided the requested $41 million year-over-year increase for the Earth Science Venture Class missions.

Congress again spared from de-funding the Nancy Grace Roman Telescope (previously WFIRST) and the Stratospheric Observatory for Infrared Astronomy (SOFIA), funding each at or near FY 2020 levels. The Hubble telescope was provided a $2.5 million increase.

Heliophysics research and analysis was provided $280.8 million, $29 million above the FY 2020 spend plan and $50 million above the request. The Living With a Star and Solar Terrestrial Probes programs were both given moderate increases above FY 2020 levels.

The Biological and Physical Science line item ($79 million) was shifted from Space Operations.

National Aeronautics and Space Administration

(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Budget	**FY 2021 Final**	Change FY 20-21 Amount	Change FY 20-21 Percent	Change Request Amount	Change Request Percent
Earth Science	1,931	1,972	1,768	**2,000**	28	1.4%	232	13.1%
Heliophysics	713	725	633	**751**	27	3.7%	118	18.6%
Planetary Science	2,747	2,713	2,660	**2,700**	-13	-0.5%	40	1.5%
Astrophysics	1,191	1,306	831	**1,356**	50	3.8%	525	63.2%
Bio and Physical Science	- -	- -	- -	**79**	- -	- -	- -	- -
Total Science	6,887	7,139	6,307	**7,301**	162	2.3%	995	15.8%
Exploration Systems Development	4,087	4,583	4,042	**4,583**	0	0.0%	540	13.4%
Orion Program	1,350	1,407	1,401	**1,407**	0	0.0%	6	0.4%
Space Launch System (SLS)	2,144	2,586	2,257	**2,586**	0	0.0%	329	14.6%
Ground Systems	593	590	385	**590**	0	0.0%	205	53.4%
Exploration R&D	958	1,435	4,719	**1973**	538	37.5%	-2,747	-58.2%
Gateway	332	421	739	**699**	278	66.0%	-41	-5.5%
Lander	- -	654	3,370	**850**	196	29.9%	-2,520	-74.8%
Total Exploration	5,045	6,018	8,762	**6,555**	538	8.9%	-2,206	-25.2%
LEO and Spaceflight Operations	4,640	4,140	4,187	**3,988**	-152	-3.7%	-199	-4.8%
Aeronautics	725	784	819	**829**	45	5.7%	10	1.2%
Exploration Technology	927	1,100	1,578	**1,100**	0	0.0%	-478	-30.3%
STEM Engagement	110	120	0	**127**	7	5.8%	127	- -
Safety, Security, Mission Services	2,755	2,913	3,010	**2,937**	23	0.8%	-73	-2.4%
Construction and Environ Compliance	372	373	539	**390**	17	4.5%	-149	-27.6%
Inspector General	39	42	44	**44**	3	6.0%	0	0.0%
NASA Total	21,500	22,559	25,246	**23,271**	712	3.2%	-1,975	-7.8%

Source: Agency budget justification and appropriations bills and reports.

All figures rounded to the nearest million.

Other Agencies Notes.

Tables for the agencies cited below appear in the pages that follow.

Department of Agriculture (USDA). The Economic Research Service (ERS) and the Agricultural Research Service (ARS) were both again shielded from funding reductions. With a 5.5% overall increase to its primary Salaries & Expenses account, ARS was directed to sustain all intramural and extramural activities at least at FY 2020 levels. Legislators also directed ARS to expand its partnerships with historically black land-grants, and to develop a new multiyear plan for construction of new research facilities.

For the National Institute of Food and Agriculture, several grant and capacity programs aimed at minority-serving institutions (such as, for instance, Evans-Allen grants to 1890 institutions) were provided increases, while other programs were sustained at FY 2020 levels. The competitive Agriculture and Food Research Initiative was directed to prioritize regionally adapted, publicly held cultivar development, within its 2.4% year-over-year increase.

Note in the following USDA table, the Forest Service research account reflects a restructured budget in FY 2021, with operational expenses moved into a separate account. Appropriators included $3 million each for the Joint Fire Science program and for the Northeastern States Research Cooperative.

National Institute of Standards and Technology (NIST). The omnibus provides year-over-year increases of $6.5 million each for NIST's quantum science and AI activities, and a $1 million increase for forensic science. It sustains cybersecurity activities and Industrial Internet of Things activities at no less than FY 2020 levels. Appropriators provided $3 million for NIST to develop reference materials and test procedures for direct air capture technology. Legislators also direct NIST to pursue greater racial diversity in its workforce.

Within the $17 million for Manufacturing USA (see table), legislators provided $10 million to sustain NIST's manufacturing innovation institute, and $1.5 million for grants to develop technology roadmaps for promising advanced manufacturing clusters.

National Oceanic and Atmospheric Administration (NOAA) Research. As can be seen in the below table, NOAA's research office once again dodged sizable cuts, with appropriators providing each of its research programs with increases of $3 million to $13 million above FY 2020.

Competitive climate grants were saved from elimination and funding increased by $1 million. Climate laboratories and cooperative institutes were given a $9 million or 13.5% increase, and the Regional Integrated Sciences and Assessments (RISA) program was provided a $2.5 million increase.

For the Weather and Air Chemistry Research program, weather labs and cooperative institutes were provided a $3.5 million or 4.3% increase above FY 2020. U.S. Weather Research was also provided a $3.5 million (or 15.2%) increase, with a $5 million increase for the Earth Prediction Innovation Center (EPIC). Legislators provided NOAA with funding to establish a tornado warning improvement and extension program as requested, but increased this amount to $7.5 million, with $2 million of this to continue the southeastern U.S. tornado forecasting program VORTEX-SE, which had been slated for termination.

The Sea Grant program was again spared from elimination and provided a $1 million increase, as were ocean labs and institutes, and ocean exploration and research.

NOAA was also provided $15 million to continue its high-performance computing collaboration, which had been recommended for termination.

U.S. Geological Survey (USGS). Legislators provided USGS with $344 million more than requested, resulting in a $45 million or 3.5% increase from FY 2020 levels. The largest program increase is for Water Resources, which received a $29 million boost. Within this, legislators provided $16 million for the Next Generation Water Observing System, nearly double FY 2020 levels and over $10 million more than requested, and $9.5 million to develop other modeling and tools at the Hydrologic Instrumentation Facility. Water Resources Research Institutes and harmful algal bloom research were increased by $1 million and $1.5 million, respectively.

Within USGS Natural Hazards, a $4 million increase was provided to develop a landslide / tsunami hazard assessment in Prince William Sound, AK, and an associated early warning system.

Elsewhere, Congress rejected the steep proposed cuts to the Climate Adaptation Science Centers, instead providing a $3 million year-over-year increase. National Land Imaging program was provided an $8 million increase.

Environmental Protection Agency (EPA). Similarly to USGS, legislators defended EPA Science and Technology from proposed FY 2021 cuts, but with even more limited program changes. Congress rejected the elimination of Science to Achieve Results (STAR) Grants, instead maintaining funding at FY 2020 levels of $28.6 million. Legislators also provided a $2 million increase for PFAS-related activities to $20 million total, and restored funding for the Atmospheric Protection Program.

Department of Homeland Security (DHS). DHS was provided the requested $19 million through the Science and Technology Directorate to proceed with closure and sale of the Plum Island Animal Disease Center, with construction of the new National Bio- and Agro-Defense Facility (NBAF) expected to be completed in late 2021.

University Centers of Excellence were spared reductions and provided a $2.2 million increase above FY 2020 levels. Funding for minority-serving institutions was increased by $1.8 million.

U.S. Department of Agriculture in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	**FY 2021 Final**	Change FY 20-21 Amount	Change FY 20-21 Percent	Change Request Amount	Change Request Percent
Agricultural Research Service (ARS)								
Salaries and Expenses	1,303	1,414	1,368	**1,492**	77	5.5%	124	9.1%
Buildings and Facilities	381	193	50	**36**	-157	-81.5%	-14	-28.6%
Total ARS	1,684	1,607	1,418	**1,527**	-80	-5.0%	110	7.7%
National Institute of Food and Agriculture (NIFA)								
Research and Education	928	963	1,068	**993**	30	3.1%	-75	-7.1%
Ag Food Research Init (AFRI)	415	425	600	**435**	10	2.4%	-165	-27.5%
Hatch Act	259	259	243	**259**	0	0.0%	16	6.5%
1890 Research	58	67	54	**73**	6	9.0%	19	35.6%
Cooperative Forestry	36	36	29	**36**	0	0.0%	7	24.7%
Extension Activities	506	527	485	**538**	12	2.3%	54	11.1%
Integrated Activities	38	38	38	**39**	1	2.6%	1	2.6%
Total NIFA	1,471	1,527	1,591	**1,570**	43	2.8%	-21	-1.3%
Economic Research Service	87	85	62	**85**	1	0.8%	23	37.6%
Nat'l Agricultural Stats Service	175	180	177	**184**	4	2.0%	6	3.6%
Census of Agriculture	45	45	46	**46**	1	2.2%	0	0.0%
Other Programs	129	135	131	**138**	3	1.9%	6	4.9%
Forest Service								
Forest and Rangeland Research*	300	305	249	**259**	- -	- -	9	3.8%

* FY 2021 funding levels reflect a restructured budget.

Source: Agency budget justification and appropriations bills and reports.

All figures rounded to the nearest million. Changes calculated from unrounded figures.

Department of Commerce in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Budget	**FY 2021 Final**	Change FY 20-21 Amount	Change FY 20-21 Percent	Change Request Amount	Change Request Percent
National Institute of Standards and Technology (NIST)								
Scientific & Tech Research and Services	725	754	652	**788**	34	4.5%	136	20.9%
Industrial Technology Services	155	162	25	**167**	5	2.8%	141	559.4%
Manufacturing USA / NNMI	15	16	25	**17**	1	3.1%	-9	-34.7%
Manufacturing Extension Partnership	140	146	0	**150**	4	2.7%	150	- -
Construction of Research Facilities	106	118	60	**80**	-38	-32.2%	20	32.8%
NIST Total	986	1,034	738	**1,035**	1	0.0%	297	40.3%
National Oceanic and Atmospheric Administration (NOAA) 1/								
National Ocean Service	680	606	381	**628**	22	3.6%	247	64.9%
National Marine Fisheries Service	906	948	842	**965**	17	1.8%	123	14.6%
Oceanic and Atmospheric Research	568	590	353	**614**	24	4.0%	261	74.1%
Climate Research	158	170	84	**182**	13	7.4%	98	116.9%
Ocean, Coastal, Great Lakes Research	218	229	113	**231**	3	1.3%	119	105.2%
Weather and Air Chemistry Research	139	134	115	**139**	6	4.3%	25	21.4%
High Performance Computing	53	59	41	**61**	3	4.3%	20	48.4%
National Weather Service	1,191	1,169	1,120	**1,204**	36	3.1%	84	7.5%
NESDIS 2/	1,689	1,513	1,504	**1,518**	6	0.4%	14	1.0%
GOES-R	407	304	335	**335**	30	10.0%	0	0.0%
Polar Weather Satellites	869	745	658	**658**	-87	-11.7%	0	0.0%
Office of Marine and Aviation Ops	323	342	332	**374**	31	9.1%	42	12.5%

Source: Agency budget justification and appropriations bills and reports.

All figures rounded to the nearest million. Changes calculated from unrounded figures.

1/ Line office figures include ORF and PAC funding.

2/ National Environmental Satellite, Data, and Information Service

U.S. Geological Survey in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
USGS Total	1,161	1,271	971	**1,316**	45	3.5%	344	35.5%
Ecosystems	229	252	127	**259**	8	3.0%	132	103.5%
Energy and Minerals	89	90	91	**90**	0	0.0%	-1	-1.3%
Natural Hazards	166	171	138	**175**	5	2.7%	37	27.2%
Water Resources	226	234	181	**263**	29	12.4%	82	45.5%
Core Science Systems	227	247	212	**253**	6	2.4%	41	19.2%
Science Support	103	97	94	**96**	-1	-1.1%	2	1.7%
Facilities	120	181	128	**179**	-2	-0.8%	52	40.5%

Source: Agency budget documents and appropriations bills and reports.

Figures rounded to nearest million. Changes calculated from unrounded figures.

Environmental Protection Agency in FY 2021 Appropriations

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Science and Technology	695	716	485	**729**	13	1.8%	245	50.5%
Clean Air	120	116	90	**119**	3	2.2%	28	31.2%
Homeland Security	29	33	34	**36**	3	8.0%	2	5.8%
Air and Energy	86	94	34	**95**	1	0.8%	62	184.0%
Safe and Sustainable Water	100	111	79	**112**	1	1.2%	33	42.2%
Sustainable Communities	135	132	59	**133**	1	0.4%	74	127.0%
Chem Safety	124	126	92	**127**	1	0.6%	35	38.6%
Superfund	1,210	1,185	1,079	**1,206**	21	1.8%	127	11.8%
Research: Chemical Safety	3	13	6	**13**	0	0.0%	7	108.2%
Research: Sust Communities	11	16	11	**16**	0	0.0%	5	43.8%
Oil Spill Response	17	20	17	**20**	1	2.6%	3	20.8%
Research: Sust Communities	1	1	1	**1**	0	0.0%	0	27.2%
Leaking Undergrd Storage Tanks	98	92	48	**92**	0	0.3%	44	91.2%
Environmental Progs and Mgmt	2,596	2,663	2,282	**2,762**	98	3.7%	479	21.0%
State and Tribal Assistance Grants	4,069	4,246	2,848	**4,314**	68	1.6%	1,466	51.5%
Buildings and Facilities	27	34	40	**34**	0	0.5%	-6	-14.7%
Inspector General	40	41	40	**44**	2	4.8%	4	9.2%
Total Discretionary Budget	8,800	9,057	6,704	**9,237**	180	2.0%	2,533	37.8%

Source: Agency budget documents and appropriations bills and reports.

Figures rounded to nearest million. Changes calculated from unrounded figures.

Department of Homeland Security R&D Programs in FY 2021 Appropriations
(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	Change FY 20-21		Change Request	
	Actual	Estimate	Budget	**Final**	Amount	Percent	Amount	Percent
Science & Technology Directorate	820	737	644	**766**	28	3.8%	122	18.9%
Operations and Support	309	315	285	**303**	-12	-3.9%	18	6.3%
Lab Facilities	122	123	123	**123**	0	0.1%	0	-0.2%
Procurement and Construction	- -	- -	19	**19**	- -	- -	0	0.0%
Lab Facilities	- -	- -	19	**19**	- -	- -	0	0.0%
Research and Development	511	422	340	**444**	22	5.1%	104	30.6%
Research, Dev, and Innovation	471	382	318	**399**	18	4.6%	81	25.5%
University Programs	41	41	22	**45**	4	9.9%	23	104.7%
Countering WMD Office	435	432	377	**402**	-30	-6.9%	25	6.7%
Research and Development	83	69	58	**65**	-4	-5.6%	7	12.2%
Other								
Coast Guard: RDT&E	20	5	5	**10**	5	107.6%	5	94.8%
Secret Service: R&D	3	12	12	**12**	-1	-4.2%	0	0.0%
Cybersecurity and Infrastructure Security Agency (CISA) R&D	13	14	6	**9**	-5	-34.6%	3	46.6%
Transp. Security Agency (TSA) R&D	21	23	30	**30**	7	28.9%	0	0.0%

Source: Agency budget justification and appropriations bills and reports.

All figures rounded to the nearest million. Changes calculated from unrounded figures.

Appendix: Estimated Total R&D by Agency

(estimated budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	**FY 2021 Final***	FY 2020 Change Amount	FY 2020 Change Percent	Request Change Amount	Request Change Percent
Defense	64,685	72,739	67,844	**71,998**	-741	-1.0%	4,153	6.1%
S&T (6.1-6.3)	15,317	16,062	14,070	**16,902**	840	5.2%	2,832	20.1%
All Other DOD	49,368	56,677	53,774	**55,096**	-1,581	-2.8%	1,322	2.5%
Health and Human Services	38,459	40,750	37,825	**41,874**	1,123	2.8%	4,049	10.7%
National Institutes of Health	37,094	39,485	36,915	**40,663**	1,177	3.0%	3,748	10.2%
All Other HHS	1,365	1,265	910	**1,211**	-54	-4.3%	301	33.1%
Energy	18,223	19,217	16,793	**21,413**	2,196	11.4%	4,620	27.5%
Atomic Energy Defense	7,306	7,752	8,627	**8,766**	1,014	13.1%	139	1.6%
Office of Science	6,517	6,923	5,760	**7,221**	298	4.3%	1,461	25.4%
Energy Programs	4,400	4,542	2,406	**5,426**	884	19.5%	3,020	125.5%
NASA	10,698	14,057	13,334	**12,836**	-1,221	-8.7%	-498	-3.7%
National Science Foundation	6,648	6,752	6,327	**6,987**	235	3.5%	660	10.4%
Agriculture	3,025	2,940	2,769	**2,844**	-96	-3.3%	75	2.7%
Commerce	1,957	1,940	1,498	**1,947**	7	0.4%	449	30.0%
NOAA	1,064	972	670	**997**	25	2.6%	327	48.7%
NIST	763	805	652	**822**	17	2.2%	170	26.1%
Transportation	1,033	1,097	979	**1,029**	-68	-6.2%	50	5.1%
Homeland Security	600	534	462	**579**	45	8.4%	117	25.3%
Veterans Affairs	1,370	1,313	1,351	**1,399**	86	6.6%	48	3.6%
Interior	958	974	726	**986**	12	1.3%	260	35.8%
US Geological Survey	640	661	461	**671**	10	1.6%	210	45.6%
Environ Protection Agency	490	493	319	**499**	6	1.2%	180	56.3%
Others	1,830	1,250	1,041	**1,075**	-175	-14.0%	34	3.2%
Total R&D	149,977	164,056	151,267	**165,463**	1,408	0.9%	14197	9.4%
Defense R&D**	72,004	80,506	76,478	**80,773**	268	0.3%	4296	5.6%
Nondefense R&D	77,973	83,550	74,789	**84,690**	1,140	1.4%	9901	13.2%
By Type								
Basic Research	39,352	43,351	40,573	**45,515**	2,164	5.0%	4942	12.2%
Applied Research	45,692	46,911	40,839	**48,245**	1,334	2.8%	7405	18.1%
Development	60,574	67,788	66,036	**66,937**	-851	-1.3%	902	1.4%
Facilities & Equipment	4,359	6,005	3,818	**4,766**	-1,239	-20.6%	947	24.8%

*AAAS estimates based on OMB and appropriations data. **Includes Defense Dept., NNSA, and DHS CISA

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2021 Basic Research by Agency
(budget authority in millions of dollars)

	FY 2019 Actual	FY 2020 Estimate	FY 2021 Request	**FY 2021 Final***	FY20 Change Amount	FY20 Change Percent	Request Change Amount	Request Change Percent
Defense	2,481	2,607	2,323	**2,675**	68	2.6%	352	15.2%
Health and Human Services	19,056	20,457	19,128	**21,474**	1,017	5.0%	2346	12.3%
National Institutes of Health	18,994	20,352	19,023	**21,376**	1,024	5.0%	2352	12.4%
All Other HHS	62	105	105	**99**	-6	-5.9%	-6	-5.9%
Energy	5,145	5,514	5,480	**6,153**	639	11.6%	673	12.3%
Atomic Energy Defense	132	139	172	**193**	54	38.8%	21	12.3%
Office of Science	4,965	5,325	4,734	**5,370**	45	0.8%	636	13.4%
Energy Programs	49	51	575	**591**	540	1064.0%	16	2.8%
NASA	4,948	6,880	6,110	**7,008**	128	1.9%	898	14.7%
National Science Foundation	5,212	5,322	5,018	**5,568**	246	4.6%	551	11.0%
Agriculture	1,213	1,264	1,256	**1,278**	14	1.1%	22	1.7%
Commerce	233	242	208	**252**	10	3.9%	43	20.9%
NIST	233	242	208	**252**	10	3.9%	43	20.9%
Transportation	0	16	18	**18**	2	12.5%	0	0.0%
Homeland Security	42	47	27	**34**	-13	-27.3%	7	26.5%
Veterans Affairs	600	559	576	**596**	37	6.7%	20	3.6%
Interior	80	82	65	**85**	3	3.6%	21	32.0%
Others	343	360	364	**373**	13	3.5%	9	2.4%
Total Basic Research	39,352	43,351	40,573	**45,515**	2,164	5.0%	4942	12.2%

*AAAS estimates based on OMB and appropriations data.

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2021 Applied Research by Agency

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	FY20 Change		Request Change	
	Actual	Estimate	Request	**Final***	Amount	Percent	Amount	Percent
Defense	8,892	9,297	6,784	**9,829**	532	5.7%	3045	44.9%
Health and Human Services	19,084	19,993	18,311	**20,132**	139	0.7%	1821	9.9%
National Institutes of Health	17,883	18,903	17,576	**19,087**	184	1.0%	1511	8.6%
All Other HHS	1,201	1,090	735	**1,045**	-45	-4.1%	310	42.2%
Energy	8,252	8,351	6,937	**8,980**	629	7.5%	2043	29.5%
Atomic Energy Defense	5,030	5,464	5,754	**5,843**	379	6.9%	88	1.5%
Energy Programs	3,222	2,887	1,183	**3,137**	250	8.7%	1954	165.2%
NASA	2,743	3,002	3,409	**3,018**	16	0.5%	-391	-11.5%
National Science Foundation	784	807	787	**852**	45	5.6%	65	8.3%
Agriculture	1,125	1,154	1,150	**1,193**	39	3.4%	43	3.7%
Commerce	979	1,037	801	**1,100**	63	6.1%	299	37.3%
NOAA	542	576	379	**612**	36	6.2%	233	61.5%
NIST	384	393	337	**421**	27	6.9%	84	24.9%
Transportation	684	710	661	**703**	-7	-1.0%	42	6.3%
Homeland Security	203	165	71	**92**	-73	-44.2%	21	29.7%
Veterans Affairs	738	725	745	**772**	47	6.4%	27	3.6%
Interior	710	717	533	**735**	18	2.5%	202	37.8%
US Geological Survey	459	476	323	**488**	11	2.3%	164	50.7%
Environ Protection Agency	414	415	249	**420**	5	1.2%	171	68.6%
Others	1,085	537	401	**419**	-118	-21.9%	18	4.5%
Total Applied Research	45,692	46,911	40,839	**48,245**	1,334	2.8%	7405	18.1%

*AAAS estimates based on OMB and appropriations data.

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2021 Total Research by Agency

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	FY20 Change		Request Change	
	Actual	Estimate	Request	**Final***	Amount	Percent	Amount	Percent
Defense	11,373	11,905	9,107	**12,504**	600	5.0%	3398	37.3%
Health and Human Services	38,140	40,450	37,440	**41,607**	1,156	2.9%	4167	11.1%
National Institutes of Health	36,877	39,255	36,600	**40,463**	1,207	3.1%	3863	10.6%
All Other HHS	1,263	1,195	840	**1,144**	-51	-4.3%	304	36.2%
Energy	13,397	13,865	12,417	**15,133**	1,268	9.1%	2716	21.9%
Atomic Energy Defense	5,162	5,602	5,926	**6,035**	433	7.7%	110	1.8%
Office of Science	4,965	5,325	4,734	**5,370**	45	0.8%	636	13.4%
Energy Programs	3,270	2,938	1,757	**3,728**	790	26.9%	1970	112.1%
NASA	7,691	9,882	9,519	**10,026**	144	1.5%	507	5.3%
National Science Foundation	5,996	6,129	5,804	**6,420**	291	4.8%	616	10.6%
Agriculture	2,338	2,418	2,406	**2,471**	53	2.2%	64	2.7%
Commerce	1,211	1,279	1,010	**1,352**	73	5.7%	342	33.9%
NOAA	542	576	379	**612**	36	6.2%	233	61.5%
NIST	616	636	545	**672**	37	5.8%	127	23.3%
Transportation	684	726	679	**721**	-5	-0.7%	42	6.1%
Homeland Security	245	212	98	**126**	-86	-40.5%	28	28.8%
Veterans Affairs	1,338	1,284	1,321	**1,368**	84	6.5%	47	3.6%
Interior	790	800	598	**821**	21	2.6%	222	37.2%
US Geological Survey	459	476	323	**488**	11	2.3%	164	50.7%
Environ Protection Agency	414	415	249	**420**	5	1.2%	171	68.6%
Others	1,428	897	765	**792**	-105	-11.7%	27	3.5%
Total Research	85,044	90,262	81,413	**93,760**	3,498	3.9%	12,347	15.2%

*AAAS estimates based on OMB and appropriations data.

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2021 Development by Agency
(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	FY20 Change		Request Change	
	Actual	Estimate	Request	**Final***	Amount	Percent	Amount	Percent
Defense	53,290	58,981	58,738	**59,493**	512	0.9%	756	1.3%
Health and Human Services	76	35	35	**33**	-2	-6.1%	-2	-6.1%
All Other HHS	76	35	35	**33**	-2	-6.1%	-2	-6.1%
Energy	2,625	2,981	2,061	**3,002**	21	0.7%	940	45.6%
Atomic Energy Defense	1,535	1,519	1,777	**1,800**	281	18.5%	23	1.3%
Energy Programs	1,089	1,462	284	**1,202**	-260	-17.8%	918	323.0%
NASA	2,890	4,121	3,767	**2,775**	-1,346	-32.7%	-992	-26.3%
Agriculture	165	176	172	**185**	9	4.9%	13	7.3%
Commerce	263	264	199	**236**	-29	-10.8%	37	18.4%
NOAA	177	150	95	**144**	-5	-3.4%	50	52.3%
NIST	9	20	15	**32**	12	60.6%	17	109.3%
Transportation	310	332	269	**277**	-55	-16.5%	8	3.1%
Homeland Security	355	322	341	**429**	108	33.5%	89	26.0%
Veterans Affairs	32	29	30	**31**	2	7.1%	1	3.6%
Interior	162	172	126	**163**	-9	-5.2%	37	29.6%
Environ Protection Agency	75	77	69	**78**	1	1.1%	9	12.8%
Others	331	299	229	**236**	-63	-21.1%	7	3.0%
Total Development	60,574	67,788	66,036	**66,937**	-851	-1.3%	902	1.4%

*AAAS estimates based on OMB and appropriations data.

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

Note: The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.

FY 2021 R&D Equipment and Facilities by Agency

(budget authority in millions of dollars)

	FY 2019	FY 2020	FY 2021	**FY 2021**	FY20 Change		Request Change	
	Actual	Estimate	Request	**Final***	Amount	Percent	Amount	Percent
Defense	22	1,853	0	**0**	-1,853	-100.0%	0	- -
Health and Human Services	243	265	350	**234**	-31	-11.7%	-116	-33.1%
National Institutes of Health	217	230	315	**200**	-30	-13.0%	-115	-36.5%
All Other HHS	26	35	35	**34**	-1	-2.5%	-1	-2.5%
Energy	2,201	2,371	2,314	**3,278**	907	38.3%	964	41.7%
Atomic Energy Defense	608	631	924	**931**	300	47.5%	7	0.7%
Office of Science	1,552	1,598	1,026	**1,851**	253	15.8%	825	80.4%
Energy Programs	41	142	364	**496**	354	249.1%	132	36.3%
NASA	117	54	48	**35**	-19	-35.6%	-13	-27.6%
National Science Foundation	652	623	523	**567**	-57	-9.1%	44	8.4%
Agriculture	522	347	191	**189**	-158	-45.5%	-2	-1.1%
Commerce	483	396	289	**359**	-37	-9.3%	70	24.4%
NOAA	345	247	197	**241**	-6	-2.3%	44	22.4%
NIST	138	150	92	**118**	-31	-21.0%	26	28.7%
Transportation	40	39	31	**31**	-8	-20.6%	0	0.4%
Homeland Security	0	0	23	**23**	23	- -	0	0.0%
Interior	6	2	2	**2**	0	17.3%	0	17.3%
Environ Protection Agency	1	1	1	**1**	0	1.2%	0	1.2%
Others	71	54	47	**47**	-7	-13.2%	0	-0.2%
Total R&D Equip. and Facilities	4,359	6,005	3,818	**4,766**	-1,239	-20.6%	947	24.8%

*AAAS estimates based on OMB and appropriations data.

Source: OMB and agency R&D data and appropriations data. Does not include emergency FY 2020 R&D spending for COVID-19.

Note: The projected GDP inflation rate between FY 2020 and FY 2021 is 2.0 percent.

All figures are rounded to the nearest million. Changes calculated from unrounded figures.