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DOE's Office of Science and the FY2016 Budget Request

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Summary

The Department of Energy's Office of Science conducts basic research in six overarching program areas: advanced scientific computing research, basic energy sciences, biological and environmental research, fusion energy sciences, high-energy physics, and nuclear physics. Through primarily these programs, the Department of Energy was the third-largest federal funder of basic research and the largest federal funder of research in the physical sciences in FY2014.

This budget and appropriations tracking report describes selected major items from the Administration's FY2016 budget request for the Office of Science and tracks legislative action on FY2016 appropriations for the office. It also provides selected historical funding data. This report has been updated to include House-passed and Senate-proposed amounts for FY2016. It will be updated to include Senate-passed (if available) and final enacted FY2016 appropriations.

Overall, the Obama Administration requests $5.340 billion for Science in FY2016, a $272 million (5%) increase over the FY2015 enacted level of $5.068 billion. By dollar amount, the largest increase is for Basic Energy Sciences (BES), which would gain $116 million (7%). The largest decrease is for Fusion Energy Sciences (FES), which would be reduced by $48 million (-10%). By percentage, the largest increase among Science's research programs would go to Advanced Scientific Computing Research (ASCR), which would receive $80 million (15%) more in FY2016.

The House-passed Energy and Water Development and Related Agencies Appropriations Act, 2016 (H.R. 2028) would provide $5.100 billion for the Science account in FY2016. This amount is $29 million (1%) more than the FY2015 enacted funding level and $240 million (-4%) less than the Administration's request. By dollar amount, the largest increase (over FY2015) in the House recommendation is for Basic Energy Sciences ($37 million). The largest percentage increase in the House recommendation is for Nuclear Physics (3%). Biological and Environmental Research would be reduced the most, measured by both amount and percentage change (-$54 million or -9%). The White House Office of Management and Budget issued a "Statement of Administration Policy" opposing H.R. 2028, in part due to Office of Science funding levels.

As amended and reported by the Senate Committee on Appropriations, H.R. 2028 would provide $5.144 billion for the Science account in FY2016. This amount is $73 million (1%) more than the FY2015 enacted funding level, $196 million (-4%) less than the FY2016 Administration request, and $44 million (1%) more than the House-passed funding level. By dollar amount, the largest increase (over FY2015) in the Senate Appropriations Committee recommendation is for Basic Energy Sciences ($111 million); by percentage, the largest increase is for Advanced Scientific Computing Research (15%). The largest decrease—by both amount and percentage—is for Fusion Energy Sciences ($197 million, -42%). The Senate Appropriations Committee recommends U.S. withdrawal from the international fusion energy project known as ITER.

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The Department of Energy's Office of Science conducts basic research in six overarching program areas: advanced scientific computing research, basic energy sciences, biological and environmental research, fusion energy sciences, high-energy physics, and nuclear physics. Through primarily these programs, the Department of Energy was the third-largest federal funder of basic research and the largest federal funder of research in the physical sciences in FY2014.[1]

This budget and appropriations tracking report describes selected major items from the Administration's FY2016 budget request for the Science account, which funds the Office of Science, and tracks legislative action on FY2016 appropriations. It also provides selected historical funding data.

Table 1 shows FY2014 current, FY2015 enacted, and FY2016 requested funding levels; as well as FY2016 House-passed and Senate Committee recommended funding levels for Office of Science programs. **Table 2** shows similar data for certain domestic scientific user facilities within the Fusion Energy Sciences program. These tables will be updated to include Senate-passed (if available) and final enacted FY2016 appropriations.

For a longer perspective, **Table 3** provides Office of Science funding data for FY2010 through the FY2016 request. **Figure 1** shows total Science funding in current and constant (FY2015) dollars between FY1998 and FY2015.[2] These trends do not adjust for policy changes or changes in the character of activities funded under the Science line.

Table 4 and **Table 5** summarize authorized funding levels for the Office of Science under certain proposed, but not yet enacted, reauthorization measures under consideration in the 114th Congress.

Science appropriations are typically included in annual Energy and Water Development and Related Agencies Appropriations acts. (CRS tracks these acts each fiscal year. See the "Appropriations Status Table" on CRS.gov, at http://www.crs.gov/Pages/AppropriationsStatusTable.aspx.) Science budget requests are published on the Office of Science website at http://science.energy.gov/budget/.

FY2016 Science Budget Request and Appropriations

The Obama Administration has requested $5.340 billion for Science in FY2016, a $272 million (5%) increase over the FY2015 enacted level of $5.068 billion. By dollar amount, the largest increase in the FY2016 Science budget request is for Basic Energy Sciences (BES), which would gain $116 million (7%). The largest decrease is for Fusion Energy Sciences (FES), which would decline by $48 million (-10%). By percentage, the largest increase among Science's research programs would go to Advanced Scientific Computing Research (ASCR), which would receive $80 million (15%) more in FY2016.

[1] Based on preliminary FY2014 data from Tables 7 and 22 of National Science Foundation, National Center for Science and Engineering Statistics, *Federal Funds for Research and Development: Fiscal Years 2012-14*, NSF 14-316 (September 2014).

[2] DOE established the Office of Science (as such) in FY2000. FY2000 budget documents provide comparable Science budget data back to FY1998.

The House-passed Energy and Water Development and Related Agencies Appropriations Act, 2016 (H.R. 2028) would provide $5.100 billion for Science in FY2016. This amount is $29 million (1%) more than the FY2015 enacted funding level and $240 million (-4%) less than the Administration's request. H.Rept. 114-91 (hereinafter referred to as the "House report" or "House recommendation") accompanied H.R. 2028 when it was reported by the House Committee on Appropriations. H.Rept. 114-91 specifies funding for certain Science programs and activities. By dollar amount, the largest increase (over FY2015) in the House recommendation is for Basic Energy Sciences ($37 million). The largest percentage increase in the House recommendation is for Nuclear Physics (3%). Biological and Environmental Research would be reduced the most, measured by both amount and percentage change (-$54 million or -9%). The White House Office of Management and Budget issued a "Statement of Administration Policy" opposing H.R. 2028 as passed by the House. Funding levels for the Office of Science were among several factors cited in the statement.[3]

As amended and reported by the Senate Committee on Appropriations, H.R. 2028 would provide $5.144 billion for the Science account in FY2016. This amount is $73 million (1%) more than the FY2015 enacted funding level, $196 million (-4%) less than the FY2016 Administration request, and $44 million (1%) more than the House-passed funding level. S.Rept. 114-54 (herein referred to as the "Senate report" or "Senate recommendation") accompanied H.R. 2028 when it was reported from the Senate Committee on Appropriations. S.Rept. 114-54 specifies funding for certain Science programs and activities. By dollar amount, the largest increase (over FY2015) in the Senate recommendation is for Basic Energy Sciences ($111 million); by percentage, the largest increase is for Advanced Scientific Computing Research (15%). The largest decrease—by both amount and percentage—would go to Fusion Energy Sciences ($197 million, -42%). The Senate Appropriations Committee recommends U.S. withdrawal from the international fusion energy project known as ITER.

The following sections highlight selected FY2016 initiatives, programs, and activities within Science research programs, as well as their FY2016 budget and appropriations status. These sections are not intended to provide a comprehensive view of each account, but rather focus mostly on large changes or on activities emphasized in House and Senate Appropriations Committee reports.

[3] Executive Office of the President, Office of Management and Budget, "Statement of Administration Policy: H.R. 2028—Energy and Water Development and Related Agencies Appropriations Act, 2016," April 28, 2015, at https://www.whitehouse.gov/sites/default/files/omb/legislative/sap/114/saphr2028r_20150428.pdf.

Table 1. Office of Science Appropriations, FY2014-FY2016

(budget authority in millions of dollars, rounded)

			FY2016			
	FY2014 Current	FY2015 Enacted	FY2016 Request	House-Passed	Senate-Report	Final
Advanced Scientific Computing Research	463.5	541.0	621.0	537.5	621.0	
Basic Energy Sciences	1,662.7	1,733.2	1,849.3	1770.3	1844.3	
Biological and Environmental Research	593.6	592.0	612.4	538.0	610.0	
Fusion Energy Sciences	495.9	467.5	420.0	467.6	270.2	
High Energy Physics	774.9	766.0	788.0	776.0	788.1	
Nuclear Physics	554.8	595.5	624.6	616.2	591.5	
Workforce Development for Teachers and Scientists	26.5	19.5	20.5	20.5	19.5	
Science Laboratories Infrastructure	97.8	79.6	113.6	89.9	113.6	
Safeguards and Security	87.0	93.0	103.0	103.0	-	
Program Direction	185.0	183.7	187.4	181.0	185.0	
SBIR/STTR (Science portion)[a]	128.5	-	-	-	-	
Subtotal	**5,070.2**[b]	**5,071.0**	**5,339.8**	**5,100.0**	**5,143.9**	
SBIR/STTR (DOE-wide transfer)[a]	64.7	-	-	-	-	
Use of prior year balances	-3.8	-	-	-	-	
Rescission of prior year balances	-	-3.3	-	4.7[c]	4.7[d]	
Total	**5,131.0**	**5,067.7**	**5,339.8**	**5,095.3**	**5,139.2**	

Source: Department of Energy, Office of Science, "Office of Science: FY2014-FY2016 Appropriations Summary," January 30, 2015, http://science.energy.gov/~/media/budget/pdf/sc-budget-request-to-congress/fy-2016/FY_2014-2016_SC_Funding_Summary.pdf; H.R. 2028, as passed by the House, and H.Rept.114-91; and H.R. 2028, as reported from the Senate Committee on Appropriations, and S.Rept. 114-54.

Notes: Items marked with a "-" are unspecified or otherwise undefined. Totals may not add due to rounding.

a. "SBIR/STTR (Science portion)" includes funding reprogrammed from within the Office of Science to support the SBIR/STTR programs. "SBIR/STTR (DOE-wide transfer)" includes funding transferred from other DOE accounts to Science for the SBIR/STTR programs. For more information about the SBIR/STTR programs, see CRS Report R43695, *Small Business Innovation Research and Small Business Technology Transfer Programs*, by (name redacted)

b. Includes a reduction of $4.6 million for the Office of Science share of a $7 million DOE-wide reduction for contractor foreign travel.

c. Section 310 of H.R. 2028, as passed by the House, would rescind $4.7 million in unobligated balances from prior years.

d. Section 308 of H.R. 2028, as amended and reported from the Senate Committee on Appropriations, would rescind $4.7 million in unobligated balances from prior years.

Advanced Scientific Computing Research (ASCR)

As described in the FY2016 Science budget request, ASCR's mission is to

> advance applied mathematics and computer science; deliver the most advanced computational scientific applications in partnership with disciplinary science; advance computing and networking capabilities; and develop future generations of computing hardware and tools for science, in partnership with the research community, including U.S. industry. The strategy to accomplish this has two thrusts: developing and maintaining world-class computing and network facilities for science; and advancing research in applied mathematics, computer science and advanced networking.[4]

For FY2016, the Administration seeks $621 million for ASCR, $80 million (15%) more than the FY2015 enacted funding level of $541 million. Most of this increase ($77 million) would go to High Performance Computing and Network Facilities, focused particularly on the Research and Evaluation Prototypes (REP) activity. REP funding will be used to further the design and development of exascale computing systems (i.e., node technologies, hardware, and software). Both Congress and the Administration have prioritized exascale computing in recent budget and appropriations cycles.[5] The FY2016 REP request also includes $10 million for the Computational Science Graduate Fellowship (CSGF), a $7 million increase from FY2015.

The House report recommends $538 million for ASCR in FY2016, $3 million (-1%) less than the FY2015 enacted funding level and $83 million (-15%) less than the request. Within this amount, the House report recommends $99 million for exascale computing activities. With respect to scientific user facility operations, the House report recommends the requested levels for both the Argonne Leadership Computing Facility (ALCF, $77 million) and the National Energy Research Scientific Computing Center at Lawrence Berkeley National Laboratory (NERSC, $76 million). The House report would provide $7 million more than the $94 million request for Oak Ridge Leadership Computing Facility (OLCF, $101 million). ALCF, NERSC, and OLCF received $80 million, $76 million, and $104 million, respectively, in FY2015 (enacted). The House report also recommends $176 million for Mathematical, Computational, and Computer Sciences Research, about the same as the FY2015 enacted level; and $8 million for the Computational Sciences Graduate Fellowship program, about $2 million less than the request.

The Senate report recommends $621 million (the requested level) for ASCR in FY2016. This amount is $80 million (15%) more than the FY2015 enacted level and $83 million (16%) more than the House recommendation. The Senate report also recommends $158 million for exascale activities within the Office of Science. Within the ASCR total, the Senate report recommends $104 million for the OLCF ($10 million more than the request and $3 million more than the House recommendation); $86 million for NERSC ($10 million more than both the request and House recommendation); and $38 million for the Energy Science Network (ESnet, same as the request).

[4] Department of Energy, "Science: Advanced Research Projects Agency–Energy," *Department of Energy FY2016 Congressional Budget Request*, vol. 4, February 2015, p. 17, at http://science.energy.gov/budget/.

[5] For example, see H.Rept. 113-486, which accompanied H.R. 4923 (Energy and Water Development Appropriations Bill, 2015), p. 118. See also, H.Rept. 113-135, which accompanied H.R. 2609 (Energy and Water Development Appropriations Bill, 2014), p. 106; and S.Rept. 113-47, which accompanied S. 1245 (Energy and Water Development Appropriations Bill, 2014), pp. 79, 93.

Basic Energy Sciences (BES)

Basic Energy Sciences (BES) supports

> fundamental research to understand, predict, and ultimately control matter and energy at the electronic, atomic, and molecular levels in order to provide the foundations for new energy technologies and to support DOE missions in energy, environment, and national security.[6]

The FY2016 Administration request for BES is $1.849 billion, $116 million (7%) more than the FY2015 enacted funding level of $1.733 billion. About half of the increase ($62 million) would go toward the next phase of the Linac Coherent Light Source–II (LCLS–II) construction and installation activities. Although this amount is slightly less than projected in FY2015, the FY2016 budget request includes projected increases in out-year costs.[7] The FY2016 BES request also seeks an increase of $10 million for Energy Frontier Research Centers (EFRCs, $110 million total request). It would maintain funding for the Batteries and Energy Storage, as well as the Fuels from Sunlight Energy Innovations Hubs at FY2015 levels ($24 million and $15 million, respectively).[8]

The House report recommends $1.770 billion for BES in FY2016, $37 million (2%) more than the FY2015 enacted funding level of $1.733 and $79 million (-4%) less than the request. Within this amount, the report would provide $192 million ($8 million below the request) for the LCLS-II.[9] In addition, the House report recommends $98 million ($12 million less than the request) for EFRCs and provides the requested levels for the two Energy Innovation Hubs. The Experimental Program to Stimulate Competitive Research (EPSCoR) would receive $14 million—$6 million more than the request and $4 million more than FY2015 enacted—under the House report. Computational Materials Sciences would receive $8 million, $4 million less than requested and equal to the FY2015 enacted funding level.

The Senate report recommends $1.844 billion for BES in FY2016. This amount is $111 million (6%) more than the FY2015 enacted level, $5 million (0%) less than the request, and $74 million (4%) more than the House recommendation. Within this amount, the Senate report would provide $126 million for the first full year of operations at the newly constructed National Synchrotron Light Source-II (NSLS-II) and $255 (the requested level) for High-Flux Neutron Sources. The Senate report recommends the requested levels for the two Energy Innovation Hubs and $20 million for EPSCoR ($11 million more than the request and $10 million more than FY2015 enacted).

Biological and Environmental Research (BER)

> The mission of the Biological and Environmental Research (BER) program is to support fundamental research and scientific user facilities to achieve a predictive understanding of

[6] *Department of Energy FY2016 Congressional Budget Request*, vol. 4, p. 43.

[7] Ibid, pp. 100-101.

[8] The FY2016 BES request indicates that a decision to renew (or not) the Fuels from Sunlight Hub for a final, five-year term would be made in January 2015. As of March 25, 2015, DOE had not announced a decision.

[9] The House report recommends $192 million for the BES construction line item. The only project requesting BES construction funds in FY2016 is the LCLS-II.

> complex biological, climatic, and environmental systems for a secure and sustainable energy future.[10]

For FY2016, the Administration seeks $612 million for BER, $20 million (3%) more than the FY2015 enacted funding level of $592 million. The largest requested increase in BER is for Climate and Earth System Modeling (CESM, $31 million increase). The largest requested increase within CESM is for the Climate Model Development and Validation activity ($18 million request). The Administration sought funding for a similarly titled activity in FY2015, but appropriators ultimately rejected that proposal.[11] The FY2016 BER budget request seeks a $6 million reduction in Biological Systems Science; within this line, Genomic Science would increase and most other activities would decrease.

The House report recommends $538 billion for BER in FY2016, $54 million (-9%) less than the FY2015 enacted funding level of $592 million and $74 million (-12%) less than the request. Section 523 of H.R.2028, as passed by the House, would prohibit the Department of Energy from using FY2016 funds for the Climate Model Development and Validation activity. The House report recommends $75 million, the same as the request and the FY2015 enacted funding level, for the three Bioenergy Research Centers.

The Senate report recommends $610 million for BER in FY2016. This amount is $18 million (3%) more than the FY2015 enacted level, about the same as the request, and $72 million (13%) more than the House recommendation. Like the House report, the Senate report also recommends the requested level ($75 million) for the three Bioenergy Research Centers. The Senate report recommends $294 million (the request) for Biological Systems Science and $316 million (close to the request) for Climate and Environmental Sciences.

Fusion Energy Sciences (FES)

Fusion Energy Sciences (FES) seeks to

> expand the fundamental understanding of matter at very high temperatures and densities and to build the scientific foundation needed to develop a fusion energy source. This is accomplished through the study of plasma, the fourth state of matter, and how it interacts with its surroundings.[12]

The FY2016 Administration request for FES is $420 million, $48 million (-10%) less than the FY2015 enacted funding level of $468 million. Most FES activities would decline or remain flat relative to FY2015. The only increase in the FES request is for the GPE/GPP/Infrastructure[13] line within the Burning Plasma Science: Foundations subprogram. Among other things, these funds would support facility and utility improvements associated with full National Spherical Torus Experiment Upgrade (NSTX-U) operations, as well as improvements to the Princeton Plasma Physics Laboratory Computer Center. In FY2015, FES signaled its intention to shutter the Massachusetts Institute of Technology's (MIT) Alcator C-Mod facility in late FY2016. The FY2016 budget request continues this planned shutdown.

[10] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 103.

[11] See the explanatory statement printed in the December 11, 2014, *Congressional Record*, p. H9701.

[12] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 131.

[13] The term "GPE" means General Purpose Equipment; "GPP" means General Plant Projects.

FES provides funding for the U.S. contribution to the ITER project. ITER is an international effort to design and build an experimental fusion reactor, which is currently under construction in France. According to DOE, ITER "aims to generate fusion power 30 times the levels produced to date and to exceed the external power applied to the plasma by at least a factor of ten."[14] Many U.S. analysts have expressed concern about ITER's cost, schedule, and management. The cost estimate for the U.S. contribution to ITER—which is 9.09% of the total project cost—has grown from between $1.45 billion and $2.2 billion in 2008 to between $4.0 billion and $6.5 billion under current assumptions.[15] Moreover, even the more recent cost estimates may not be reliable.[16] Criticism of the ITER project has generally focused on concerns about the international project, not U.S. ITER.[17] The Director-General of the international ITER project was replaced on March 5, 2015. An FY2015 draft Senate Appropriations Committee report recommended that the U.S. withdraw from ITER; the final FY2015 appropriations agreement included no such provision. The FY2016 request for the U.S. contribution to ITER is $150.0 million, equal to the FY2015 enacted level.

The House report recommends $468 million for FES in FY2016. This amount is equal to the FY2015 enacted funding level and $48 million (11%) more than the request. For ITER, the House recommends $150 million, the same as both the FY2015 enacted and FY2016 requested levels. However, the House report warns that the committee will reconsider its support for ITER if management reforms are not implemented. Other items in the House recommendation include $17.5 million for High Energy Density Laboratory Plasmas ($2 million less than FY2015 enacted and $11 million more than the FY2016 request); as well as close to enacted levels ($35 million) for Theory and Simulation.[18] The Administration seeks a $4 million reduction in this item.

The Senate report recommends $270 million for FES in FY2016. This amount is $197 million (-42%) less than both the FY2015 enacted funding level and House recommendation, and $150 million (-36%) less than the request. The Senate recommendation includes no funding for the U.S. contribution to ITER and would direct the Secretary of Energy to work with the Department of State to withdraw from the project. In addition, the Senate report would provide $2.8 million for heavy ion fusion science research at the Neutralized Drift Compression Experiment-II at Lawrence Berkeley National Laboratory.

Table 2 shows funding for selected domestic tokamak user facilities within the FES account in FY2015 (enacted) and the FY2016 request, as well as the House report recommendations. (The Senate report did not specify funding levels for these activities.) It will be updated to include Senate-passed amounts (if available) and final FY2016 appropriations.

[14] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 155.

[15] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 165.

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

[17] A sizeable portion of the U.S. contribution to the international ITER project is in the form of in-kind hardware that is designed and fabricated in the United States. These hardware contributions are managed by U.S. ITER, an Office of Science project hosted by Oak Ridge National Laboratory in Tennessee. More information about U.S. ITER is available at https://www.usiter.org/about/index.shtml.

[18] This item includes both Theory and Scientific Discovery through Advanced Computing (SciDAC). Theory received $25 million in FY2015 enacted; SciDAC received close to $10 million.

Table 2. Specified Funding for Selected FES User Facilities, FY2015-FY2016

(budget authority in millions of dollars, rounded)

User Facility[a]	FY2015 Enacted	FY2016 Request	House-Passed	Senate-Report	Final
DIII-D (total)	80.0	71.3	80.0	–	
Research	*36.1*	*32.0*	*35.0*	–	
Operations	*43.9*	*39.3*	*45.0*	–	
Alcator C-Mod (total)	22.3	18.0	18.0	–	
Research	*9.5*	*6.1*	*6.1*	–	
Operations	*12.8*	*11.9*	*11.9*	–	
NSTX-U (total)	66.8[b]	62.9	69.5	–	
Research	*28.5*	*26.0*	*30.5*	–	
Operations	*38.3*	*36.9*	*39.0*	–	

Source: FY2016 Office of Science congressional budget justification and H.Rept. 114-91.

Notes: Items marked with a "-" are unspecified or otherwise undefined. Totals may not add due to rounding.

a. The DIII-D National Fusion Facility is at General Atomics in San Diego, CA; Alcator C-Mod is at the Massachusetts Institute of Technology in Cambridge, MA; and the NSTX-U is at the Princeton Plasma Physics Laboratory in Princeton, NJ.

b. Excludes $3.5 million in Major Items of Equipment (MIE) capital equipment funding. This funding is limited-term funding. NSTX-U MIE funding ended in FY2015.

High Energy Physics (HEP)

The High Energy Physics (HEP) program examines

> how the universe works at its most fundamental level by discovering the elementary constituents of matter and energy, probing the interactions between them, and exploring the basic nature of space and time.[19]

The Administration seeks $788 million for HEP in FY2016, $22 million (3%) more than the FY2015 enacted funding level of $766 million. The FY2016 HEP budget request would make changes to HEP subprograms and activities in order to bring the HEP program into alignment with the recommendations of the Particle Physics Project Prioritization Panel (P5) report.[20] Among these changes is the "internationalization and re-scoping of the Long Baseline Neutrino Experiment" (LBNE), based on the Large Hadron Collider (LHC) project model.[21] The FY2016 LBNE request includes funding to make design changes in order to facilitate international participation.

[19] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 173.

[20] DOE and the National Science Foundation charged the High Energy Physics Advisory Panel (HEPAP) with convening the P5 in September 2013. In May 2014, HEPAP unanimously approved the P5 report. The report is available at http://science.energy.gov/hep/hepap/reports/.

[21] As described by the FY2016 budget request, the LHC model involves engaging foreign funding agencies to contribute in-kind to a host laboratory that would coordinate and integrate contributions. *Department of Energy FY2016 Congressional Budget Request*, v. 4, pp. 174, 205.

The FY2016 Administration request for HEP also seeks construction funding to continue the Muon to Electron Conversion Experiment (Mu2e) and would shift funding among the program's three major experimental areas—increasing funding for Energy Frontier Experimental Physics and Cosmic Frontier Experimental Physics, while decreasing funding for Intensity Frontier Experimental Physics by a similar amount.

The House report recommends $776 million for HEP in FY2016, $10 million (1%) more than the FY2015 enacted level and $12 million (-2%) less than the FY2016 request. The report notes that the committee "strongly supports" efforts to align the HEP program with the P5 report. The House recommendation would provide $22 million for the Long Baseline Neutrino Facility—including funding for both research and development (R&D) and engineering and design—and would adopt the Administration's proposed shift in funding among HEP's three major experimental areas in FY2016. Among other items in the House report, the recommendation also includes the requested levels for Mu2e ($40 million), Fermilab Accelerator Complex operations ($135 million), and Homestake Mine ($15 million).

The Senate report recommends $788 million for HEP in FY2016. This amount is $22 million (3%) more than the FY2015 enacted level, the same as the request, and $12 million (2%) more than the House recommendation. The Senate report also notes strong support for the Secretary's efforts to implement the recommendations of the P5 report. Within funds provided, the Senate report recommends $19 million for the Long Baseline Neutrino Facility ($3 million less than the House recommendation) and recommends funding for two major items of equipment: the Dark Energy Spectroscopic Instrument (DESI, $10 million) and the LUX ZEPLIN (LZ, $11 million).

Nuclear Physics (NP)

The mission of the Nuclear Physics (NP) program is "to discover, explore, and understand all forms of nuclear matter."[22] For FY2016, the Administration seeks $625 million for NP, $29 million (5%) over the FY2015 enacted funding level of $596 million. The request provides increases for research, facilities operations, and construction. In the construction account, a reduction for the 12 GeV Continuous Electron Beam Accelerator Facility (CEBAF) upgrade is as planned in the approved project profile.

The House report recommends $616 million for NP in FY2016, $21 million (3%) more than the FY2015 enacted level and $8 million (-1%) less than the FY2016 request. Included in the House recommendation is $100 million (the requested level) for CEBAF operations; $169 million for operations at the Brookhaven National Lab's Relativistic Heavy Ion Collider (RHIC); and $98 million for Facility for Rare Isotope Beams (FRIB) construction.

The Senate report recommends $592 million for NP in FY2016. This amount is $4 million (-1%) less than the FY2015 enacted level, $33 million (-5%) less than the request, and $25 million (-4%) less than the House recommendation. Within these funds, the Senate report recommends $95 million for FRIB ($3 million less than the House report) and $175 million ($6 million more than the House report) for the RHIC.

[22] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 235.

Workforce Development for Teachers and Scientists (WDTS)

The Workforce Development for Teachers and Scientists (WDTS) program mission is "to help ensure that DOE has a sustained pipeline of science, technology, engineering, and mathematics (STEM) workers."[23]

The FY2016 Administration request for WDTS is $21 million, $1 million (5%) more than the FY2015 enacted funding level. The request includes funding for Science Undergraduate Laboratory Internships (SULI), Community College Internships (CCI), Office of Science Graduate Student Research (SCGSR), the Visiting Faculty Program (VFP), Albert Einstein Distinguished Educator Fellowship, and the National Science Bowl. The FY2016 request includes increases for SULI, CCI, and the VFP. Other activities would be funded at FY2015 levels.

The House report recommends the requested level for WDTS in FY2016 ($21 million). The Senate report recommends the FY2015 enacted level ($20 million).

Historical Appropriations

Table 3 shows Office of Science current dollar appropriations from FY2010 to FY2014, as well as FY2015 enacted appropriations and the FY2016 request. The Office of Science subtotal (not including transfers from other accounts, or the use or rescission of prior-year balances) increased by $241 million (5%) between FY2010 and FY2014.[24] Most of the increase—$222 million or 92%—went to ASCR, BES, and FES. Funding for High Energy Physics was reduced by about -2% during this period.

Table 3. Office of Science Appropriations, FY2010-FY2016

(budget authority in millions of dollars, rounded)

	FY2010	FY2011	FY2012[a]	FY2013[b]	FY2014[c]	FY2015 Enacted	FY2016 Request
Advanced Scientific Computing	383.2	410.3	428.3	405.0	463.5	541.0	621.0
Basic Energy Sciences	1,599.0	1,638.5	1,644.8	1,551.3	1,662.7	1,733.2	1,849.3
Biological and Environmental Research	588.0	595.2	592.4	560.7	593.6	592.0	612.4
Fusion Energy Sciences	417.7	367.3	393.0	377.8	495.9	467.5	420.0
High Energy Physics	790.8	775.6	770.5	727.5	774.9	766.0	788.0
Nuclear Physics	522.5	527.7	534.6	507.2	554.8	595.5	624.6

[23] *Department of Energy FY2016 Congressional Budget Request*, v. 4, p. 285.

[24] This calculation does not compare against FY2015 enacted funding levels because FY2015 program funding levels do not reflect the reallocation of SBIR/STTR program funding within the Office of Science. At least with regard to SBIR/STTR, the most recent five-year period of comparable funding is FY2010 to FY2014.

	FY2010	FY2011	FY2012[a]	FY2013[b]	FY2014[c]	FY2015 Enacted	FY2016 Request
Workforce Development for Teachers and Scientists	20.7	22.6	18.5	17.5	26.5	19.5	20.5
Science Laboratories Infrastructure	127.6	125.7	111.8	105.7	97.8	79.6	113.6
Safeguards and Security	83.0	83.8	80.6	77.5	87.0	93.0	103.0
Program Direction	189.4	202.5	185.0	174.9	185.0	183.7	187.4
SBIR/STTR (Science Contribution)	107.4	108.4	114.1	116.1	128.5	–	–
Subtotal	**4,829.1**	**4,857.7**	**4,873.6**	**4,621.1**	**5,070.2**	**5,071.0**	**5,339.8**
SBIR/STTR (DOE-wide transfer)	60.2	54.6	61.3	60.1	64.7	–	–
Use of prior year balances	-153.0	-15.0	–	–	-3.8	–	–
Rescission of prior year balances	–	–	–	–	–	-3.3	–
Total	**4,963.9[d]**	**4,897.3**	**4,935.0**	**4,681.2**	**5,131.0**	**5,067.7**	**5,339.8**

Source: Office of Science annual budget requests to Congress and related materials from http://science.energy.gov/budget/.

Notes: "SBIR/STTR (Science Contribution)" includes funding reprogrammed from within the Office of Science to support the SBIR/STTR programs. "SBIR/STTR (DOE-wide transfer)" includes funding transferred from other DOE accounts to Science for the SBIR/STTR programs. For more information about the SBIR/STTR programs, see CRS Report R43695, *Small Business Innovation Research and Small Business Technology Transfer Programs*, by (name redacted)

a. The FY2012 column reflects the original Science appropriation minus the allocation of a DOE-wide general reduction for a contractor pay freeze.

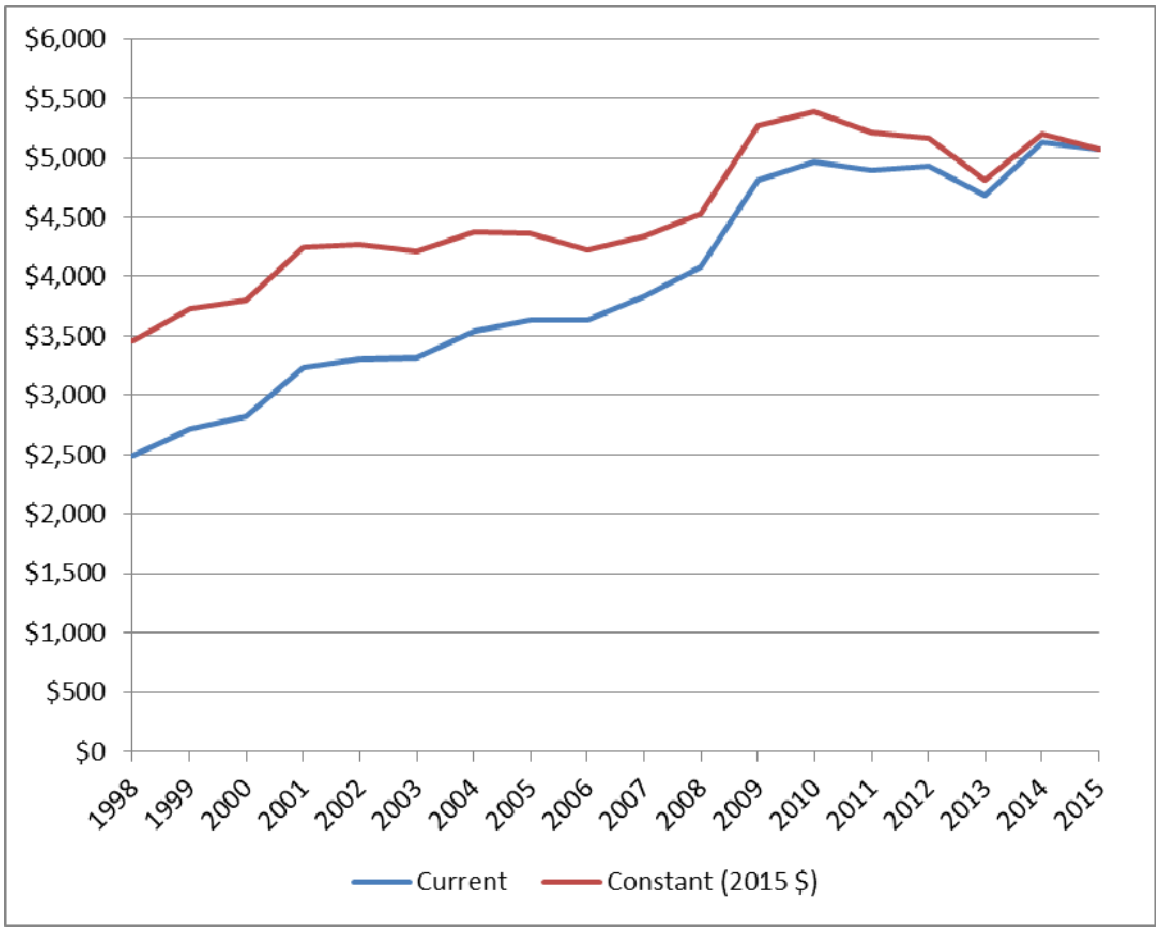
b. The FY2013 column includes the original appropriation and the allocation of a 5.2% reduction for the sequester and rescissions from P.L. 113-6 (Consolidated and Further Continuing Appropriations Act, 2013).

c. The FY2014 column contains a reduction of $4.6 million for the Science share of a $7 million DOE-wide reduction for contractor foreign travel.

d. This FY2010 total also includes $74.7 million in congressionally directed spending.

Figure 1. Office of Science Appropriations, FY1998-FY2015

(budget authority in millions of dollars, rounded)



Source: FY2000 to FY2016 Office of Science budget requests from the Office of Science, "Budget" website at http://science.energy.gov/budget/.

Notes: These trends do not adjust for changes in policy or in the character of Science activities over the examined time period. DOE may have increased or decreased program responsibilities—such as expanding or reducing the number of programs or changing the workload within programs—within this account during the observed period.

Authorizations of Appropriations

Appropriations authorizations to the Office of Science, which were last enacted in the America COMPETES Reauthorization Act of 2010 (P.L. 111-358), expired in FY2013. Members of the 114th Congress have introduced measures to reauthorize provisions from P.L. 111-358, including provisions that authorize appropriations to the Office of Science. An analysis of these bills may be found in CRS Report R43880, *The America COMPETES Acts: An Overview*, by (name redac ted). **Table 4** summarizes funding levels for the Office of Science under selected proposed reauthorization measures from the 114th Congress.

Table 4. Office of Science Funding Levels under Selected, Proposed Reauthorization Bills

(dollars in millions, rounded)

Bill	FY2016	FY2017	FY2018	FY2019	FY2020
America COMPETES Reauthorization Act of 2015 (H.R.1806)	5,339.8	5,339.8	-	-	-
America Competes Reauthorization Act of 2015 (H.R.1898)	5,339.8	5,606.8	5,887.1	6,181.5	6,490.6
Energy Title of America COMPETES Reauthorization Act of 2015 (S. 1398)	5,271.0	5,485.0	5,704.0	5,932.0	6,178.0

Source: America COMPETES Reauthorization Act of 2015 (H.R. 1806, as referred in Senate); America Competes Reauthorization Act of 2015 (H.R. 1898, as introduced); and Energy Title of America COMPETES Reauthorization Act of 2015 (S. 1398, as introduced).

Notes: Items marked with a "-" are unspecified or otherwise undefined. Totals may not add due to rounding

Unlike H.R. 1898 and S. 1398, H.R. 1806 specifies funding levels for major Science research programs (such as ASCR and FES). These amounts are included in **Table 5**, along with FY2015 enacted and FY2016 requested funding levels (for comparison).

Table 5. Office of Science Program Funding Levels: FY2015 Enacted, FY2016 Request, and under H.R. 1806

(millions of dollars, rounded)

Program	FY2015 Enacted	FY2016 Requested	H.R. 1806	
			FY2016	FY2017
Advanced Scientific Computing Research	541.0	621.0	621.0	621.0
Basic Energy Sciences	1,733.2	1,849.3	1,850.0	1,850.0
Biological and Environmental Research	592.0	612.4	550.0	550.0
Fusion Energy Sciences	467.5	420.0	488.0	488.0
High Energy Physics	766.0	788.0	788.0	788.0
Nuclear Physics	595.5	624.6	624.7	624.7
Workforce Development for Teachers and Scientists	19.5	20.5	20.5	20.5
Science Laboratories Infrastructure	79.6	113.6	113.6	113.6
Safeguards and Security	93.0	103.0	103.0	103.0
Program Direction	183.7	187.4	181.0	181.0
Total	**5,071.0**	**5,339.8**	**5,339.8**	**5,339.8**

Source: FY 2016 Office of Science congressional budget justification and America COMPETES Reauthorization Act of 2015 (H.R. 1806, as referred in Senate).

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