U.S. DEPARTMENT OF ENERGY | Office of Science

FY 2016 Budget Request to Congress for DOE's Office of Science

3 April 2015

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Acting Director, Office of Science

http://science.energy.gov/sc-2/presentations-and-testimony/

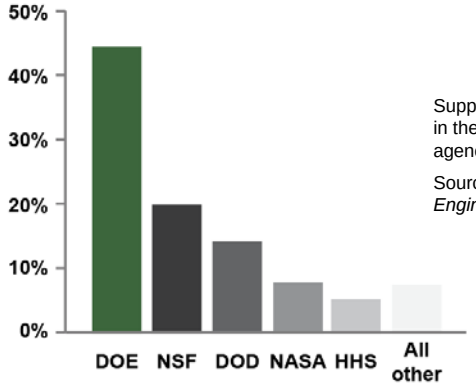
Office of Science
By the numbers

Shown is a portion of SLAC's two-mile-long linear accelerator (or linac), which provides the electron beam for the new Linac Coherent Light Source (LCLS) – the world's first hard x-ray, free-electron laser. For nearly 50 years, SLAC's linac had produced high-energy electrons for physics experiments. Now researchers use the very intense X-ray pulses (more than a billion times brighter than the most powerful existing sources) much like a high-speed camera to take stop-motion pictures of atoms and molecules in motion, examining fundamental processes on femtosecond timescales.

SC delivers scientific discoveries and tools to transform our understanding of nature and advance the energy, economic, and national security of the U.S.

Research

- Support for 47% of the U.S. Federal support of basic research in the physical sciences;
- ~22,000 Ph.D. scientists, grad students, engineers, and support staff at >300 institutions, including all 17 DOE labs;
- U.S. and world leadership in high-performance computing and computational sciences;
- Major U.S. supporter of physics, chemistry, materials sciences, and biology for discovery and for energy sciences.



Support for basic research in the physical sciences by agency.

Source: *NSF Science and Engineering Indicators 2012*

Scientific User Facilities

- The world's largest collection of scientific user facilities (aka research infrastructure) operated by a single organization in the world, used by 31,000 researchers each year.

Office of Science FY 2016 Budget Request to Congress

(Dollars in thousands)

	FY 2014 Enacted Approp. (prior to SBIR/STTR)	FY 2014 Current Approp.	FY 2015 Enacted Approp.	FY 2016 President's Request	FY 2016 President's Request vs. FY 2015 Enacted Appropriation	
Advanced Scientific Computing Research	478,093	463,472	541,000	620,994	+79,994	+14.8%
Basic Energy Sciences	1,711,929	1,662,702	1,733,200	1,849,300	+116,100	+6.7%
Biological and Environmental Research	609,696	593,610	592,000	612,400	+20,400	+3.4%
Fusion Energy Sciences	504,677	495,855	467,500	420,000	-47,500	-10.2%
High Energy Physics	796,521	774,920	766,000	788,000	+22,000	+2.9%
Nuclear Physics	569,138	554,802	595,500	624,600	+29,100	+4.9%
Workforce Development for Teachers and Scientists	26,500	26,500	19,500	20,500	+1,000	+5.1%
Science Laboratories Infrastructure	97,818	97,818	79,600	113,600	+34,000	+42.7%
Safeguards and Security	87,000	87,000	93,000	103,000	+10,000	+10.8%
Program Direction	185,000	185,000	183,700	187,400	+3,700	+2.0%
SBIR/STTR (SC)	.....	128,539	.....	.....	.....	.....
Subtotal, Office of Science	**5,066,372**	**5,070,218**	**5,071,000**	**5,339,794**	**+268,794**	**+5.3%**
SBIR/STTR (DOE)	.....	64,666	.....	.....	.....	.....
Subtotal, Office of Science	**5,066,372**	**5,134,884**	**5,071,000**	**5,339,794**	**+268,794**	**+5.3%**
Use of Prior Year Balances (SBIR)	.....	-3,846	.....	.....	.....	.....
Rescission of Prior Year Balances	.....	.....	-3,262	.....	+3,262	-100.0%
Total, Office of Science	**5,066,372**	**5,131,038**	**5,067,738**	**5,339,794**	**+272,056**	**+5.4%**

FY 2016 SC Budget Request by Category

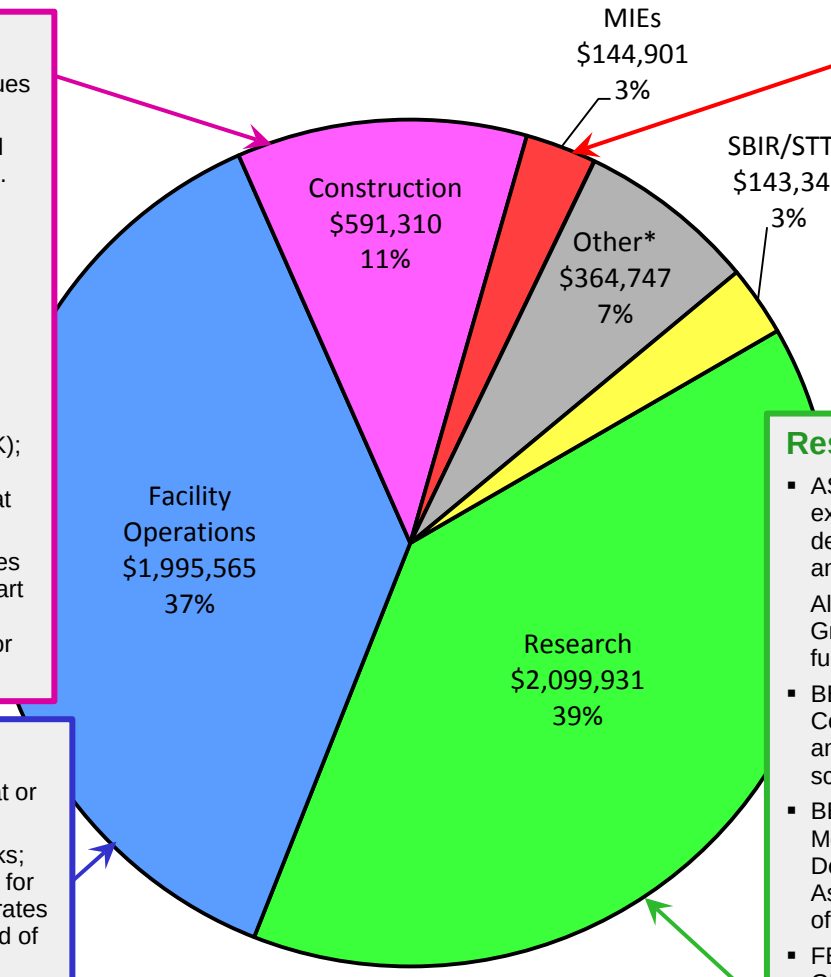
Dollars in Thousands

Construction

- BES: Linac Coherent Light Source-II continues and is in its peak funding year ($200,300K).
- FES: ITER – support for the USIPO, IO, and hardware fabrication continues ($150,000K).
- HEP: Long Baseline Neutrino Facility ($20,000K for PED); Muon to Electron Conversion ($40,100K).
- NP: FRIB continues and is at the peak of its funding profile ($100,000K); accelerator commissioning and detector construction of the CEBAF 12 GeV upgrade continue ($12,000K).
- SLI: Materials Design Lab at ANL ($23,910K); Photon Science Lab Building at SLAC ($25,000K); Integrative Genomics Building at LBNL ($20,000K).
- Also in SLI: "Infrastructure Support" increases by $31,100K for top priorities identified as part of the Campus Strategy discussions, for electrical upgrades at ANL and SLAC and for facility improvements at FNAL.

Facility Operations

- ASCR, BER, BES, HEP: Facilities operate at or near to optimal, >98%.
- FES: NSTX resumes operations for 14 weeks; DIII-D operates for 12 weeks until shutdown for installation of upgrades; Alcator C-Mod operates for 5 weeks prior to final shutdown at the end of FY 2016.
- NP: RHIC operates 22 weeks, same as in FY 2015 and has funding for capital equipment and spares; ATLAS operates 37 weeks; CEBAF is supported for continued machine development and commissioning of beam to Halls B and C.



*Other includes GPP/GPE amounts for BES, GPP for FES, Other (DOE/SC/Fermi/Lawrence) for NP, WDTS, SLI non-construction funding, S&S, and Program Direction.

Major Items of Equipment

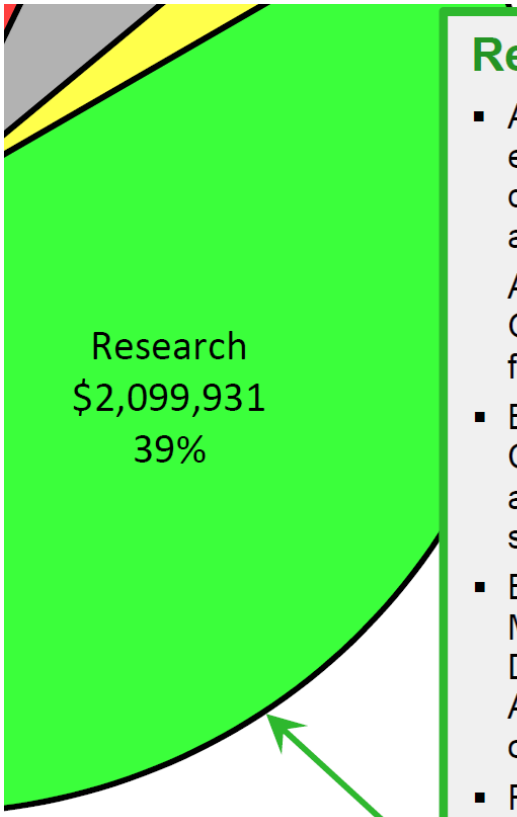
- BES: Advanced Photon Source Upgrade (APS-U) ($20,000K) and NSLS-II Experimental Tools (NEXT) (15,500K).
- HEP: LHC Detector Upgrades (ATLAS and CMS) ($9,500K each); Large Synoptic Survey Telescope camera (LSSTcam) ($40,800K); Muon g-2 ($10,200K); LUX-ZEPLIN ($9,000K); SuperCDMS-SNOLab ($2,000K); Dark Energy Spectroscopic Instrument (DESI) ($5,300K).

Research

- ASCR: There is a significant increase for the exascale initiative to support for HPC vendors to design and develop exascale node technologies and systems. (Δ = +$86,895K).

  Also in ASCR: The Computational Science Graduate Fellowship is restored at $10,000K to fully fund a new cohort!
- BES: Increases for EFRCs (Δ = +$10,000K), Computational Materials Sciences (Δ = +$4,000K), and mid-scale instrumentation for ultrafast electron scattering (Δ = +$5,000K).
- BER: Increases for Climate and Earth System Modeling with largest increase for Climate Model Development & Validation and Integrated Assessment. (Δ = +$18,730K). Some decreases offset the increases.
- FES: Research continues in all areas. Increase for GPP for PPPL in support of NSTX-U operations. HEDLP is reduced, but the Matter in Extreme Conditions end station at LCLS remains fully funded.
- HEP: Research funding is nearly flat with FY 2015 and supports scientific results from operating experiments and R&D for future projects.
- NP: Research increases by more than 8% to support high-priority work.

Research



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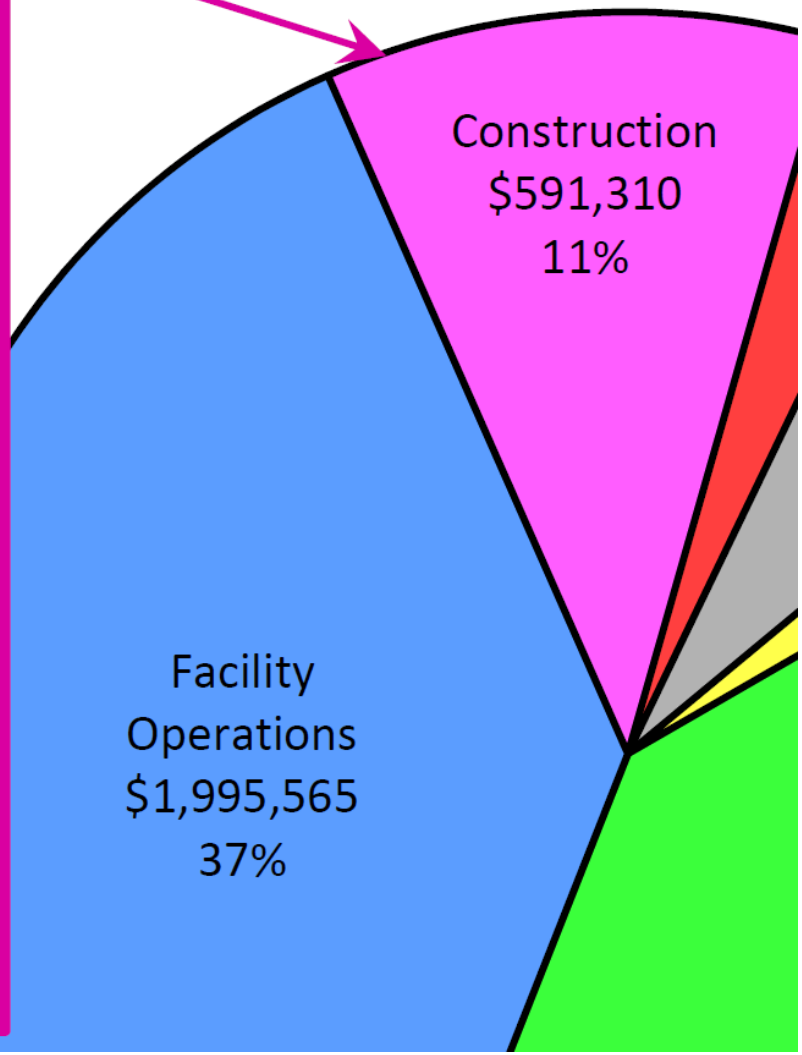

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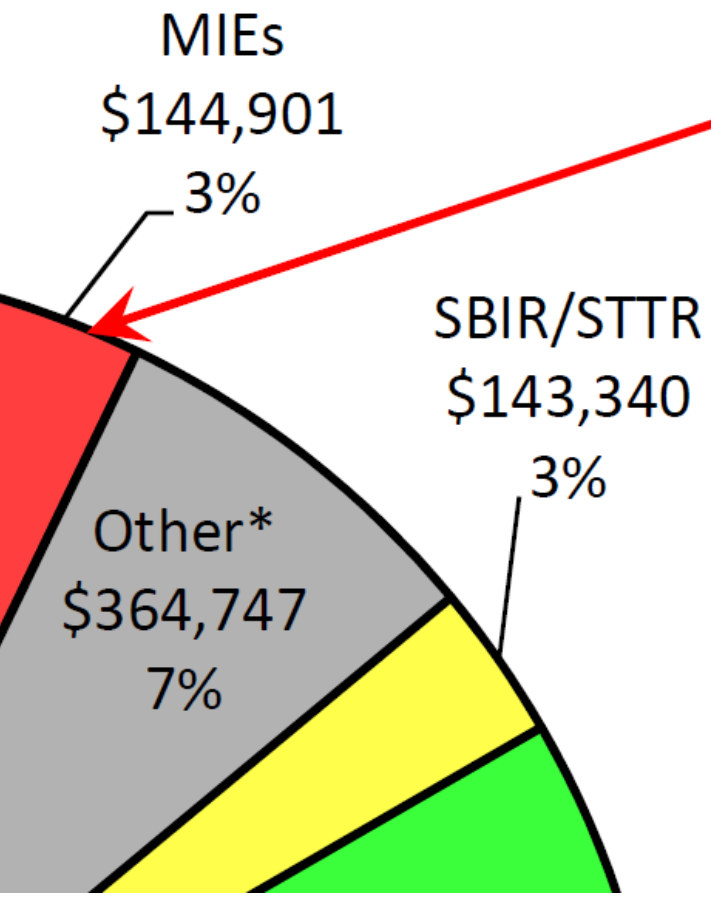

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Implementing the 2007 Long Range Plan

January 31, 2013

Because of the superb science lost in either shutting down RHIC or terminating construction on FRIB, the committee was not able to make a choice based on scientific merit alone. Based on additional considerations of timing of the budget crisis relative to the status of the ongoing construction initiative, the subcommittee vote, while closely split, resulted in a slight preference for the choice that proceeds with FRIB. This choice secures the significant non-ONP contributions that are critical to the cost-effective construction of FRIB, ensures a leading position for the U.S. in the central area of nuclear structure and nuclear astrophysics based on FRIB's unprecedented science capabilities.

This slight preference arises in the context of facility timelines and the approximate profile for FRIB construction, presented to the subcommittee as a snapshot of the field. If this budget exercise had occurred in a near future year, this snapshot would have changed, and the choice might well have been different.

Mr. SIMPSON. Okay. Dr. Dehmer, the nuclear physics program in your office will likely face some difficult tradeoffs between major facilities in the near future. There are currently two construction projects within this program, the upgrades for the accelerator facility at Thomas Jefferson Lab in Virginia, and the construction of the facility for rare isotope beams at Michigan State University.

While these two construction projects continue, operations continue at Brookhaven National Lab to run Relativistic Heavy Ion Collider (RHIC). A flat or shrinking budget within the nuclear physics program simply may not be able to support all of the activities at their desired levels.

While this year's request increases the nuclear physics program by $29 million, we have to think about priorities under a flat scenario.

Previous long-range plans have identified the upgrades at Jefferson Lab and the construction of the facilities for rare isotope beams as the highest priorities within nuclear physics.

Under a flat-budget scenario, the long-range plans recommended shutting down RHIC. In a flat-budget scenario, does this prioritization remain the same?