



U.S. DEPARTMENT OF
ENERGY

Office of
Science

Comments from the Office of Science

Briefing for NSAC
19 December 2013

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Acting Director, Office of Science
U.S. Department of Energy

Professor Lynn Orr – Nominee for S-4

Professor Franklin "Lynn" Orr has served as director of the Precourt Institute for Energy at Stanford University since 2009. The \$100 million Precourt Institute, founded by primary donors Jay Precourt and the husband-and-wife team of Thomas Steyer and Kat Taylor, draws talent from across the campus and around the world to develop sustainable energy solutions and search for ways to reduce atmospheric levels of carbon. The Precourt Institute and the TomKat Center for Sustainable Energy foster Stanford-wide, interdisciplinary research combining science and technology research with research on energy economics, policy, finance and the behavior of energy consumers. Prior to leading the Precourt Institute, Orr served as the founding director of the Global Climate and Energy Project at Stanford from 2002 to 2008.

Since 1985, Orr has been an associate professor and professor in Stanford's Department of Energy Resources Engineering (formerly the Department of Petroleum Engineering). He was dean of the School of Earth Sciences at Stanford from 1994 to 2002 and chairman of the Department of Petroleum Engineering from 1991 to 1994. Orr held several other research positions from 1970 to 1985 in New Mexico, Texas and Washington, D.C. He received his BS degree from Stanford University and PhD from the University of Minnesota.



Professor Lynn Orr

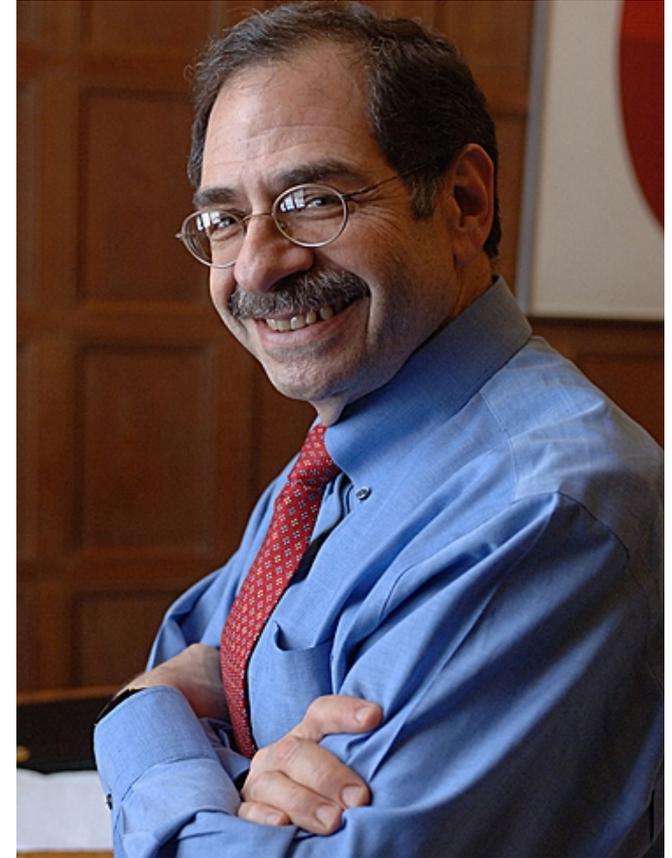
Professor Marc Kastner – Nominee for SC-1

Professor Marc Kastner is the dean of MIT's School of Science and the Donner Professor of Physics. He has been on the MIT faculty since 1973 and has led MIT's Department of Physics and its Center for Materials Science and Engineering.

MIT's School of Science, which Kastner has led since 2007, includes the departments of Biology; Brain and Cognitive Sciences; Chemistry; Earth, Atmospheric and Planetary Sciences; Mathematics; and Physics. The school is home to approximately 300 faculty, 1,200 graduate students, and 1,000 undergraduate majors.

Kastner's early research focused on the electronic and optical properties of amorphous semiconductors. In 1990, his research group fabricated the first semiconductor single-electron transistor; his group continues to use these devices as tools to study the quantum mechanical behavior of electrons confined to nanometer dimensions.

Kastner is a member of the NAS and American Academy of Arts and Sciences, and a fellow of the AAAS and the APS. He received a B.S. in chemistry, an M.S. in physics, and a Ph.D. in physics from the University of Chicago.

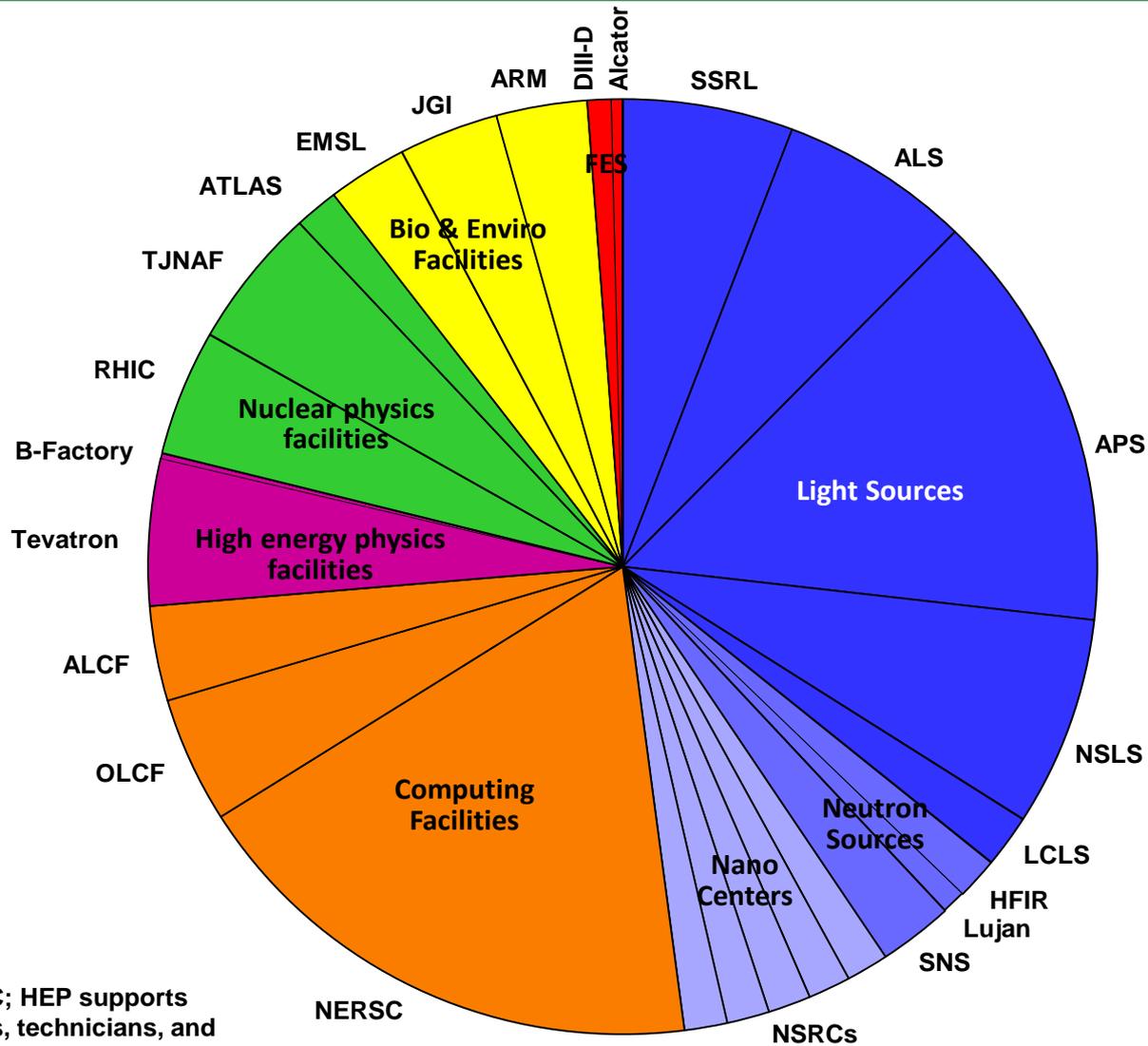


Professor Marc Kastner

Scientific User Facilities – A Few Facts

Distribution of Users at the ~30 SC Facilities 2013

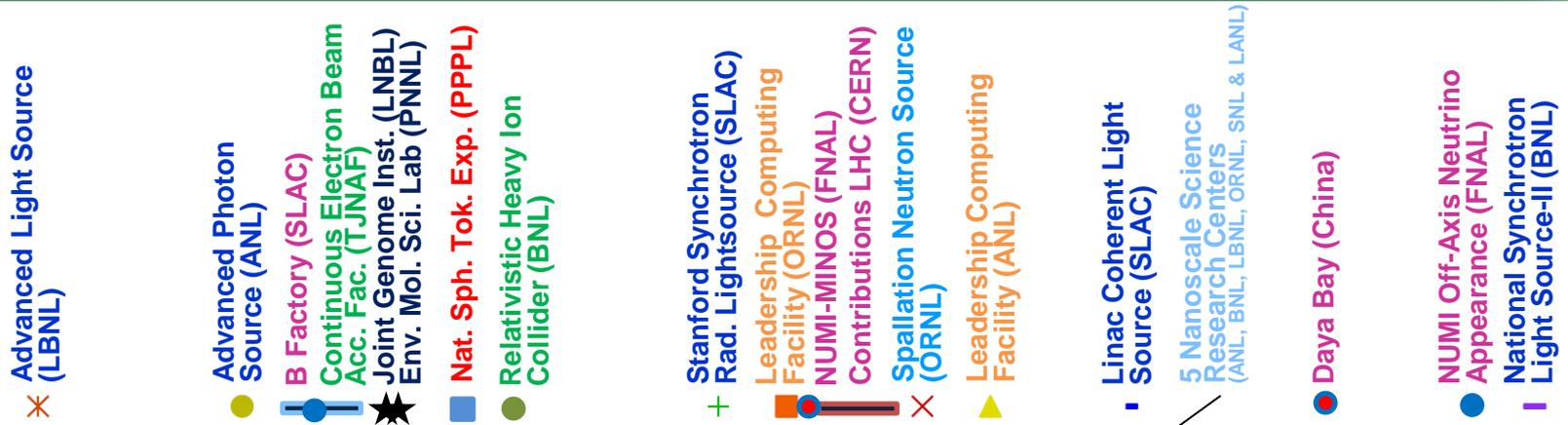
Nearly $\frac{3}{4}$ of users do their work at ASCR or BES facilities



Does not include LHC; HEP supports about 1,700 scientists, technicians, and engineers at the LHC.

A Summary of Terminated and New Major Facilities 1990-2015

New facilities

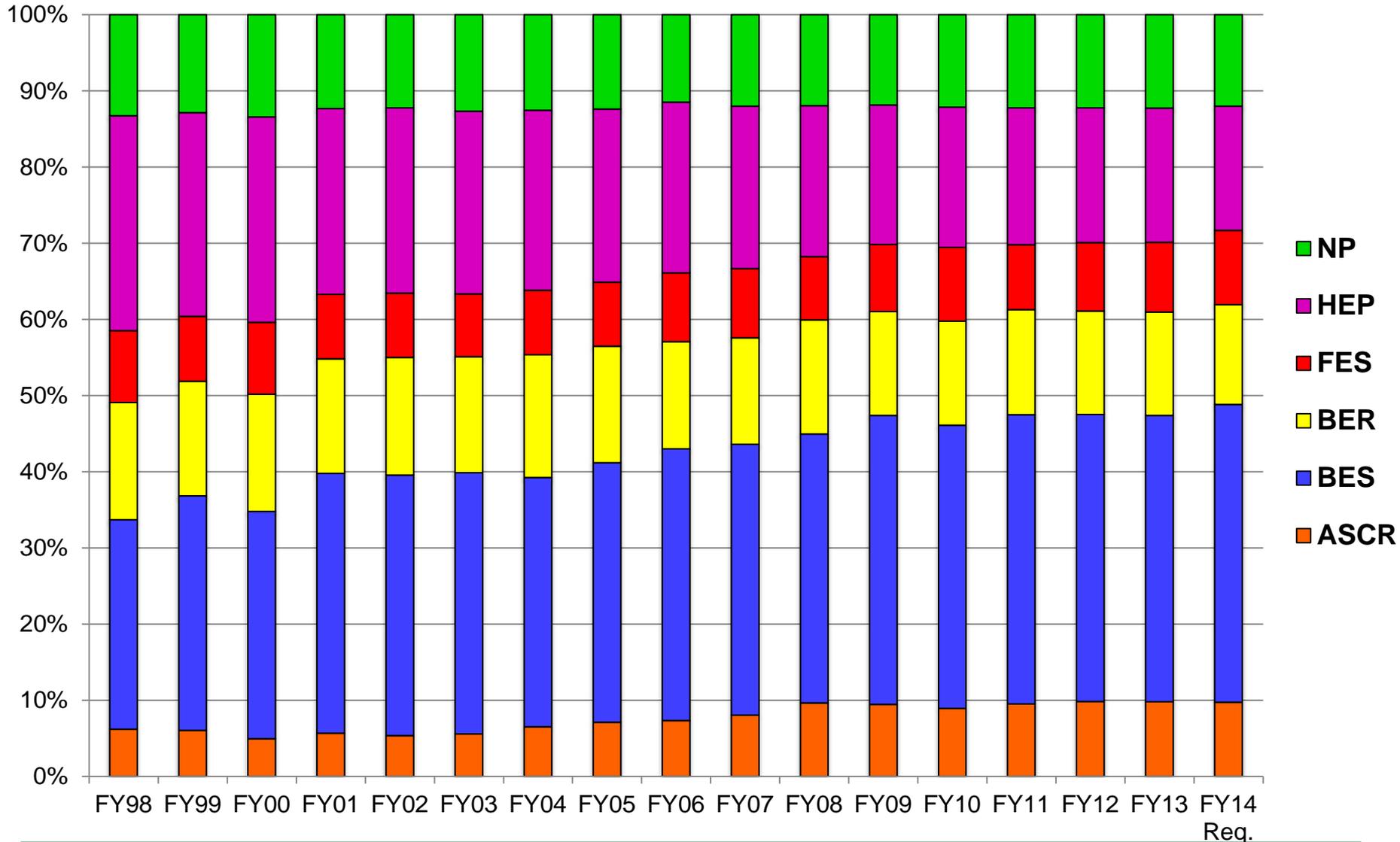


Terminated facilities

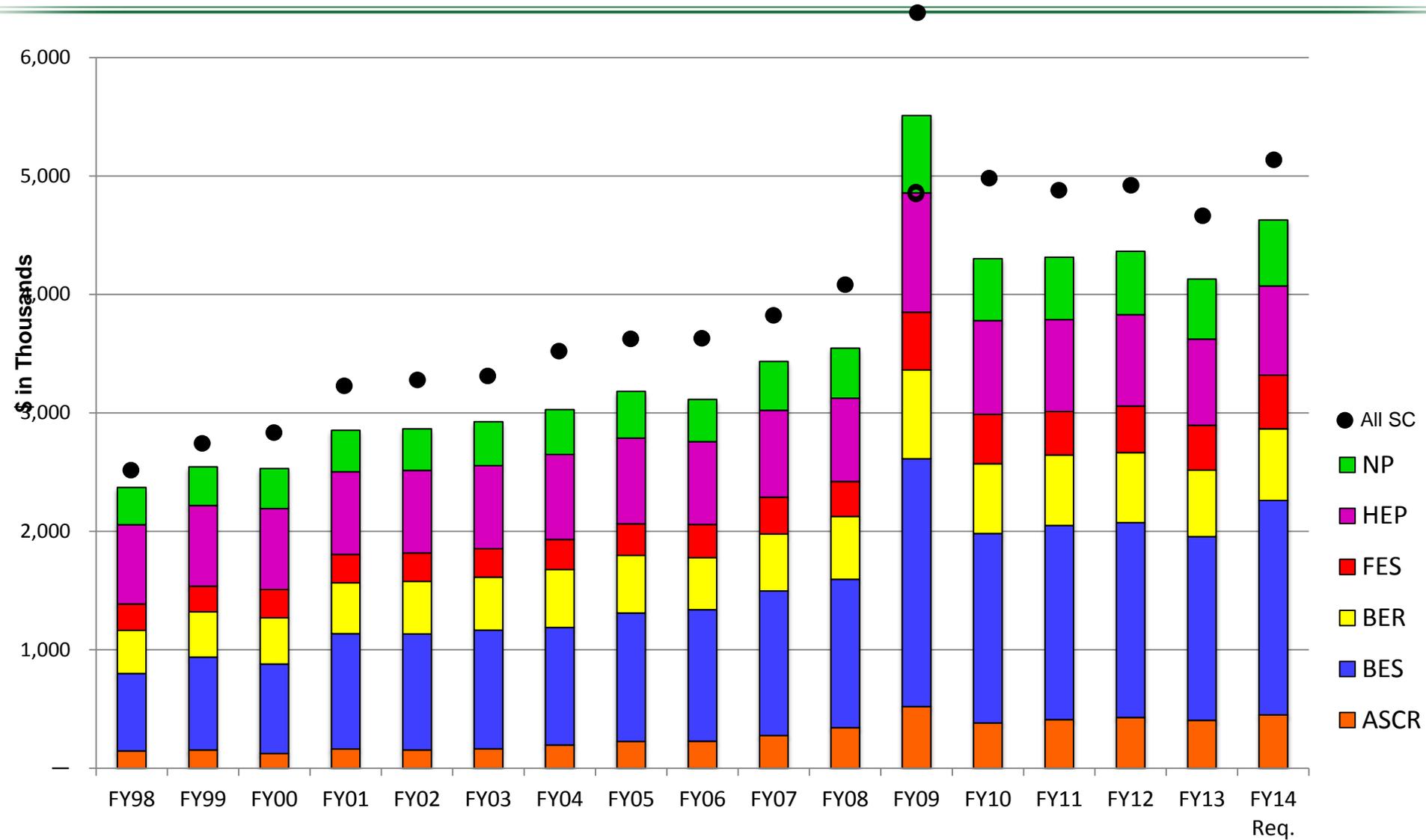
(Does not include facilities that were proposed but never started, e.g. BTeV, ILC,)



Major SC Program Funding (% of total) FY 1998-2014

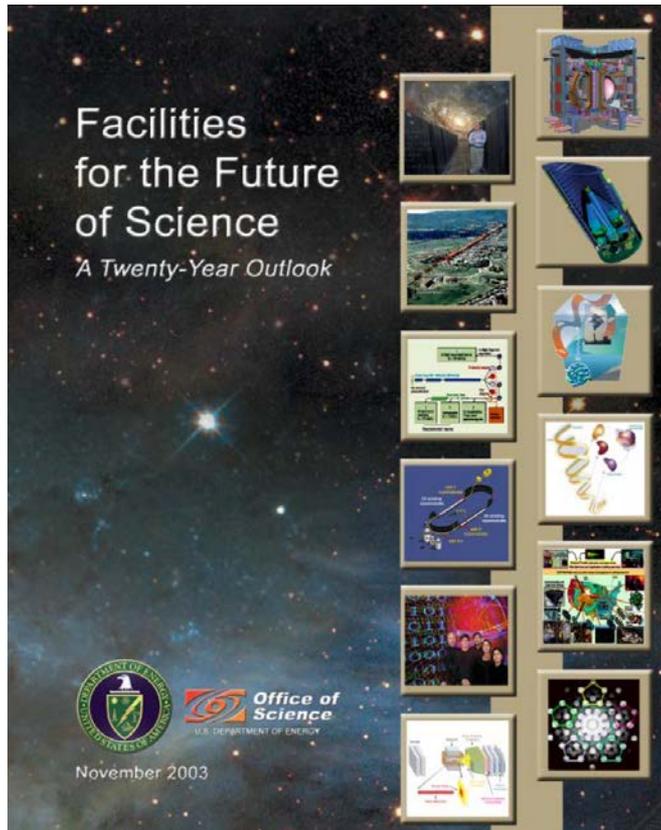


Office of Science Funding FY 1998-2014



**Facilities for the Future of Science:
A 20-year Outlook
(November 2003)**

Facilities for the Future of Science (2003)

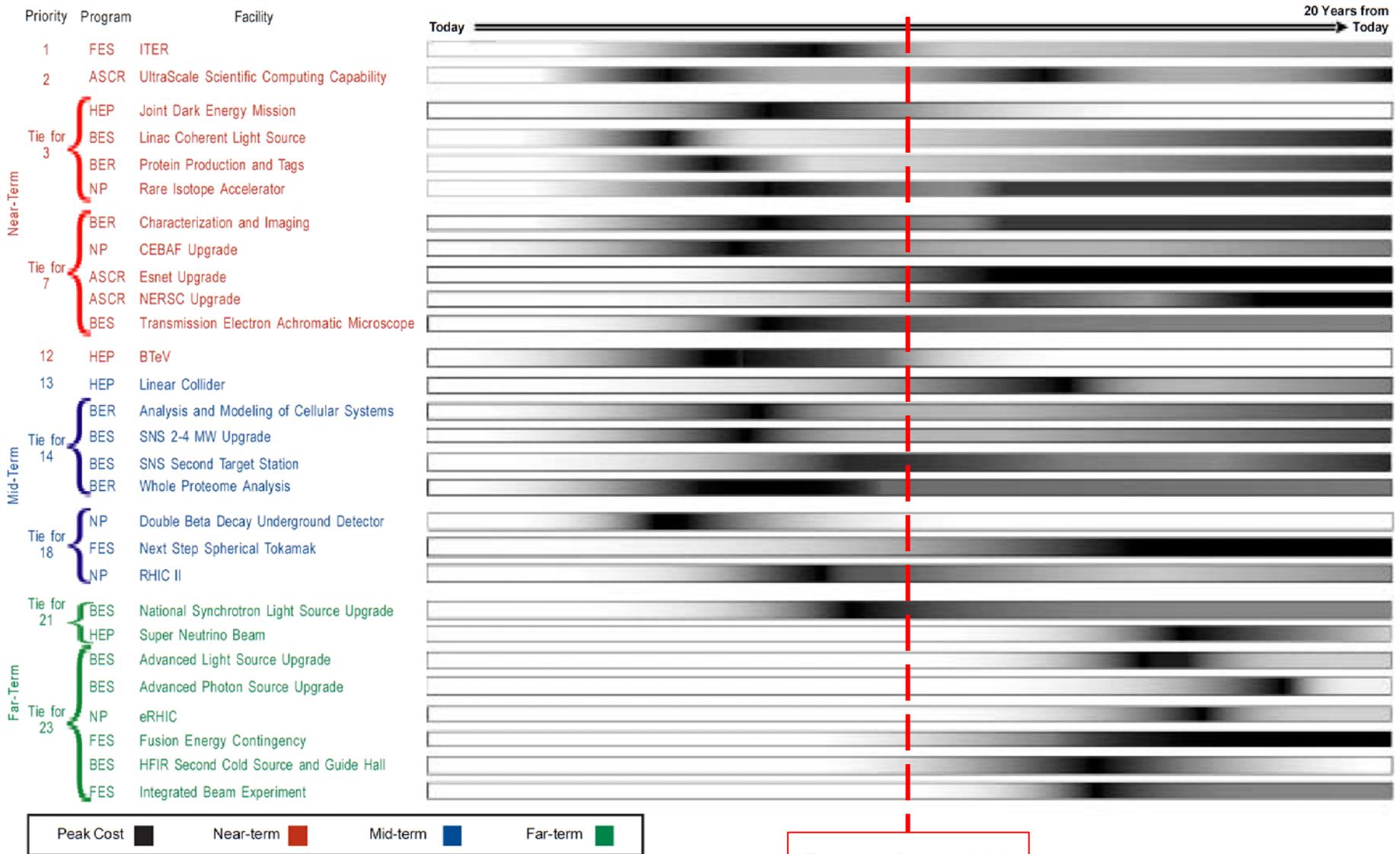


Paraphrasing FFS, “Today, the Department of Energy is building the Spallation Neutron Source, the last large-scale SC user facility under construction. And that raises the question that *Facilities for the Future of Science: A Twenty-Year Outlook* addresses: What facilities are needed next for scientific discovery?”

Funding envelopes were constructed from the “Bigget Bill” authorization levels for SC for FY 2004 through FY 2008 (replaced later by H.R. 6 and S. 14) and then a four percent increase in authorization level each following year until 2023.

H.R. 34, the “Energy and Science Research Investment Act of 2003,” aka the Bigget Bill, authorized an increase in funding for SC of ~60% from FY 2004 through FY 2007. The bill called for an increase of ~8% for FY 2004 followed by increases of 11%, 15%, and 15% in the following three years. The FY 2007 authorization level would have been \$5.31 B.





December 2013
We are here.

Programs:

- ASCR = Advanced Scientific Computing Research
- BES = Basic Energy Sciences
- BER = Biological and Environmental Research
- FES = Fusion Energy Sciences
- HEP = High Energy Physics
- NP = Nuclear Physics

Priority	Program	Facility	Status
1	FES	ITER Yes; ITER is underway
2	ASCR	UltraScale Scientific Computing Capability Yes; ANL and ORNL LCFs complete and are already upgraded
Near-Term	Tie for 3	HEP	Joint Dark Energy Mission No; terminated
		BES	Linac Coherent Light Source Yes; complete, awaiting Congressional approval for upgrade
		BER	Protein Production and Tags No; replaced with BRCs, which are not user facilities
		NP	Rare Isotope Accelerator Yes; replaced with less expensive FRIB, awaiting Congressional start
	Tie for 7	BER	Characterization and Imaging No; replaced with BRCs, which are not user facilities
		NP	CEBAF Upgrade Yes; upgrade in progress
		ASCR	Esnet Upgrade Yes; complete
		ASCR	NERSC Upgrade Yes; complete
		BES	Transmission Electron Achromatic Microscope... Yes; complete
	12	HEP	BTeV
13	HEP	Linear Collider No; terminated
Mid-Term	Tie for 14	BER	Analysis and Modeling of Cellular Systems No; replaced with BRCs, which are not user facilities
		BES	SNS 2-4 MW Upgrade No; power upgrade will be included in 2nd Target Station
		BES	SNS Second Target Station No; past CD-0 and CD-1 but cost precludes near-term start
		BER	Whole Proteome Analysis No; replaced with BRCs, which are not user facilities
	Tie for 18	NP	Double Beta Decay Underground Detector Partially; Majorana demonstrator operating, but not yet full exp.
Far-Term	Tie for 21	FES	Next Step Spherical Tokamak No, NSTX upgrade was pursued following NCSX termination due to cost overruns
		NP	RHIC II Yes, luminosity upgrade complete at a fraction of the cost & within operating budget
	Tie for 23	BES	National Synchrotron Light Source Upgrade ... Yes, NSLS-II will commission in FY 2014
		HEP	Super Neutrino Beam Partially; NOvA is near complete, but not yet LBNE
		BES	Advanced Light Source Upgrade No
		BES	Advanced Photon Source Upgrade No
		NP	eRHIC No
FES	Fusion Energy Contingency No		
BES	HFIR Second Cold Source and Guide Hall No		
FES	Integrated Beam Experiment No		

**“Prioritization of Scientific
Facilities to Ensure Optimal Benefit
from Federal Investments”
(October 2013)**

FY2012-2013 SC Priority Goal

From OMB to DOE/SC

Prioritization of scientific facilities to ensure optimal benefit from Federal investments. By September 30, 2013, formulate a 10-year prioritization of scientific facilities across the Office of Science based on (1) the ability of the facility to contribute to world-leading science, (2) the readiness of the facility for construction, and (3) an estimated construction and operations cost of the facility.

Steps in Addressing the Priority Goal

- Funding levels allowed the SC Associate Directors some flexibility but did not permit the growth seen in the Biggert Bill. It is recognized that even COL growth may be optimistic.
- The ADs prepared draft lists of facilities needed for scientific leadership in their programs to 2024. In general, upgrades or new facilities were >\$100M.
- Lists were submitted to the respective Federal Advisory Committees, which could add facilities at their discretion. They were asked to rate each facility on:
 - The ability of the facility to contribute to world-leading science in one of these categories: Absolutely Central; Important; Lower priority; or Don't know enough yet
 - The readiness of the facility for construction in one of these categories: Ready to initiate construction; Scientific/engineering challenges to resolve before initiating construction; or Mission and technical requirements not yet fully defined
- Facilities were grouped in bins, but they were not numerically ranked.
- This activity provides *input to decisions* on scientific priorities, i.e., it provides a snapshot of the full scope of projects under consideration by the six SC program offices and the financial requirements of those projects.