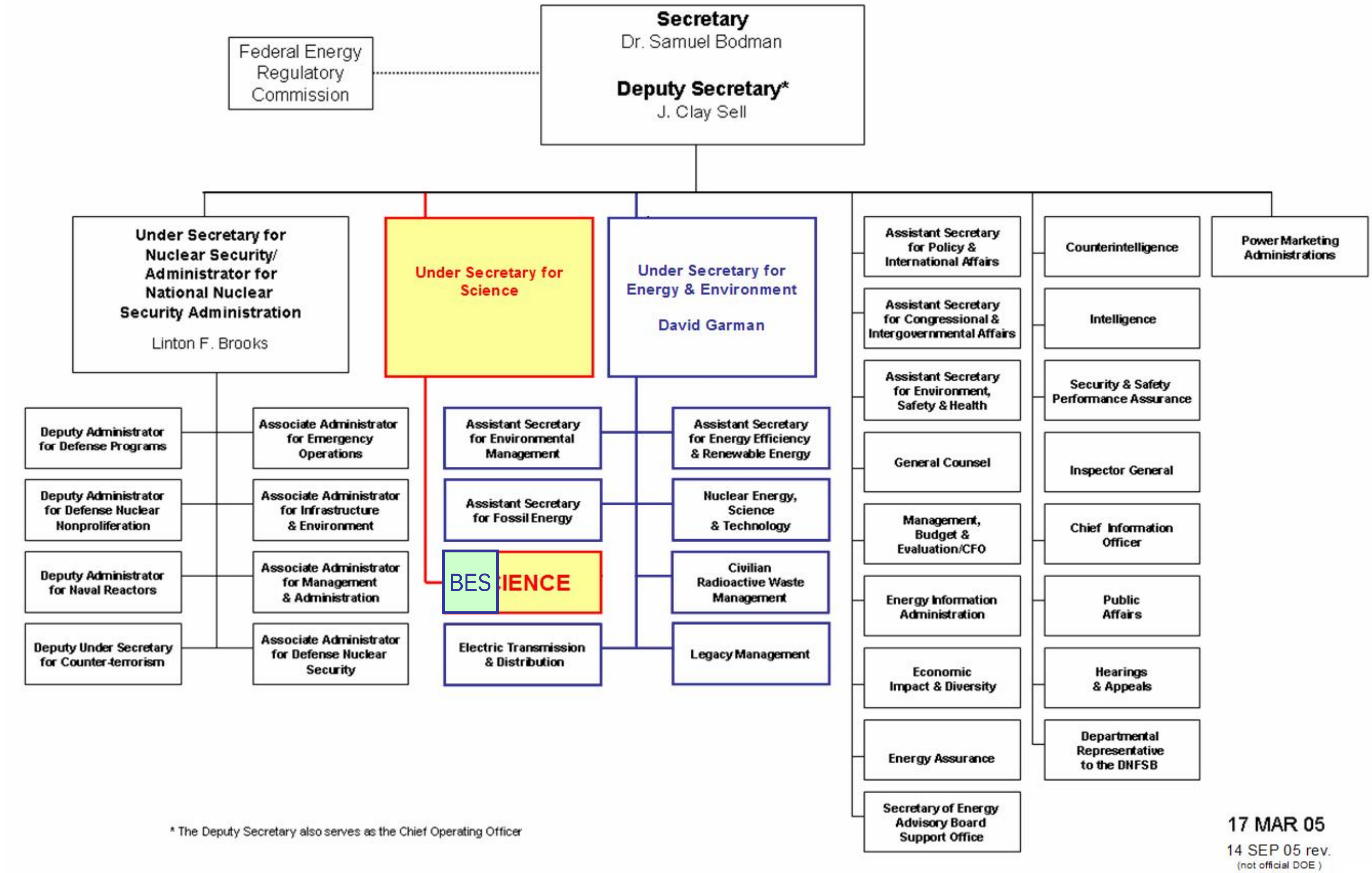
Basic Energy Sciences Update
and
Current Status of Facilities

Patricia M. Dehmer
Director, Office of Basic Energy Sciences
Office of Science, U.S. Department of Energy
6 April 2006

Science in a Mission Agency



* The Deputy Secretary also serves as the Chief Operating Officer

The FY 2007 Congressional Budget Request for SC

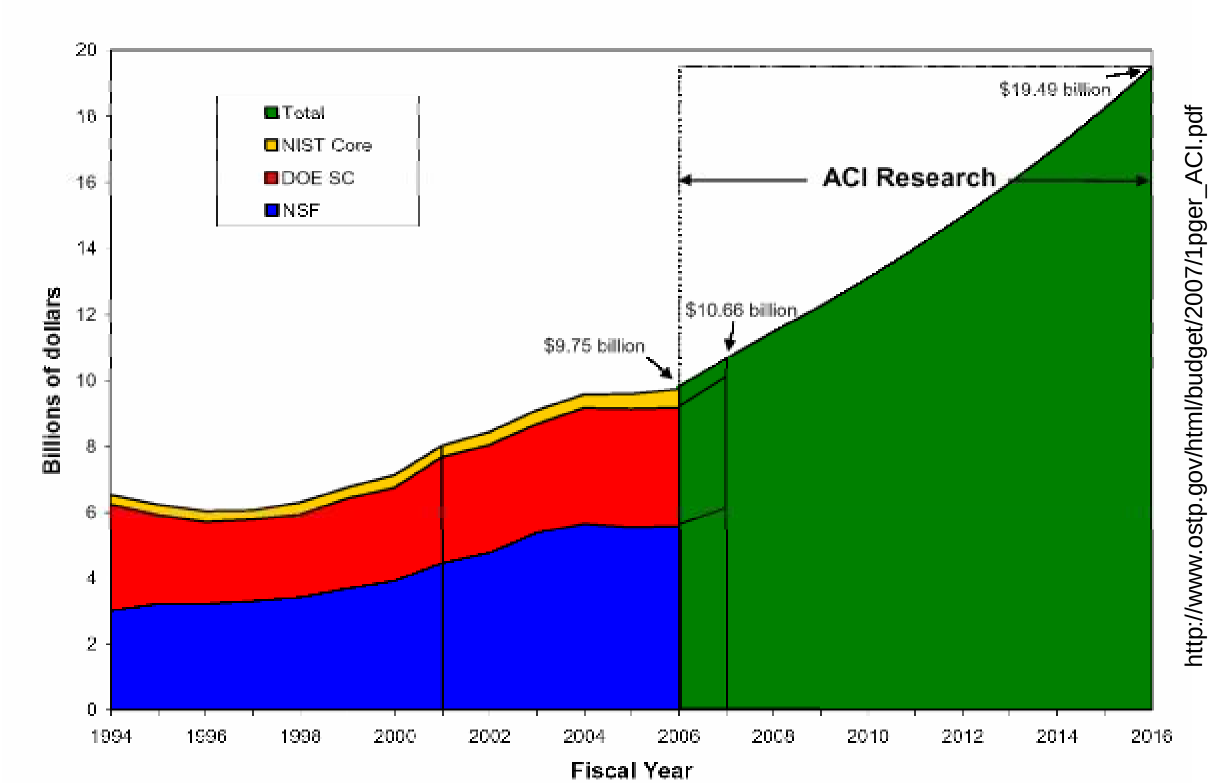
(dollars in thousands)

	FY 2005 Approp.	FY 2006 Approp.	FY 2007 President's Request	FY 2007 vs. FY 2006
Basic Energy Sciences	1,083,616	1,134,557	1,420,980	+286,423
Advanced Scientific Computing Research	226,180	234,684	318,654	+83,970
Biological and Environmental Research				
Base program	487,474	451,131	510,263	+59,132
Congressionally-directed projects	79,123	128,700	—	-128,700
Total, Biological and Environmental Research	566,597	579,831	510,263	-69,568
High Energy Physics	722,906	716,694	775,099	+58,405
Nuclear Physics	394,549	367,034	454,060	+87,026
Fusion Energy Sciences	266,947	287,644	318,950	+31,306
Science Laboratories Infrastructure	37,498	41,684	50,888	+9,204
Science Program Direction	154,031	159,118	170,877	+11,759
Workforce Development for Teachers and Scientists	7,599	7,120	10,952	+3,832
Small Business Innovation Research/Technology Transfer	113,621	—	—	—
Safeguards and Security	67,168	68,025	70,987	+2,962
Subtotal, Science	3,640,712	3,596,391	4,101,710	+505,319
Use of prior year balances	-5,062	—	—	—
Total, Science	**3,635,650**	**3,596,391**	**4,101,710**	**+505,319***

* One half of the $505 million increase is for operations of our scientific facilities, including operations at new facilities: the Spallation Neutron Source and the Center for Nanophase Materials Sciences at Oak Ridge; the Center for Nanoscale Materials at Argonne; the Molecular Foundry at Berkeley; and the Center for Integrated Nanotechnologies at Sandia and Los Alamos National Laboratories. Research is increased by $237 million, 47% of the $505 million increase.

American Competitiveness Initiative Drove the SC Budget Increases

In 2007, the ACI proposes overall funding increases for NSF, DoE SC and NIST core of $910 million, or 9.3%. To achieve ten-year doubling, overall annual increases for these agencies will average roughly 7%.



http://www.ostp.gov/html/budget/2007/1pger_ACI.pdf

	FY06 Funding	ACI Research FY 2007		ACI Research FY 2016	
	$ (billions)	$ (billions)	% increase	$ (billions)	% inc. over FY06
NSF	$5.58	$6.02	7.8	$11.16[1]	100.0
DoE SC	$3.60	$4.10	14.0	$7.19[1]	100.0
NIST Core[2]	$0.57[3]	$0.54	-5.8[4]	$1.14[1]	100.0
TOTAL	$9.75	$10.66	9.3	$19.49	100.0

[1] ACI doubles total research fund; individual agency allocations remain to be determined.
[2] NIST core consists of NIST lab research and construction accounts.
[3] The 2006 enacted level for NIST core includes $137 million in earmarks.
[4] Represents a 24 percent increase after accounting for earmarks.

Two High-level ACI Investment Goals

Sustained scientific advancement and innovation are key to maintaining our competitive edge, and are supported by a pattern of related investments and policies, including:

- Federal investment in cutting-edge basic research whose quality is bolstered by merit review and that focuses on fundamental discoveries to produce valuable and marketable technologies, processes, and techniques;
- Federal investment in the tools of science—facilities and instruments that enable discovery and development—particularly unique, expensive, or large-scale tools beyond the means of a single organization;

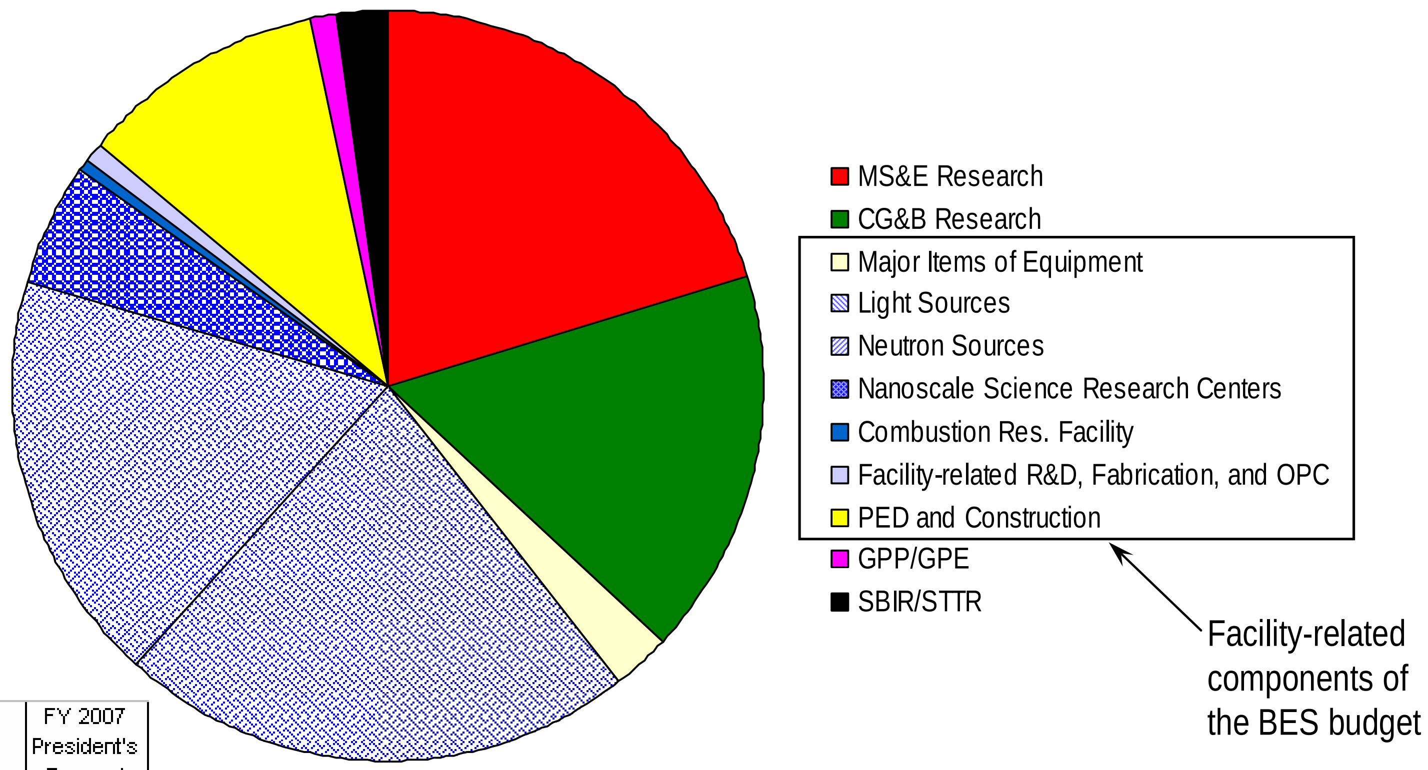
BES Goals Align with Those of the ACI

Balance key portfolio components that together create a uniquely DOE program:

- Fundamental research
  - in support of a *decades-to-century energy security plan* and
  - in support of *discovery science* that enables the mission; this also includes the support of a critical mass of principal investigators – “the great discovery machine”
- Forefront scientific user facilities for the Nation

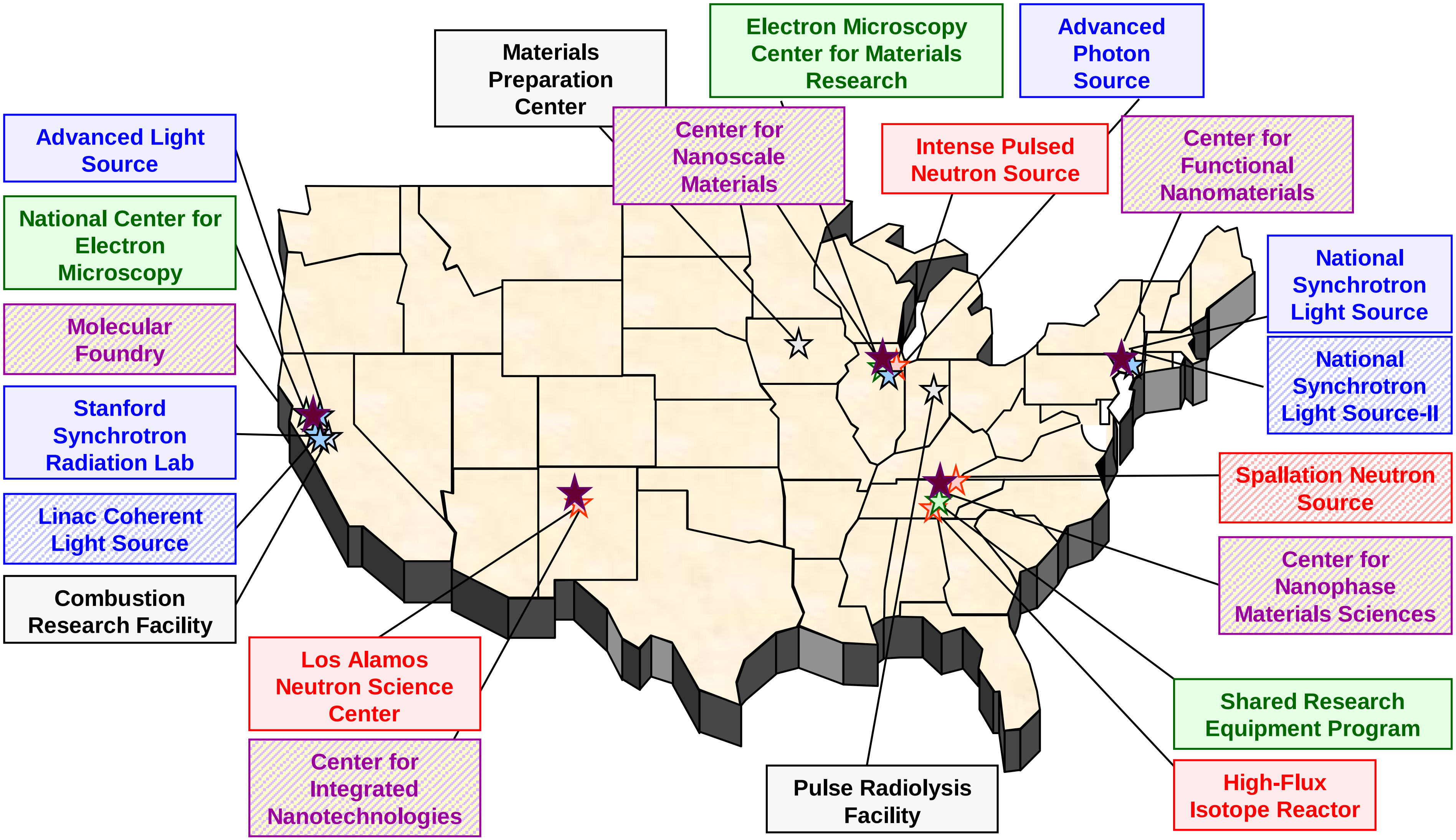
Aim for world leadership in all activities that are supported

Details of the FY 2007 Congressional Budget Request for BES - $1,421M



	FY 2007 President's Request
MS&E Research	286,909
CG&B Research	237,647
Major Items of Equipment	36,008
Light Sources	316,005
Neutron Sources	252,120
Nanoscale Science Research Centers	76,760
Combustion Res. Facility	6,805
Facility-related R&D, Fabrication, and OPC	11,445
PED and Construction	148,269
GPP/GPE	18,203
SBIR/STTR	30,809
TOTAL BES	1,420,980

BES Scientific User Facilities



- 4 Synchrotron Radiation Light Sources
- Linac Coherent Light Source (Under construction)
- 4 High-Flux Neutron Sources (SNS under construction)
- 3 Electron Beam Microcharacterization Centers
- 5 Nanoscale Science Research Centers (Under construction)
- 3 Special Purpose Centers

Scientific User Facilities

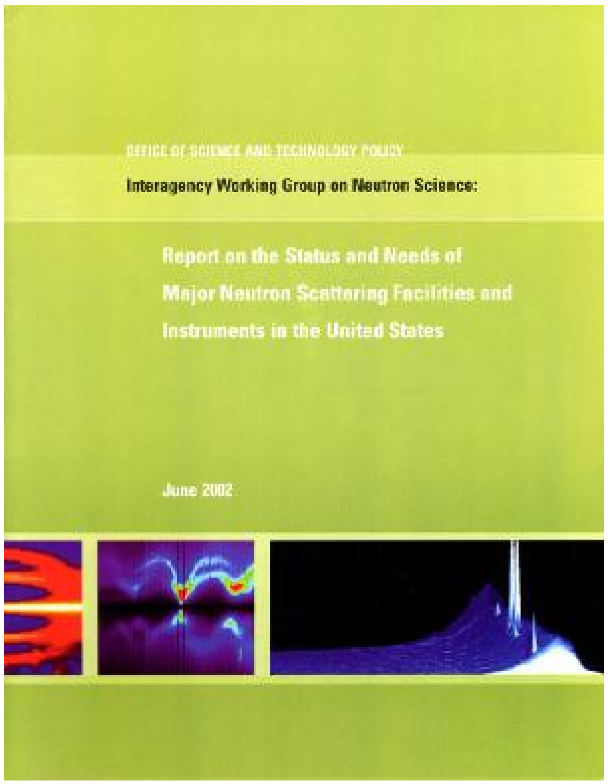
BESAC evaluation February 2003
Report released late 2003

- Under construction at the time of the evaluation
  - *Spallation Neutron Source*
  - *5 Nanoscale Science Research Centers*
  - *SSRL (SPEAR3) upgrade*
- Facilities underway since the evaluation
  - *Linac Coherent Light Source*
  - *Transmission Electron Aberration Corrected Microscope*
  - *National Synchrotron Light Source - II*
- Facilities rated longer-term priority at the time of the evaluation
  - *Spallation Neutron Source power upgrade (CD-0 signed)*

  - *Spallation Neutron Source 2nd target station*
  - *Advanced Light Source upgrade*
  - *Advanced Photon Source upgrade*

Available at
http://www.science.doe.gov/Sub/Facilities_for_future/facilities_future.htm

2002 OSTP Report: Status and Needs of Major Neutron Scattering Facilities and Instruments in the United States



The highest priority for federal investments in neutron scattering is to fully exploit the best U.S. neutron source capabilities – including the SNS – for the benefit of the broadest possible scientific community. Specifically, these investments should aim to:

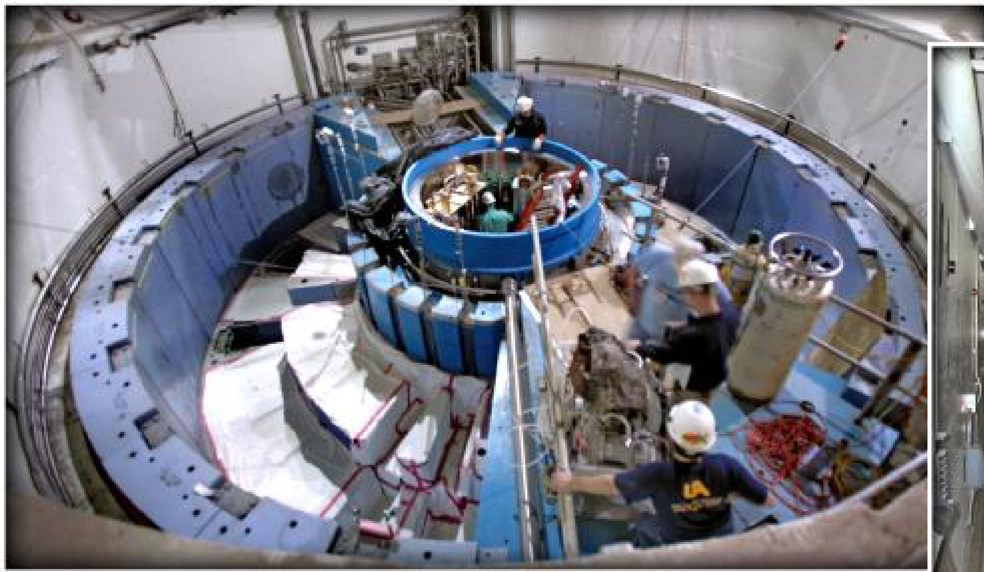
Fully develop at least 85% of available beam lines with neutron instrumentation that exceeds, or is at least competitive with international best-in-class instruments;

> Maximize the amount of beam time made available to the broad scientific community through an independent, peer-review based general user program;
>
> Provide resources to fully staff and support the high productivity operation of the neutron scattering instruments;
>
> Provide additional support for research using neutron scattering techniques.

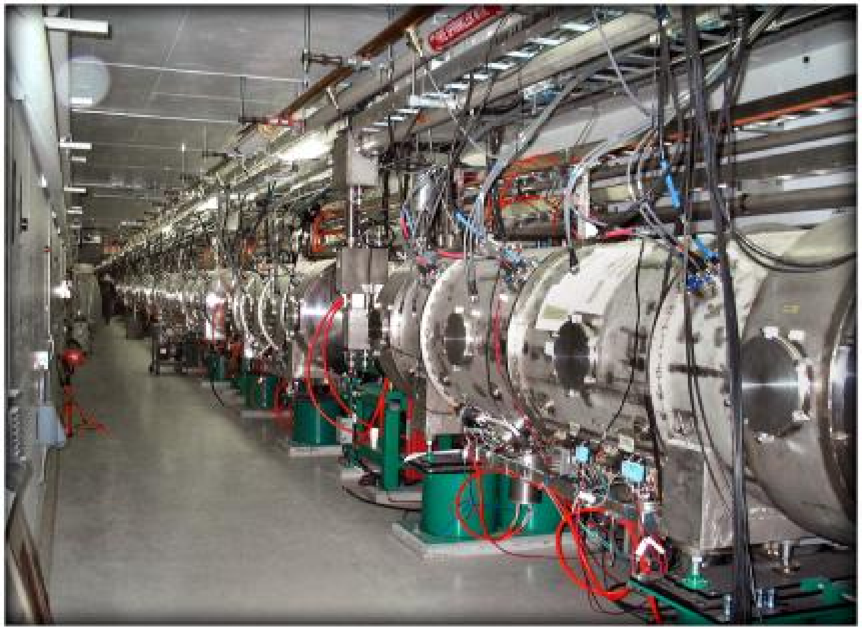

Flashback in time to March 2002
01685 2002

The Spallation Neutron Source

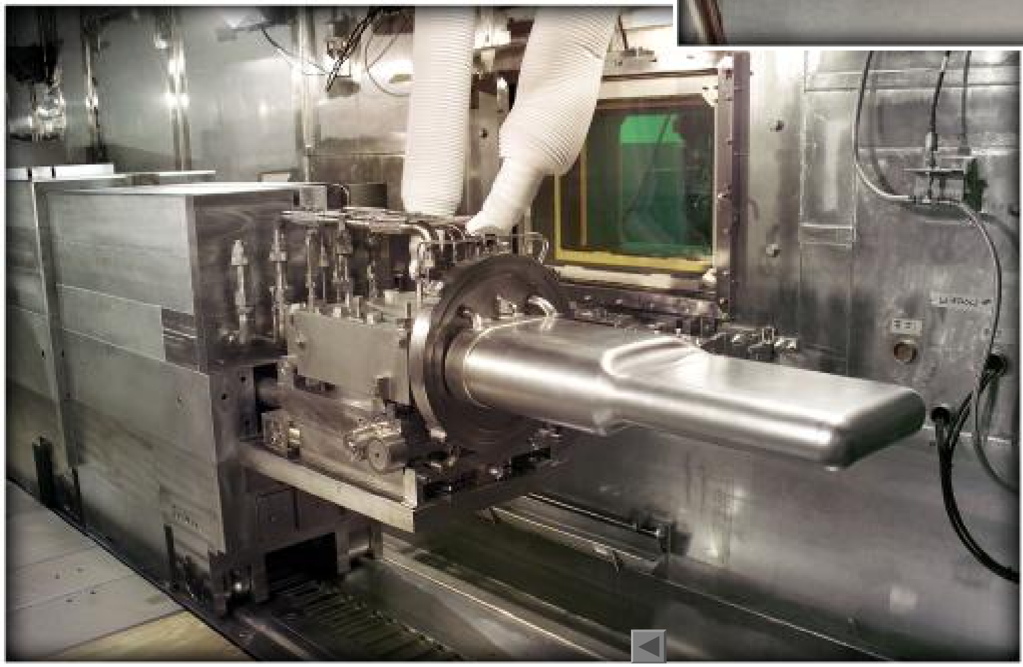
Spallation Neutron Source



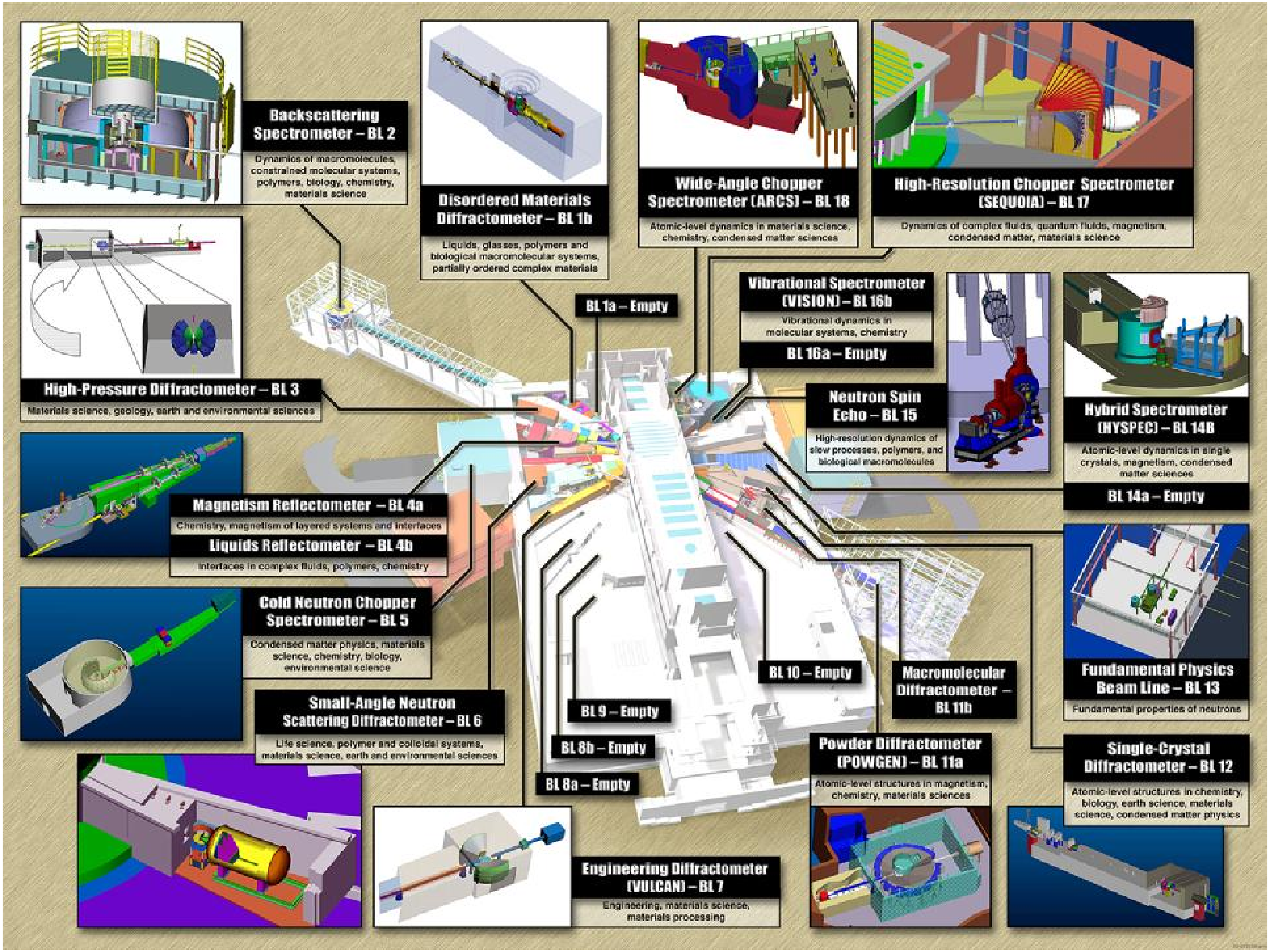
Target monolith and beam ports



Superconducting linac

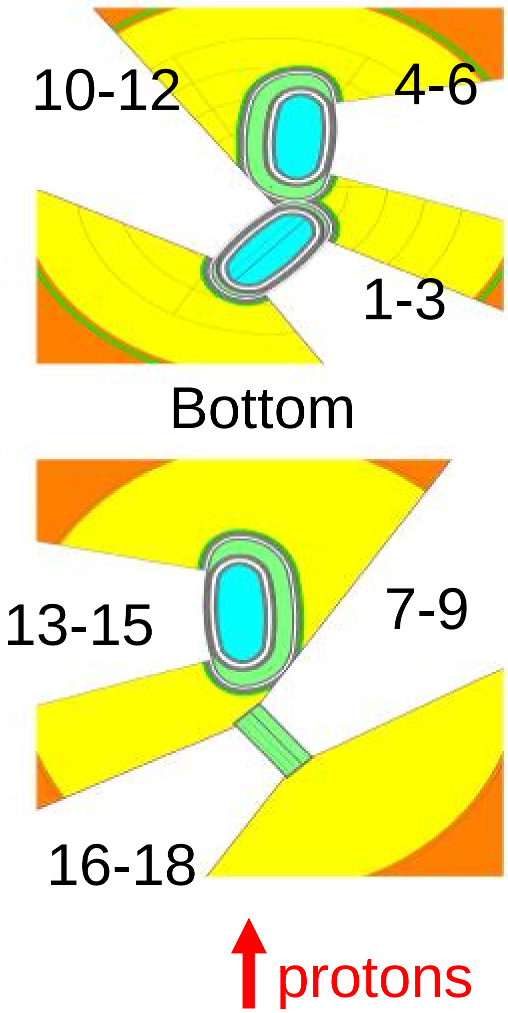


Hg target module



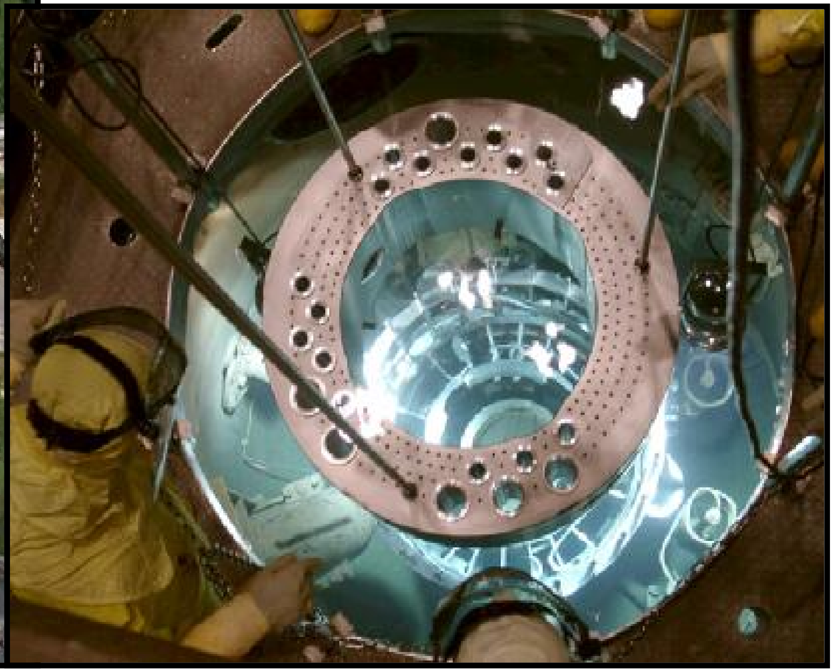
Backscattering Spectrometer – BL 2
Dynamics of macromolecules, constrained molecular systems, polymers, biology, chemistry, materials science
Disordered Materials Diffractometer – BL 1b
Liquids, glasses, polymers and biological macromolecular systems, partially ordered complex materials
Wide-Angle Chopper Spectrometer (ARCS) – BL 18
Atomic-level dynamics in materials science, chemistry, condensed matter sciences
High-Resolution Chopper Spectrometer (SEQUOIA) – BL 17
Dynamics of complex fluids, quantum fluids, magnetism, condensed matter, materials science
BL 1a – Empty
Vibrational Spectrometer (VISION) – BL 16b
Vibrational dynamics in molecular systems, chemistry
BL 16a – Empty
High-Pressure Diffractometer – BL 3
Materials science, geology, earth and environmental sciences
Neutron Spin Echo – BL 15
High-resolution dynamics of slow processes, polymers, and biological macromolecules
Hybrid Spectrometer (HYSPEC) – BL 14B
Atomic-level dynamics in single crystals, magnetism, condensed matter sciences
BL 14a – Empty
Magnetism Reflectometer – BL 4a
Chemistry, magnetism of layered systems and interfaces
Liquids Reflectometer – BL 4b
Interfaces in complex fluids, polymers, chemistry
Cold Neutron Chopper Spectrometer – BL 5
Condensed matter physics, materials science, chemistry, biology, environmental science
Fundamental Physics Beam Line – BL 13
Fundamental properties of neutrons
BL 10 – Empty
Macromolecular Diffractometer – BL 11b
Small-Angle Neutron Scattering Diffractometer – BL 6
Life science, polymer and colloidal systems, materials science, earth and environmental sciences
BL 9 – Empty
BL 8b – Empty
BL 8a – Empty
Powder Diffractometer (POWGEN) – BL 11a
Atomic-level structures in magnetism, chemistry, materials sciences
Single-Crystal Diffractometer – BL 12
Atomic-level structures in chemistry, biology, earth science, materials science, condensed matter physics
Engineering Diffractometer (VULCAN) – BL 7
Engineering, materials science, materials processing

SNS Allocated Beam Lines



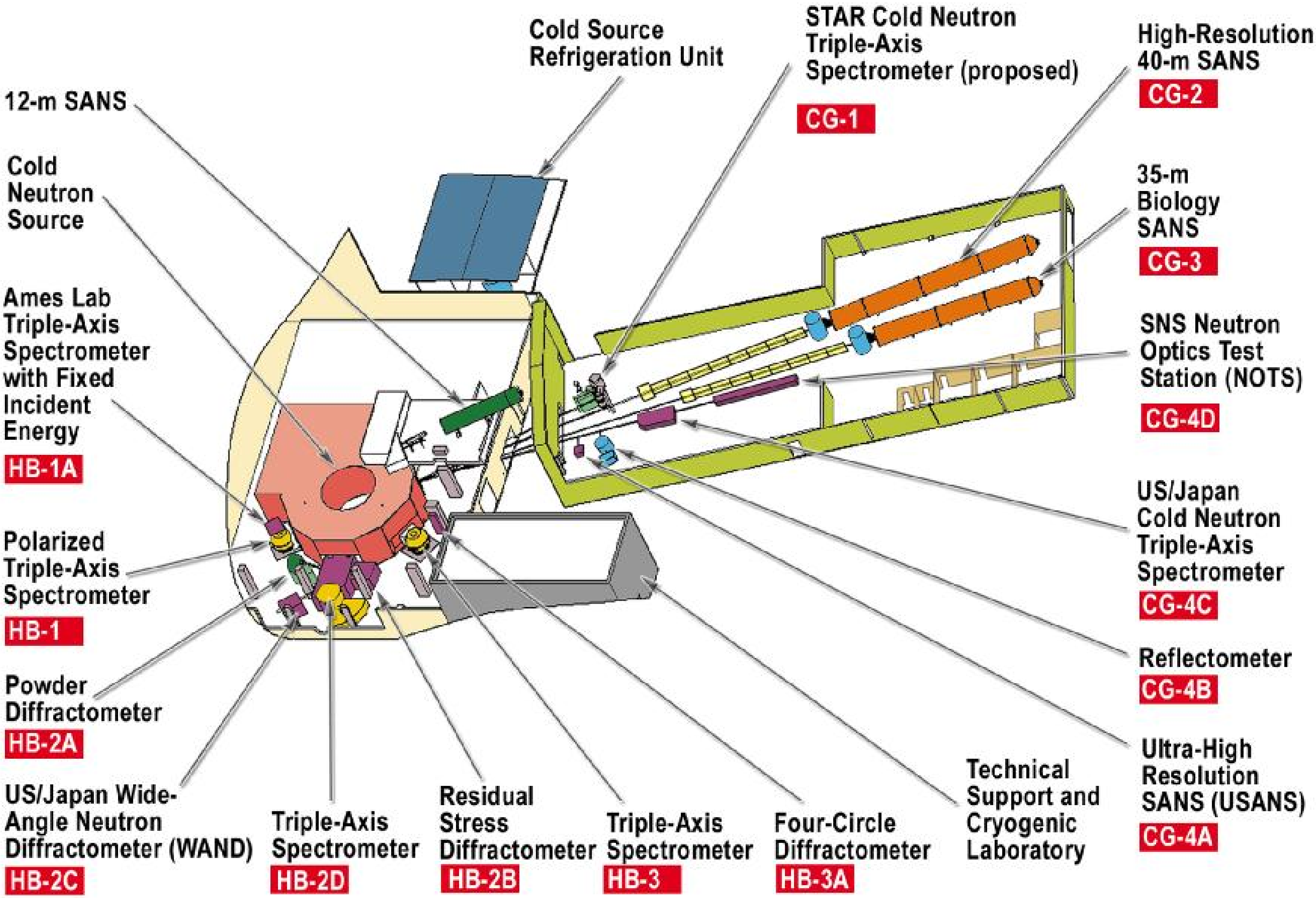
BL	Moderator		Instrument
1a	H_2	decoupled, poisoned	MuSANS + another
1b	H_2	decoupled, poisoned	Disordered Materials Diffractometer
2	H_2	decoupled, poisoned	Backscattering
3	H_2	decoupled, poisoned	High Pressure Diffractometer
4a	H_2	coupled	Magnetism Reflectometer
4b	H_2	coupled	Liquids Reflectometer
5	H_2	coupled	Cold Neutron Chopper Spectrometer
6	H_2	coupled	SANS
7	water	decoupled, poisoned	Vulcan
8a	water	decoupled, poisoned	
8b	water	decoupled, poisoned	
9	water	decoupled, poisoned	
10	H_2	decoupled, poisoned	
11a	H_2	decoupled, poisoned	Powder Diffractometer
11b	H_2	decoupled, poisoned	Mandi
12	H_2	decoupled, poisoned	Single Crystal Diffractometer
13	H_2	coupled	Fundamental Physics
14a	H_2	coupled	Long Beam Line - High Field Magnet?
14b	H_2	coupled	Hyspec
15	H_2	coupled	NSE
16a	water	decoupled, poisoned	
16b	water	decoupled, poisoned	Vision
17	water	decoupled, poisoned	Sequoia
18	water	decoupled, poisoned	ARCS

High Flux Isotope Reactor



Instrument Installation in the HFIR Cold Guide Hall

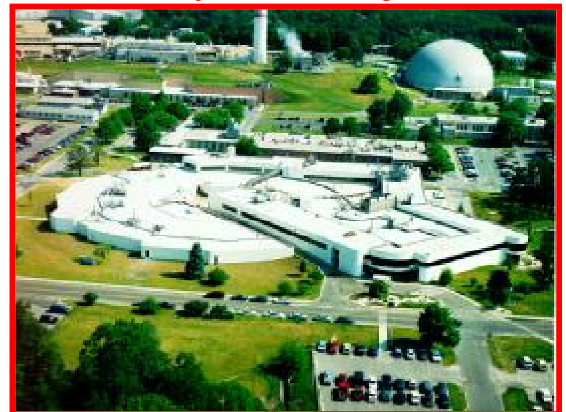
HFIR Instrument Floor Plan



BES Facilities for X-ray Scattering

Advanced Photon Source

National Synchrotron Light Source



Advanced Light Source

Stanford Synchrotron
Radiation Laboratory

The long-established metric for light source operation – i.e., the ratio of delivered to scheduled annual hours of operation of the accelerator complex – generally ranges from 0.95 to 1.00. However, this ratio gives little information about the overall well being of the facility. Over the past year and a half, BES has developed alternate ways of measuring how effectively the light sources are utilized.

Assessments of the BES Light Sources

http://www.sc.doe.gov/bes/synchrotron_techniques/

As a start to developing additional assessment tools for the light sources, the light sources were asked to group all of the beamlines into technique-oriented categories. Twelve categories emerged, and descriptions of each with examples of the science enabled are posted on the web.

SPECTROSCOPY techniques are used to study the energies of particles that are emitted or absorbed by samples that are exposed to the light-source beam and are commonly used to determine the characteristics of chemical bonding and electron motion.

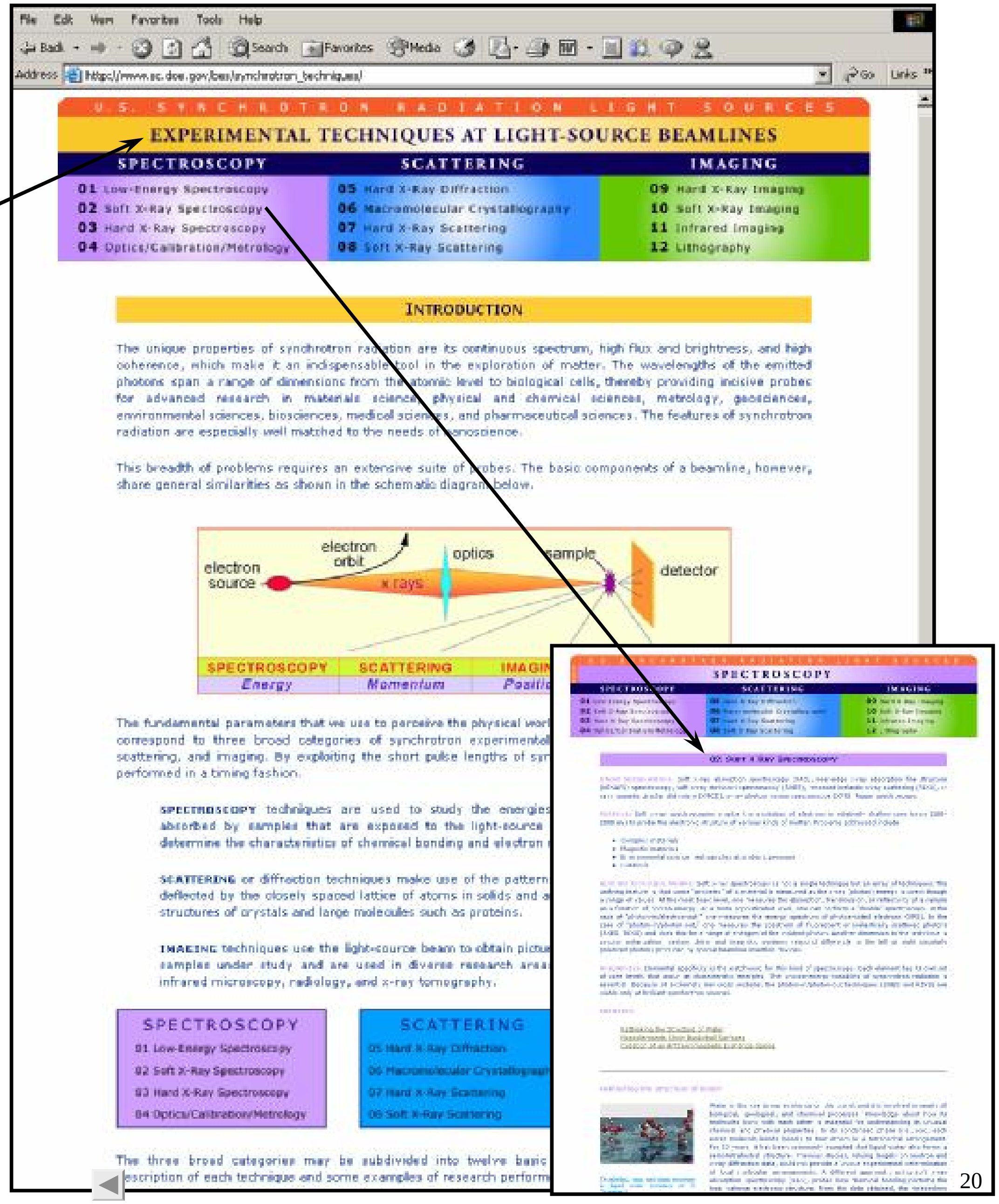
- 01 Low-Energy Spectroscopy
- 02 Soft X-Ray Spectroscopy
- 03 Hard X-Ray Spectroscopy
- 04 Optics/Calibration/Metrology

SCATTERING or diffraction techniques make use of the patterns of light produced when x-rays are deflected by the closely spaced lattice of atoms in solids and are commonly used to determine the structures of crystals and large molecules such as proteins.

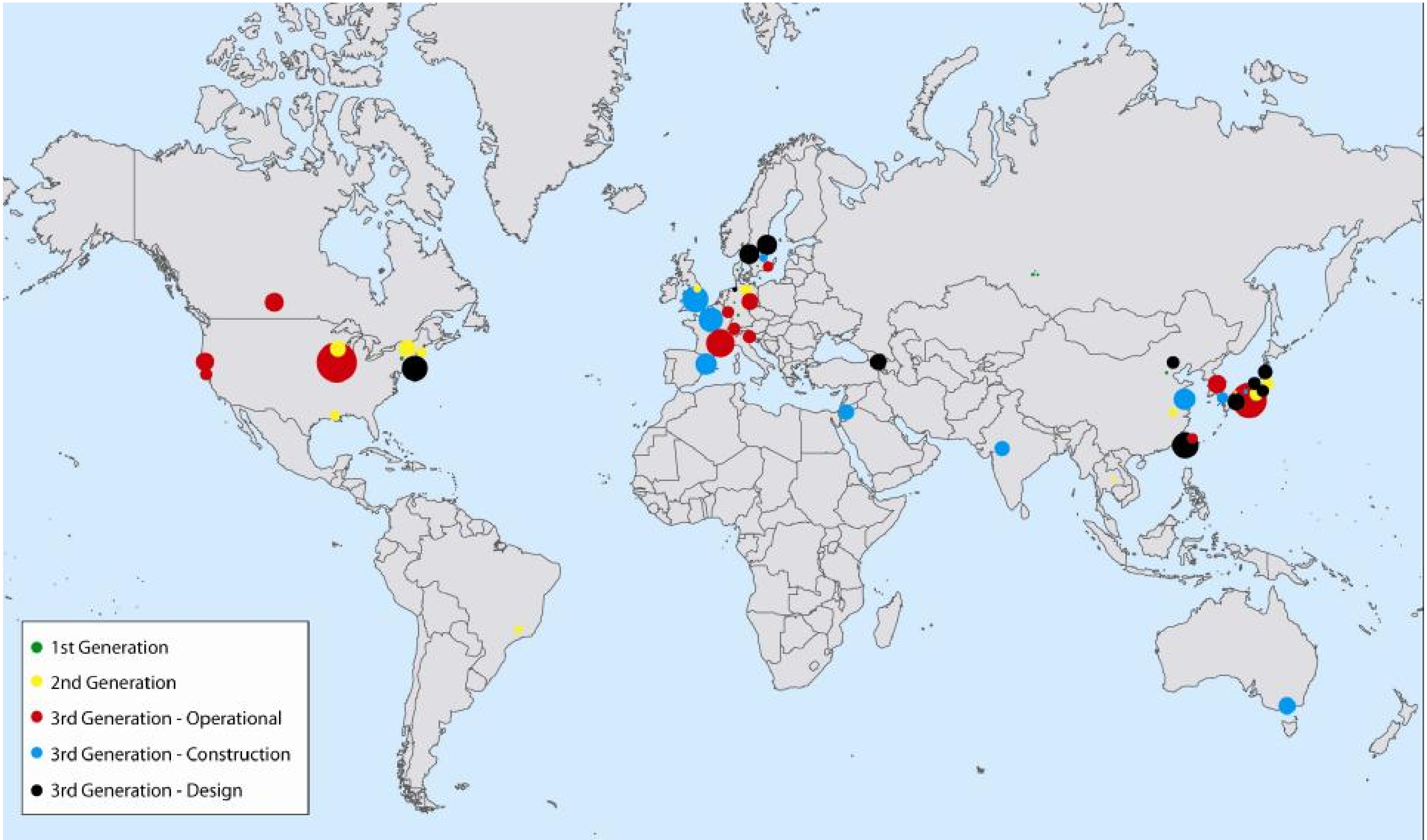
- 05 Hard X-Ray Diffraction
- 06 Macromolecular Crystallography
- 07 Hard X-Ray Scattering
- 08 Soft X-Ray Scattering

IMAGING techniques use the light-source beam to obtain pictures with fine spatial resolution of the samples under study and are used in diverse research areas such as cell biology, lithography, infrared microscopy, radiology, and x-ray tomography.

- 09 Hard X-Ray Imaging
- 10 Soft X-Ray Imaging
- 11 Infrared Imaging
- 12 Lithography



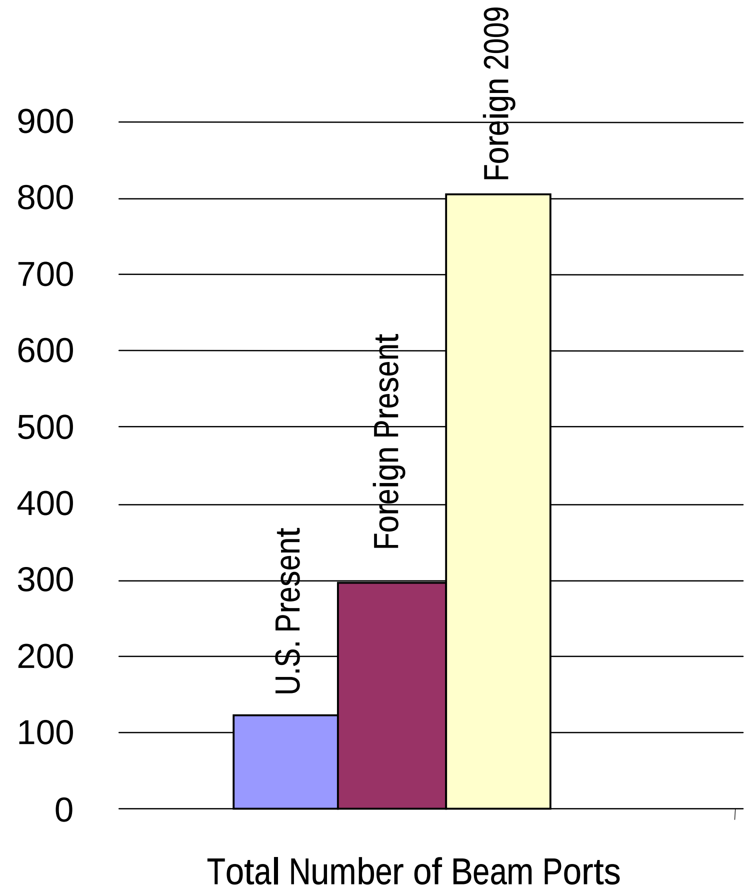
International Benchmarking: Synchrotrons Worldwide



The dots show all 1st, 2nd, and 3rd generation light sources worldwide that are operational, under construction, and in design. The dot diameter is proportional to the total number of beamlines at each facility. The number of users that a facility can host scales with the number of beamlines.

Red, blue, and black dots show 3rd generation machines. .

International Benchmarking: 3rd Generation Synchrotrons Worldwide



Considering only beam ports on the 3rd generation sources, this shows that by 2009 the U.S. will be outnumbered by the rest of the world by 7:1 (123 beam ports in the U.S. versus 806 beam ports in the rest of the world).

The NSLS-II Project

NSLS-II is a highly optimized x-ray synchrotron project delivering:

- extremely high brightness and flux;*
- exceptional beam stability; and
- a suite of advanced instruments, optics, and detectors that capitalize on these special capabilities. About one fourth of the highest brightness beamlines will be instrumented as part of the project.

Together these enable:

- 1 nm spatial resolution,
- 0.1 meV energy resolution, and
- single atom sensitivity.

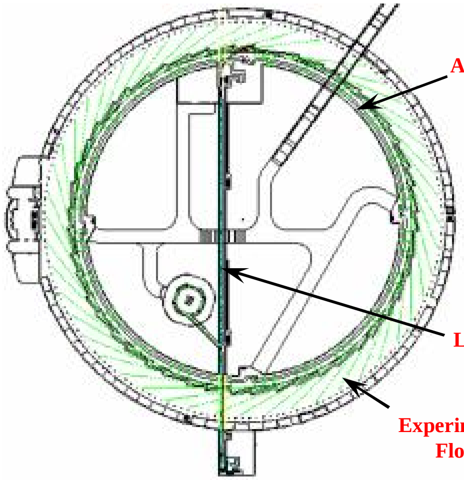
NSLS-II will provide:

- the world's finest capabilities both for x-ray imaging and for high-resolution energy analysis, ~10x better than any other synchrotron now operating or under construction and 1,000x higher sensitivity.

Technical specifications set NSLS-II apart from all other synchrotrons worldwide.

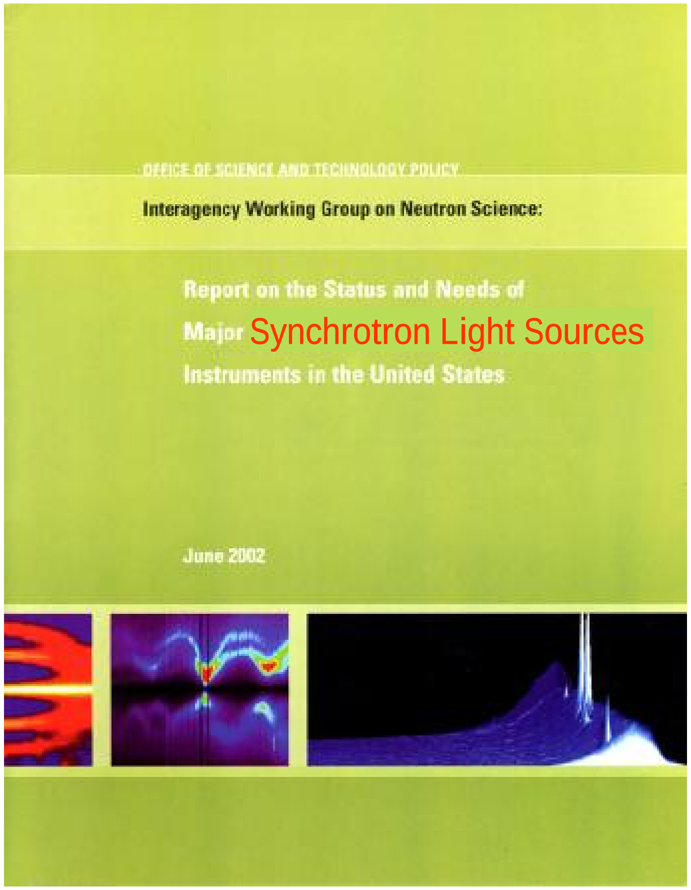
X-ray Ring
- Energy: 3 GeV
- Current: 500 mA
- Circumference: 630 m
- Brightness: 120x greater than APS for hard x-rays, 380x greater than ALS for soft x-rays
- Flux: 12x greater than APS for hard x-rays, 12x greater than ALS for soft x-rays

Infrared Ring
- Energy: 800 MeV,
- Current: 1000 mA
- Other
- Instruments, optics, robotics, detectors

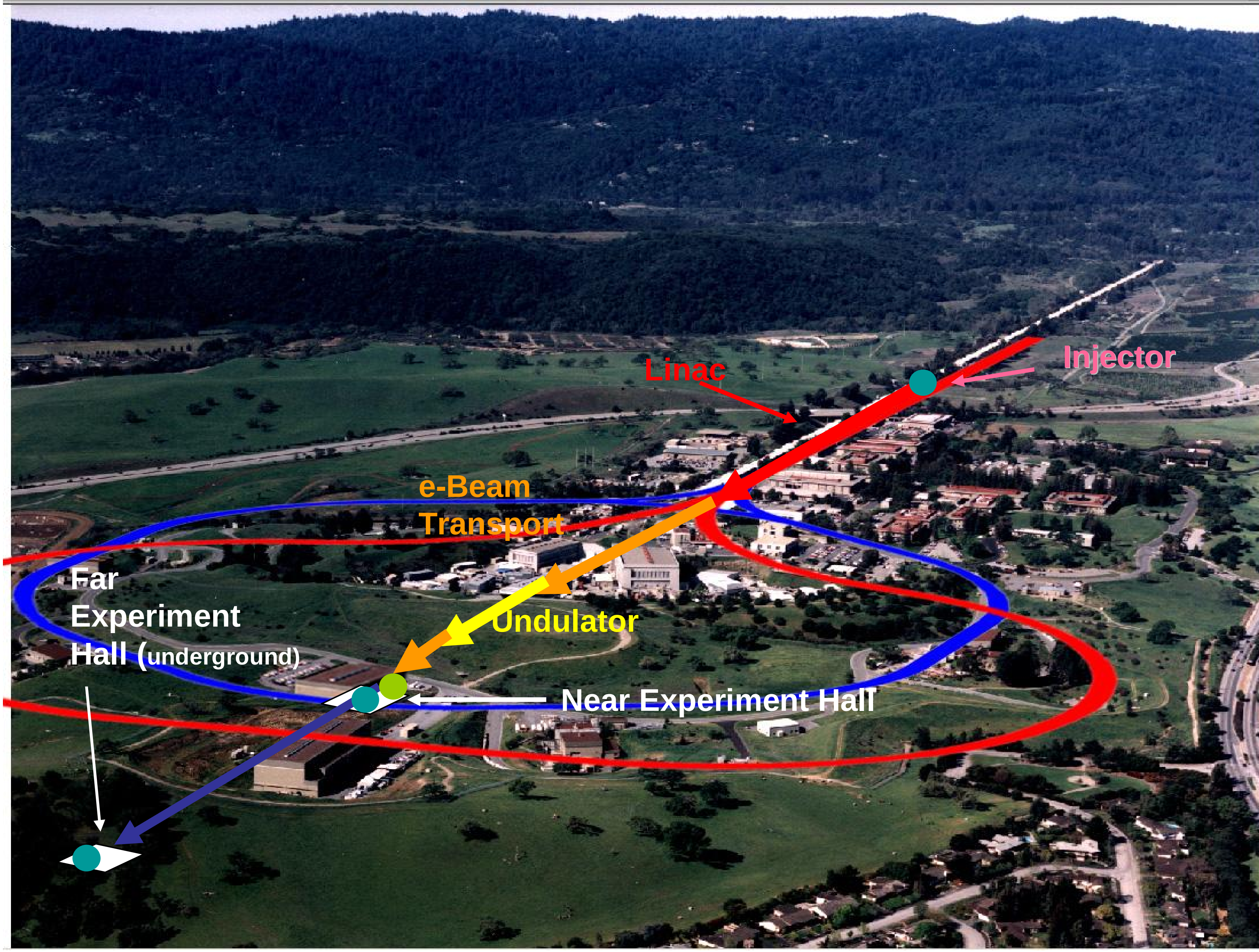


* Flux is a measure of the total beam intensity; high flux is important for experiments that use the entire unfocused beam. Brightness is a measure of the beam intensity per square millimeter of source size, per square milliradian of opening angle, and within a given spectral bandwidth (usually 0.1%); high brightness is important for experiments that need tightly focused, very intense beams.

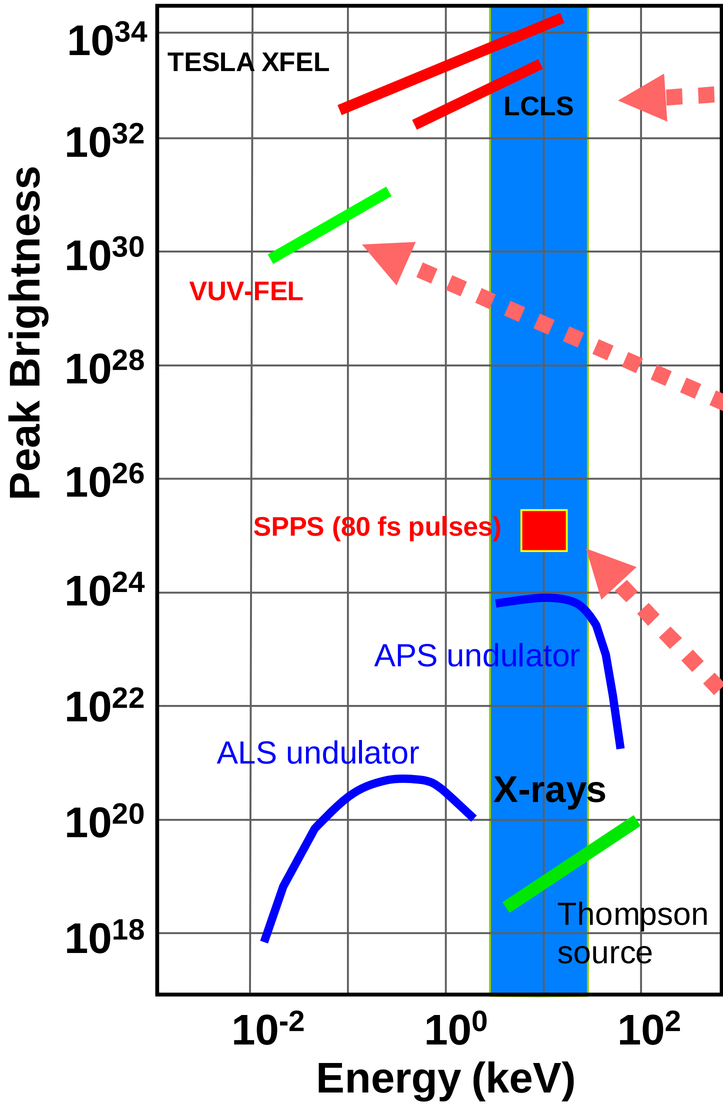
Coming Soon OSTP Report: Status and Needs of Major Synchrotron Light Sources and Instruments in the United States



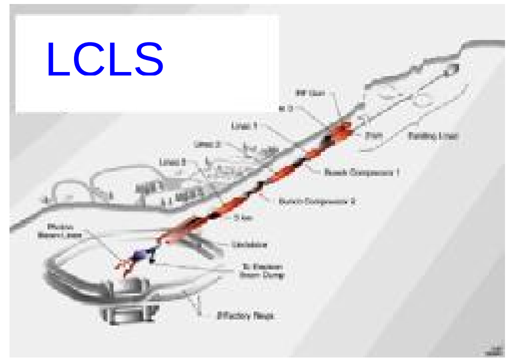
LCLS at SLAC – The World's First X-ray FEL



X-ray Science at SLAC



APS - Advanced Photon Source (ANL)
ALS - Advanced Light Source (LBNL)



operational 2009

8 keV, ~100 fs, 10^{12} photons/pulse

Linac Coherent Light Source, SLAC, Stanford

operational now

40 eV, ~30 fs, 10^{13} photons
(500 eV in 2007)

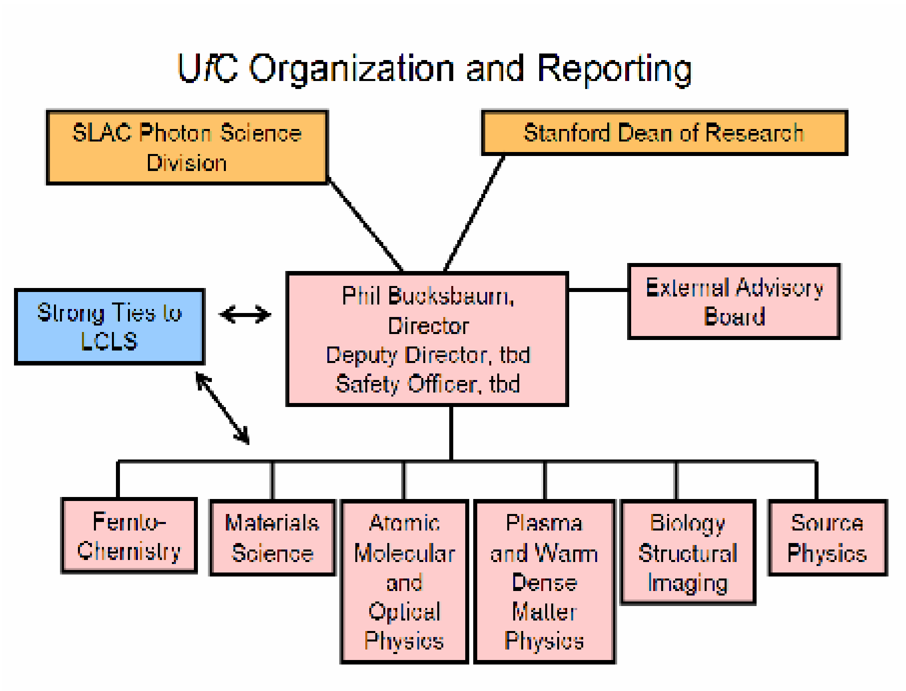
DESY, Hamburg

operational now

8 keV, 80 fs, 10^7 photons

Sub-picosecond Photon Source, SLAC, Stanford

Ultrafast Science Center at SLAC



	Current	[1]Target
Core Faculty	3	10
Affiliated Faculty	5	10
Research Staff	4	10
Grad Students/PDs	4	20
Funding[2]	$1.8M/yr	$10M/yr

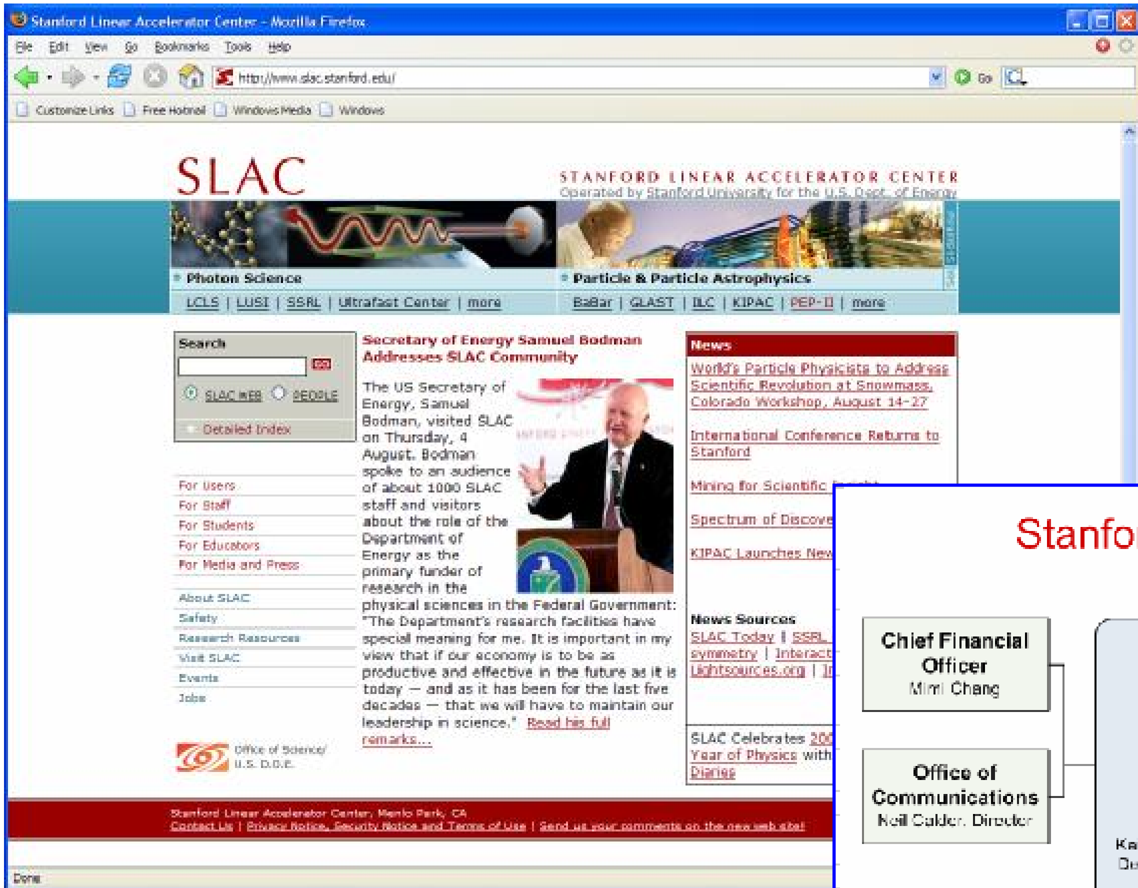
[1]Target date is FY2009

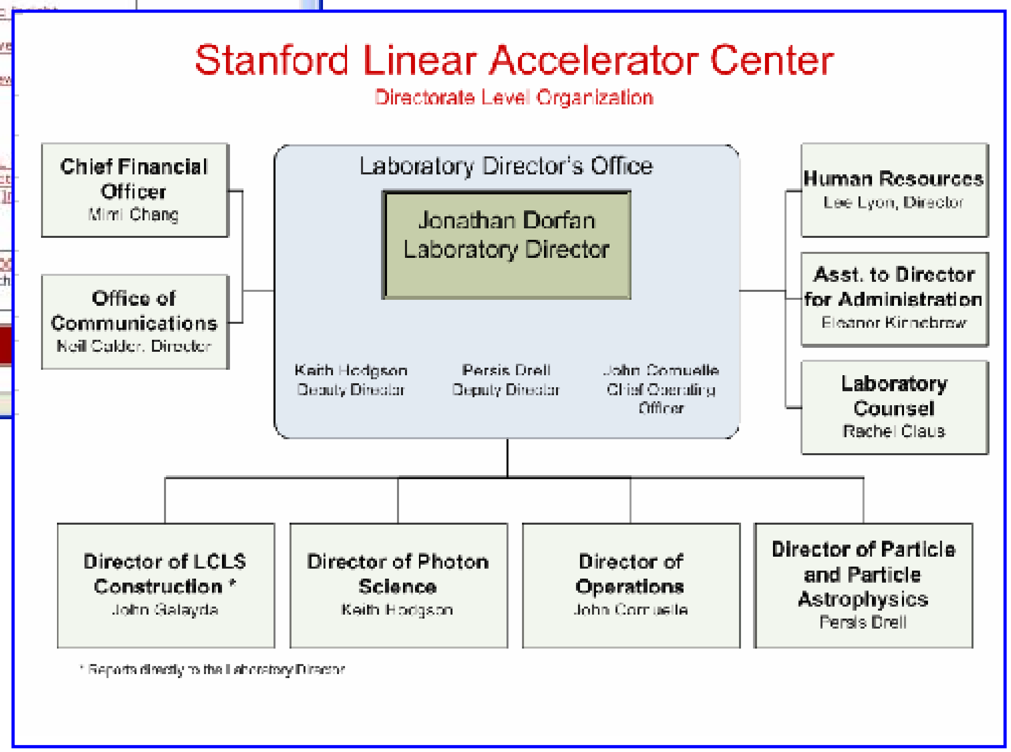
[2]DOE-BES and Keck Foundation are primary current sources

Philip H. Bucksbaum, Director of the Ultrafast Science Center, is an atomic physicist whose main research interests are fundamental light-matter interactions, particularly the control of quantum systems using ultrafast laser fields. He has developed new sources of ultrafast radiation in the infrared, visible, ultraviolet and X-ray spectral regions.

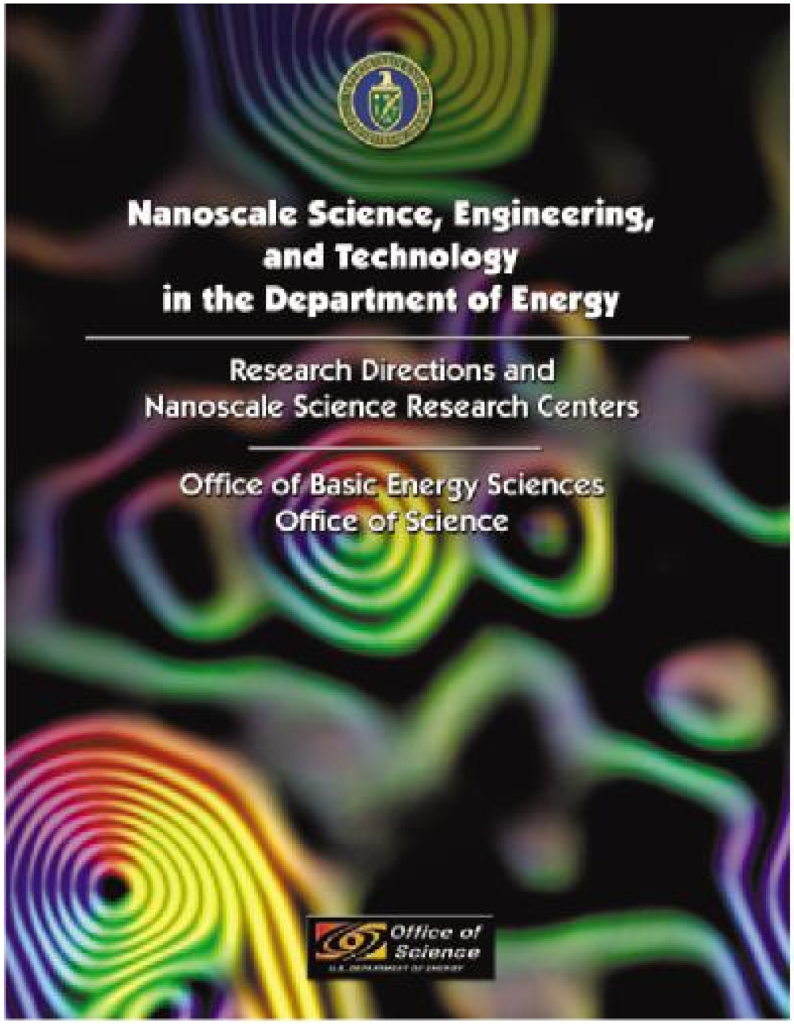
He received his A.B. degree in physics in 1975 from Harvard College. His doctoral work at the University of California at Berkeley was an experimental investigation of parity non-conservation induced by the electro-weak interaction. He received his Ph.D. in 1980. After one-year post-doctoral positions at Lawrence Berkeley Laboratory and Bell Labs in Holmdel , N.J. , he became a member of the research technical staff at Bell Labs in Murray Hill , N.J. Since 1990, Phil has been professor of physics at the University of Michigan . He was named Otto Laporte Collegiate Professor in 1997 and Distinguished University Professor at Michigan in 1995. Until his move to Stanfrd, he served as the director of the FOCUS Center, an NSF Physics Frontier Center devoted to the frontier of coherent control in ultrafast science.

SLAC – A DOE Laboratory in Transition





NSET and Nanoscience Center Brochure



Nanoscale Science, Engineering, and Technology in the Department of Energy

Research Directions and Nanoscale Science Research Centers

Office of Basic Energy Sciences
Office of Science

Office of Science
U.S. DEPARTMENT OF ENERGY

DOE/Office of Basic Energy Sciences

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U.S. Department of Energy
1000 Independence Avenue SW
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Other BES staff contacts: www.sc.doe.gov/bes/besstaff.html

DOE/Office of Science

On the Web: www.sc.doe.gov

DOE's Nanoscale Science Research Centers

Center for Functional Nanomaterials, Brookhaven National Laboratory • www.cfn.bnl.gov

Center for Integrated Nanotechnology, Sandia National Laboratories and Los Alamos National Laboratory • cint.sandia.gov • cint.lanl.gov

Center for Nanophase Materials Sciences, Oak Ridge National Laboratory • www.cnms.ornl.gov

Center for Nanoscale Materials, Argonne National Laboratory • nano.anl.gov

Molecular Foundry, Lawrence Berkeley National Laboratory • www.foundry.lbl.gov

National Nanotechnology Initiative

On the Web: www.nano.gov

March 2004

Available at: http://www.sc.doe.gov/bes/brochures/files/NSRC_brochure.pdf

Nanoscale Science Research Centers – Artists' Conceptions

All five DOE Nanoscale Science Research Centers are in construction (on-time, within budget) with commissioning beginning in FY 2006.

Center for Functional Nanomaterials
(Brookhaven National Laboratory)

Center for Nanoscale Materials
(Argonne National Laboratory)

Molecular Foundry
(Lawrence Berkeley National Laboratory)

Center for Nanophase Materials Sciences
(Oak Ridge National Laboratory)

Center for Integrated Nanotechnologies
(Sandia & Los Alamos National Labs)

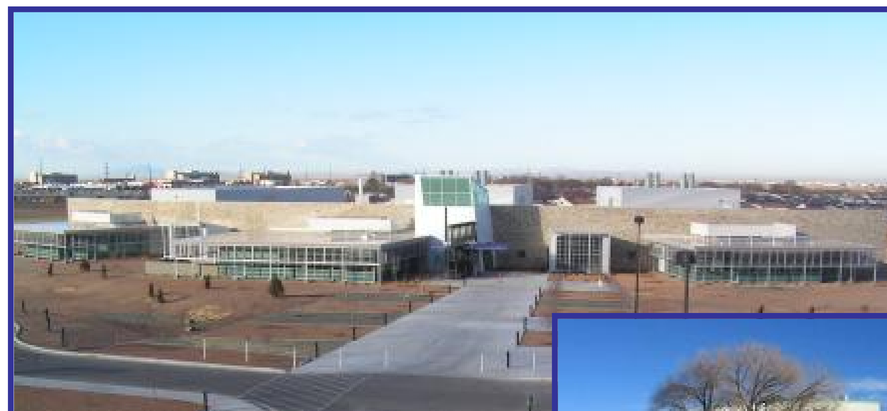
Nanoscale Science Research Centers – Actual Photos

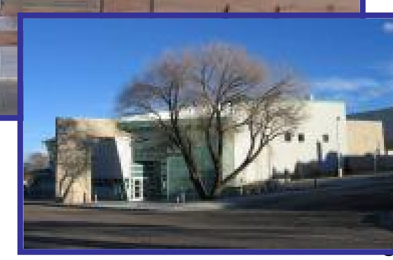
Center for Functional Nanomaterials (Brookhaven National Laboratory)

Center for Nanoscale Materials (Argonne National Laboratory)

Molecular Foundry (Lawrence Berkeley National Laboratory)

Center for Nanophase Materials Sciences (Oak Ridge National Laboratory)



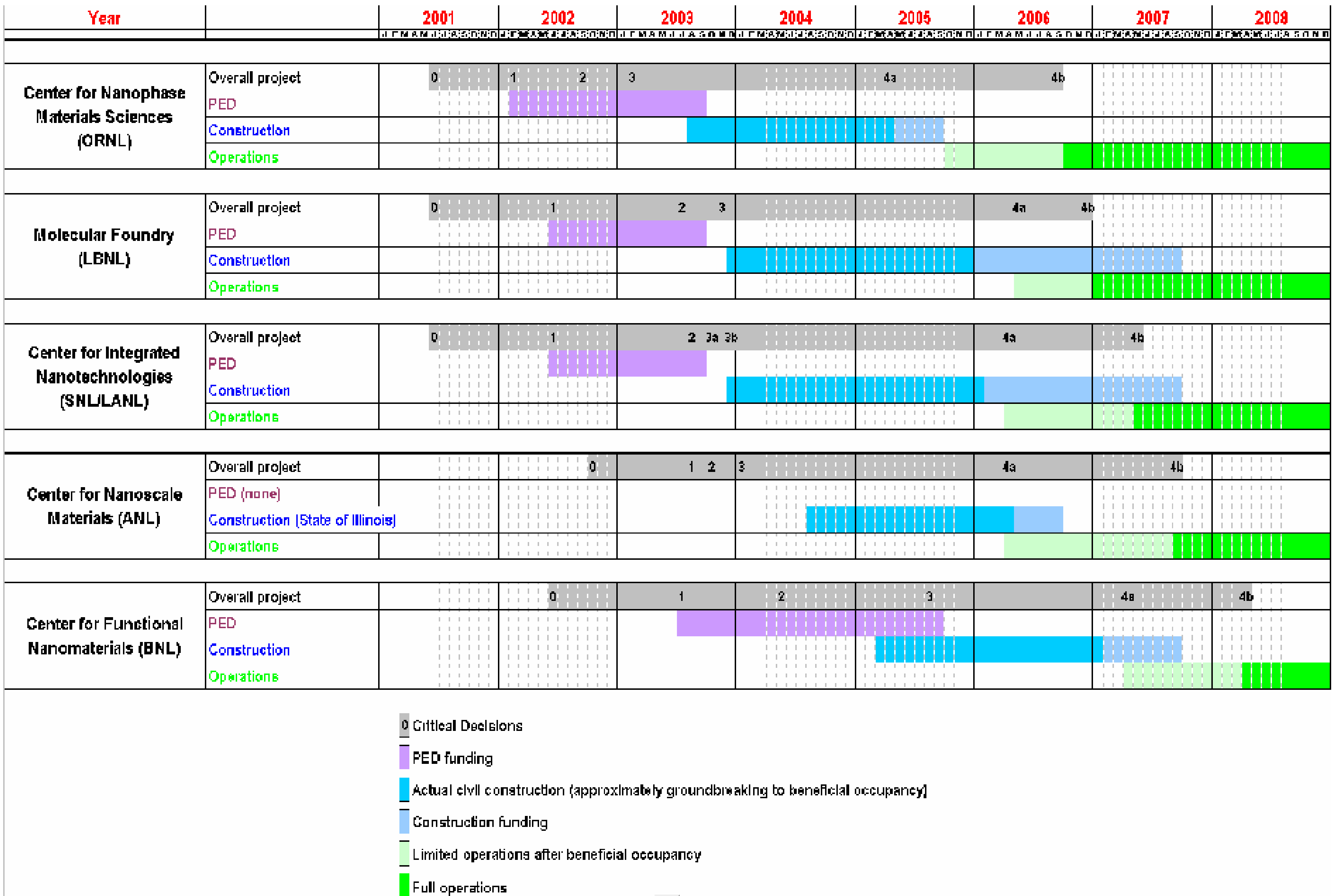


Center for Integrated Nanotechnologies (Sandia & Los Alamos National Labs)

Nanoscale Science Research Centers – Actual Photos

View of San Francisco Bay from the Molecular Foundry
(Lawrence Berkeley National Laboratory)

Nanoscale Science Research Centers Timelines



End

Details of the FY 2007 Congressional Budget Request for BES

$ in thousands	FY 2005 Conf. Approp.	FY 2006 Rescission	FY 2007 President's Request	Delta FY06-FY07	% increase
Research	**477,524**	**433,125**	**536,001**	**102,876**	**23.8%**
Core Research	448,341	400,625	409,454	8,829	2.2%
Hydrogen	29,183	32,500	50,000	17,500	53.8%
Solar Energy Utilization			34,115	34,115	
Advanced Nuclear Energy Systems			12,432	12,432	
Ultrafast Science			10,000	10,000	
Mid-Scale Instrumentation			10,000	10,000	
Chemical Imaging			5,000	5,000	
Complex Systems/Emergent Behavior			5,000	5,000	
MIEs	**20,729**	**32,785**	**36,008**	**3,223**	**9.8%**
TEAM MIE	5,586	6,206	5,508	-698	-11.2%
LUSI MIE	0	0	10,000	10,000	
SNS SING I MIE	3,143	12,579	10,500	-2,079	-16.5%
SNS SING II MIE	0	0	10,000	10,000	
ANL Nanoscience Center MIE	12,000	14,000	0	-14,000	
Facilities Operations	**337,263**	**450,926**	**651,690**	**200,764**	**44.5%**
4 light and 3 neutron sources & CRF *	294,163	275,425	322,521	47,096	17.1%
SNS	37,600	101,001	171,409	70,408	69.7%
NSLS II	1,000	0	25,000	25,000	
LCLS	0	3,500	16,000	12,500	357.1%
linac for LCLS	0	29,700	40,000	10,300	34.7%
4 NSRCs	0	41,300	76,760	35,460	85.9%
REDC	4,500	0	0	0	
* Itemize Facilities					
SSRL	32,388	25,475	35,836	10,361	40.7%
ALS	44,800	42,783	49,802	7,019	16.4%
APS	100,500	95,890	108,604	12,714	13.3%
NSLS	36,750	36,196	40,763	4,567	12.6%
IPNS	16,800	15,500	18,531	3,031	19.6%
HFIR	46,900	43,330	51,598	8,268	19.1%
Lujan	9,588	10,000	10,582	582	5.8%
CRF	6,437	6,251	6,805	554	8.9%

Details of the FY 2007 Congressional Budget Request for BES

$ in thousands	FY 2005 Conf. Approp.	FY 2006 Rescission	FY 2007 President's Request	Delta FY06-FY07	% increase
Construction	**230,025**	**176,292**	**148,269**	**-28,023**	**-15.9%**
LCLS	49,674	84,688	105,901	21,213	25.0%
BNL NSRC	20,313	36,187	18,864	-17,323	-47.9%
LBNL NSRC	31,828	9,510	257	-9,253	-97.3%
CINT	30,650	4,580	247	-4,333	-94.6%
NSLS II PED	0	0	20,000	20,000	
ALS User Building	0	0	3,000	3,000	
SNS	79,891	41,327	0	-41,327	
ORNL NSRC	17,669	0	0	0	
Other	**39,091**	**41,429**	**49,012**	**7,583**	**18.3%**
GPP/GPE	18,075	17,141	18,203	1,062	6.2%
SBIR/STTR	21,016	24,288	30,809	6,521	26.8%
TOTAL	**1,104,632**	**1,134,557**	**1,420,980**	**286,423**	**25.2%**

Details of the FY 2007 Congressional Budget Request for BES

$ in thousands	FY 2005 Cont. Approp.	FY 2006 Rescission	FY 2007 President's Request	Delta FY06-FY07	% increase
BES Core Research Activities					
MS&E Research (KC-02)	**246,307**	**226,878**	**286,909**	**60,031**	**26.5%**
Structure and Composition of Materials	24,807	16,943	22,245	5,302	31.3%
Mechanical Behavior and Radiation Effects	14,008	13,037	18,195	5,158	39.6%
Physical Behavior of Materials	25,551	24,677	29,756	5,079	20.6%
Synthesis and Processing Science	15,149	17,083	21,022	3,939	23.1%
Engineering Research	5,306	2,444	1,000	-1,444	-59.1%
Neutron and X-ray Scattering	46,061	45,141	62,055	16,914	37.5%
Experimental Condensed Matter Physics	41,024	36,691	47,480	10,789	29.4%
Condensed Matter Theory	19,798	22,888	27,408	4,520	19.7%
Materials Chemistry	46,860	40,694	49,748	9,054	22.2%
Experimental Program to Stimulate Competitive Research	7,643	7,280	8,000	720	9.9%
Facility-related (R&D; Fabrication; OPC) (KC-02)	**20,114**	**14,557**	**11,445**	**-3,112**	**-21.4%**
Accelerator and Detector Research	4,000	2,119	3,000	881	41.6%
Electron-Beam Microcharacterization Centers	7,614	7,945	7,945	0	0.0%
Neutron Scattering Instrumentation at HFIR	2,000	2,000	0	-2,000	-100.0%
Nanoscale Science Research Centers OPC	600	993	500	-493	-49.6%
Linac Coherent Light Source R&D	4,000		0	0	
Linac Coherent Light Source LUSI R&D	1,900	1,500	0	-1,500	-100.0%
CG&B Research (KC-03)	**211,103**	**191,690**	**237,647**	**45,957**	**24.0%**
Atomic, Molecular, and Optical (AMO) Science	16,627	15,397	19,248	3,851	25.0%
Chemical Physics Research	32,946	31,866	37,813	5,947	18.7%
Photochemistry and Radiation Research	30,446	25,489	32,007	6,518	25.6%
Molecular Mechanisms of Natural Solar Energy Conversion	13,640	12,411	18,188	5,777	46.5%
Metabolic Regulation of Energy Production	19,427	17,554	17,601	47	0.3%
Catalysis and Chemical Transformation	37,871	38,107	47,459	9,352	24.5%
Separations and Analyses	15,490	17,287	24,041	6,754	39.1%
Heavy Element Chemistry	10,506	9,354	17,128	7,774	83.1%
Geosciences Research	22,212	20,494	22,345	1,851	9.0%
Chemical Energy and Chemical Engineering	11,938	3,731	1,817	-1,914	-51.3%
BES Research (x/MIEs; GPP/GPE; SBIR)	**477,524**	**433,125**	**536,001**	**102,876**	**23.8%**

FY 2007 Solicitations and Program Web Announcements

	$ in thousands	FY 2005 Conf. Approp.	FY 2006 Rescission	FY 2007 President's Request	Delta FY06-FY07	% increase
	Research	**477,524**	**433,125**	**536,001**	**102,876**	**23.8%**
BAA*	Core Research	448,341	400,625	409,454	8,829	2.2%
S	Hydrogen	29,183	32,500	50,000	17,500	53.8%
S	Solar Energy Utilization			34,115	34,115	
S	Advanced Nuclear Energy Systems			12,432	12,432	
A	Ultrafast Science			10,000	10,000	
S	Mid-Scale Instrumentation			10,000	10,000	
S in FY05	Chemical Imaging			5,000	5,000	
A	Complex Systems/Emergent Behavior			5,000	5,000	

* About $10 million for X-ray and neutron scattering instrumentation within the core will be competed with mid-scale instrumentation in the same solicitation.

Draft Timelines for FY 2007 BES Solicitations

Solicitation	Instrumentation	Basic research for the hydrogen fuel initiative	Basic research for solar energy utilization	Basic research for advanced nuclear energy systems
Funding available in FY 2007	approx. $20 million	$17.5 million	$34.1 million	$12.4 million
FY 2007 Congressional Budget released	February 6, 2006	February 6, 2006	February 6, 2006	February 6, 2006
Announcement of intent to issue solicitations	February 16, 2006	February 16, 2006	February 16, 2006	February 16, 2006
Posting on SC website*	Early March 2006	Mid April 2006	Mid March 2006	October 1, 2006
Preapplications deadline*	Mid May 2006	Early July 2006	Early June 2006	Early December 2006
Pis notified of preapplication decisions*	Late June/Early July 2006	Mid September 2006	Mid August 2006	Early January 2007
Full proposal deadline*	Late August/Early Sept 2006	Mid December 2006	Mid November 2006	Late March/Early April 2007
Announce awards*	Early April 2007	Mid May 2007	Mid April 2007	Late June 2007
* All dates are approximate.				

SSSC Meeting Thumbnails