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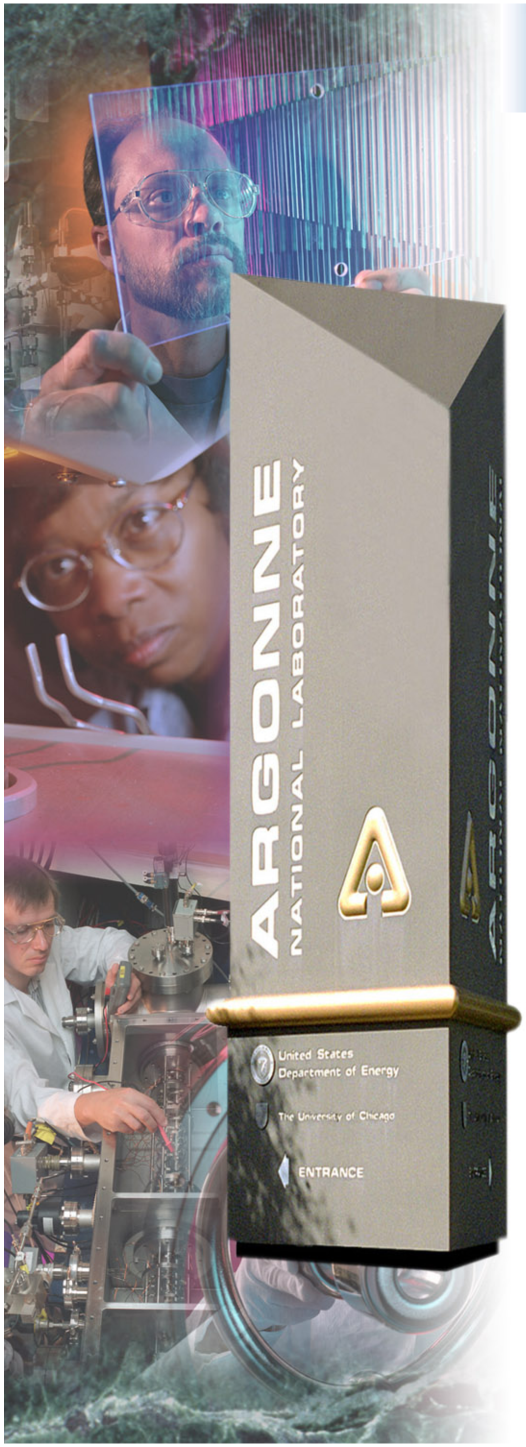

Monthly APS/Users Operations Meeting

Dennis Mills

November 9, 2005

THE UNIVERSITY OF CHICAGO

Office of Science
U.S. DEPARTMENT OF ENERGY

Argonne National Laboratory is managed by
The University of Chicago for the U.S. Department of Energy

Agenda

- APS Update - D. Mills
- Electrical Arc Flash Incident Update - John Quintana
- APSUO Meeting Update and Advocacy Activities - Keith Brister
- CAT Transitions to XOR - Gabrielle Long
- Summary of the High Pressure Workshop (Nov. 2) - Guoyin Shen

Update on Homeland Security Presidential Directive -12

- At the last Monthly Ops meeting, Murray mentioned the rebadging that would be required under HSPD-12

- The Deputy Secretary of Energy, Clay Sell, has clarified HSPD-12:

  "I have determined that the mandatory applicability of HSPD-12 and its associated processes shall apply to all DOE Federal employees, all contractor employees that have either an L or Q security clearance, and to all uncleared contractor employees servicing the DOE Headquarters complex."

What happens to all that information we ask for?

- Many of you will recall that a while back I was requesting information for DOE/BES on:
  - the number of staff you have supporting operations on the beamline
  - the what “quality” of your beamline, and
  - techniques your beamline supports
- Similar information was submitted by all 4 BES facilities
- At the SSRL Users Meeting (October 2005), Pat Dehmer summarized some of that data and I thought I would share that with you.
- The idea is to develop the case that more funding is required to fully utilize the BES facilities

BASIC ENERGY SCIENCES –
Serving the Present, Shaping the Future

http://www.science.doe.gov/bes

Basic Energy Sciences

Beta Test of Alternative Metrics for Assessing the BES Light Sources

Patricia M. Dehmer
Director, Basic Energy Sciences
October 2005

From the SSRL User's Meeting

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BES has developed a “SR Techniques” page on their website.

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.

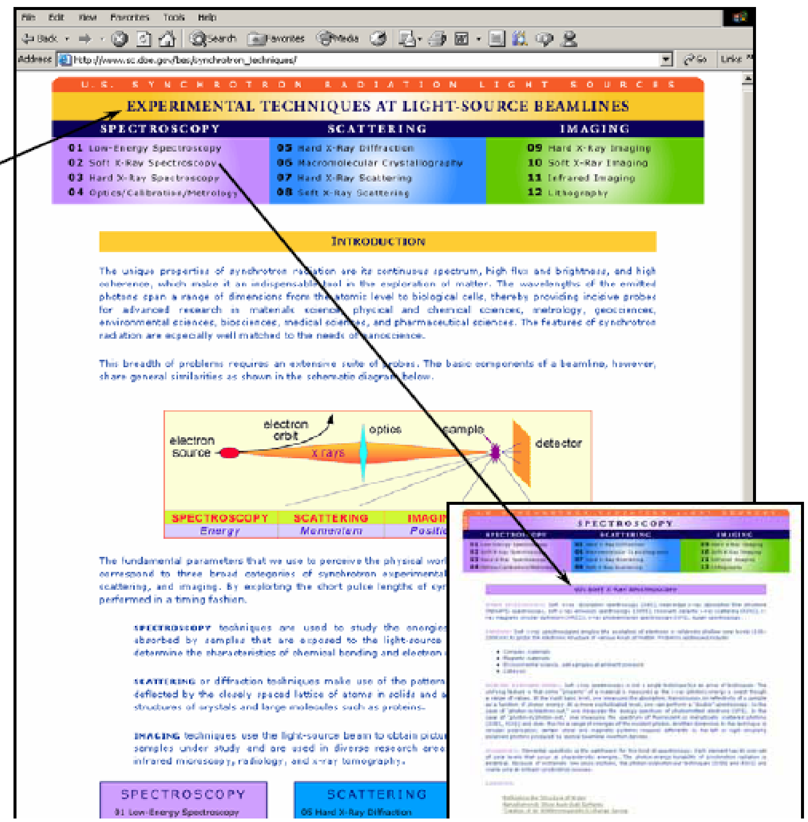
01 Low-Energy Spectroscopy
02 Soft X-Ray Spectroscopy
03 Hard X-Ray Spectroscopy
04 Optics/Calibration/Metrology

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



Pat Dehmer’s SSRL Talk

Each facility has developed a spreadsheet for techniques and staff

Beamline Matrix – Advanced Photon Source (44)

Then each light source mapped every one of its operating beamlines onto a matrix of the 12 techniques.

Together, there are 179 operating beamlines at the four BES light sources. There are another ~100 beamlines that have never been instrumented or that have obsolete instrumentation.

Note, though, that not all 100 of these "open" spaces for beamlines could be developed into "best-in-class" beamlines. This is due primarily to space limitations on the light source experimental floors and to ultimate brightness of the beam from the beam port. For example, at the APS, only 20% of the uncommitted ports are high brightness insertion device lines.

Utilization Matrix for the Four DOE/BES Light Sources

DESCRIPTIONS of 12 TECHNIQUES:

e.gov/bes/synchrotron_techniques/index.htm

BEAMLINE TECHNIQUES
Percentage for each technique that is available on each beamline. The sum of percentages equals 100% for each beamline.

FY 2004

Beamline Type	Count	Spectroscopy: Low energy spectroscopy 01	Soft x-ray spectroscopy 02	Hard x-ray spectroscopy 03	Optics; calibration; metrology 04	Scattering: Hard x-ray diffraction 05	Macromolecular crystallography 06	Hard x-ray scattering 07	Soft x-ray scattering 08	Imaging: Hard x-ray imaging 09	Soft x-ray imaging 10	IR imaging 11	Lithography 12	Operational Beamlines: *	Facility	Designation	Check (X) indicates that the beamline is "Best in Class" as benchmarked against similar capabilities worldwide
action, and imaging	1					30		40		30				1	APS	01-BM	
action, and imaging	2					35		35		30				1	APS	01-ID	
ffraction	3					30				70				1	APS	02-BM	X
ttering	4								30		70			1	APS	02-ID-B	X
	5					10				90				1	APS	02-ID-D	X
	6									100				1	APS	02-ID-E	
	7				20			80						1	APS	03-ID	X
attering, and imaging	8		40						30		30			1	APS	04-ID-C	
	9			20		60				20				1	APS	04-ID-D	X
nd diffraction	10			50		50								1	APS	05-BM-C	
scattering	11					50		50						1	APS	05-BM-D	
raphy and hard x-ray diffraction and scattering	12					25	50	25						1	APS	05-ID	
scattering	13					50		50						1	APS	06-ID	
scattering	14					50		50						1	APS	06-ID-D	
	15					100								1	APS	07-ID	
raphy	16						100							1	APS	08-BM	
scattering	17					50		50						1	APS	08-ID	
	18					5		95						1	APS	09-ID	
	19			70		30									APS	10-ID	
	20					100									APS	11-ID-B	
	21					100									APS	11-ID-C	
nd diffraction	22			50		50									APS	11-ID-D	
Hard x-ray spectroscopy and diffraction	23			50		50									APS	12-BM	
Hard x-ray diffraction and scattering	24					50		50							APS	12-ID	X
Hard x-ray diffraction, spectroscopy, and imaging	25			25		50				25					APS	13-BM	X
Hard x-ray diffraction, spectroscopy, scattering, and imaging	26			35		35		15		15					APS	13-ID	X
Macromolecular crystallography	27						100								APS	14-BM-C	
Macromolecular crystallography	28						100								APS	14-BM-D	X
Macromolecular crystallography	29						100								APS	14-ID	
Hard x-ray diffraction	30					100									APS	15-ID	X
Hard x-ray diffraction and scattering	31					50		50							APS	16-ID-B	X
Macromolecular crystallography	32						100								APS	17-BM	

Note: The check marks indicate beamlines that are "best in class."

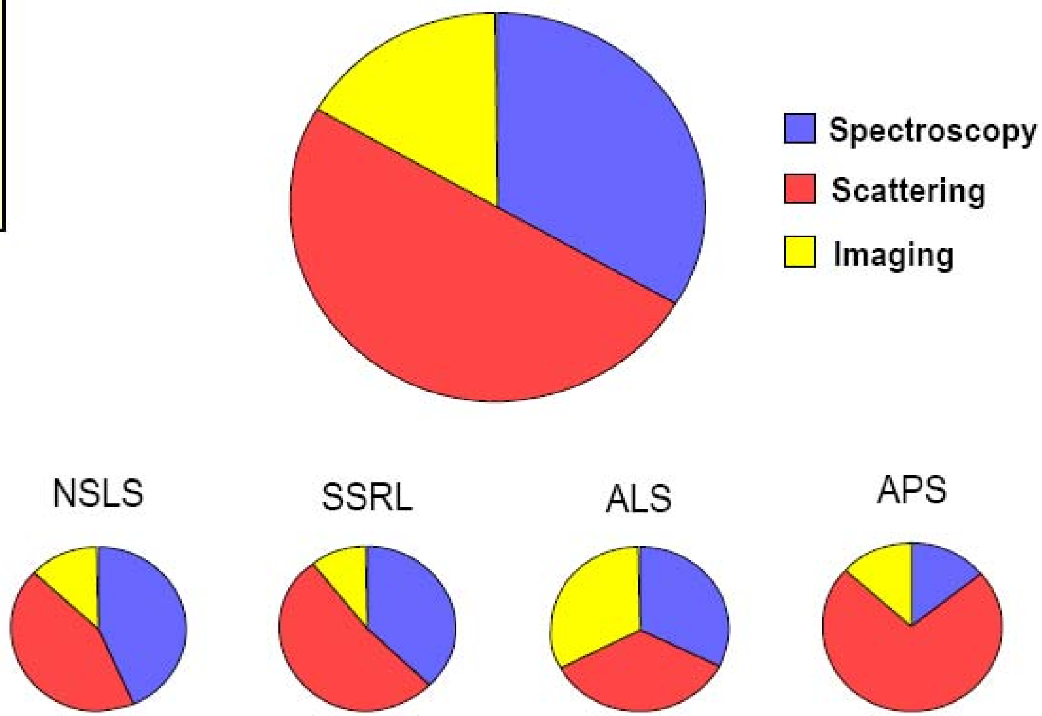
Note: Some "beam ports" – which are the primary openings for x-ray radiation from the electron storage ring – can support more than one "beamline." See example for the Advanced Light

Pat Dehmer's SSRL Talk

Distribution of Beamline Techniques

Here is a graphical display of the summary statistics for all 179 operating beam lines at the four DOE light sources.

Note that the APS (a hard x-ray light source) emphasizes scattering while ALS (a soft x-ray light source) emphasizes spectroscopy and imaging.



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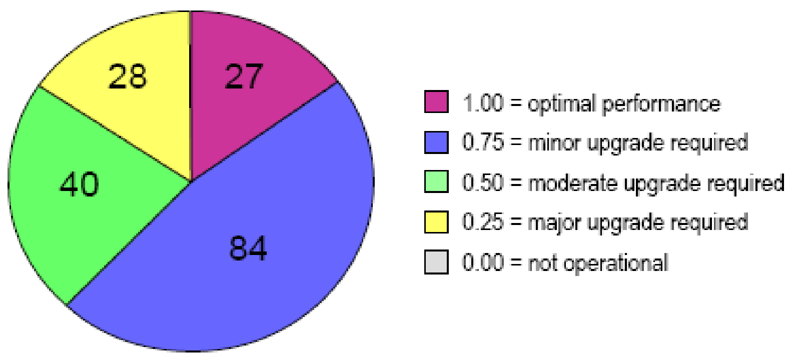
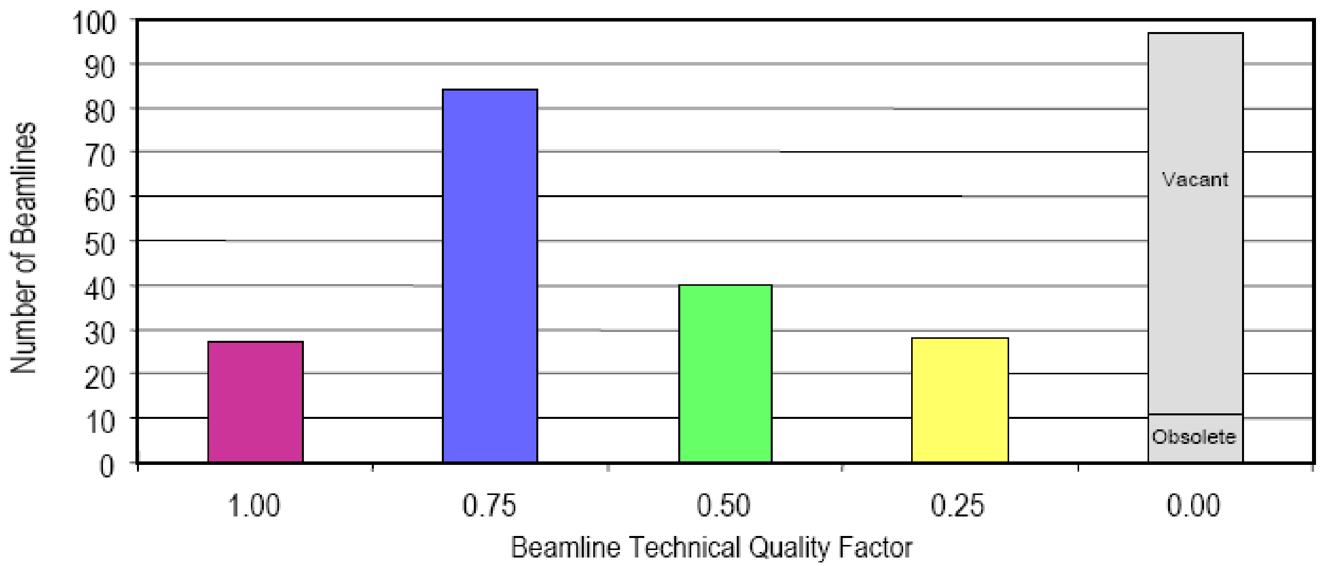
Quality Distribution of 179 Operating Beamlines

The light sources then rated each beamline according to a quality factor. A "normalization" team consisting of one senior technical staff member from each light source visited the four light sources and spot checked the ratings to ensure uniformity.





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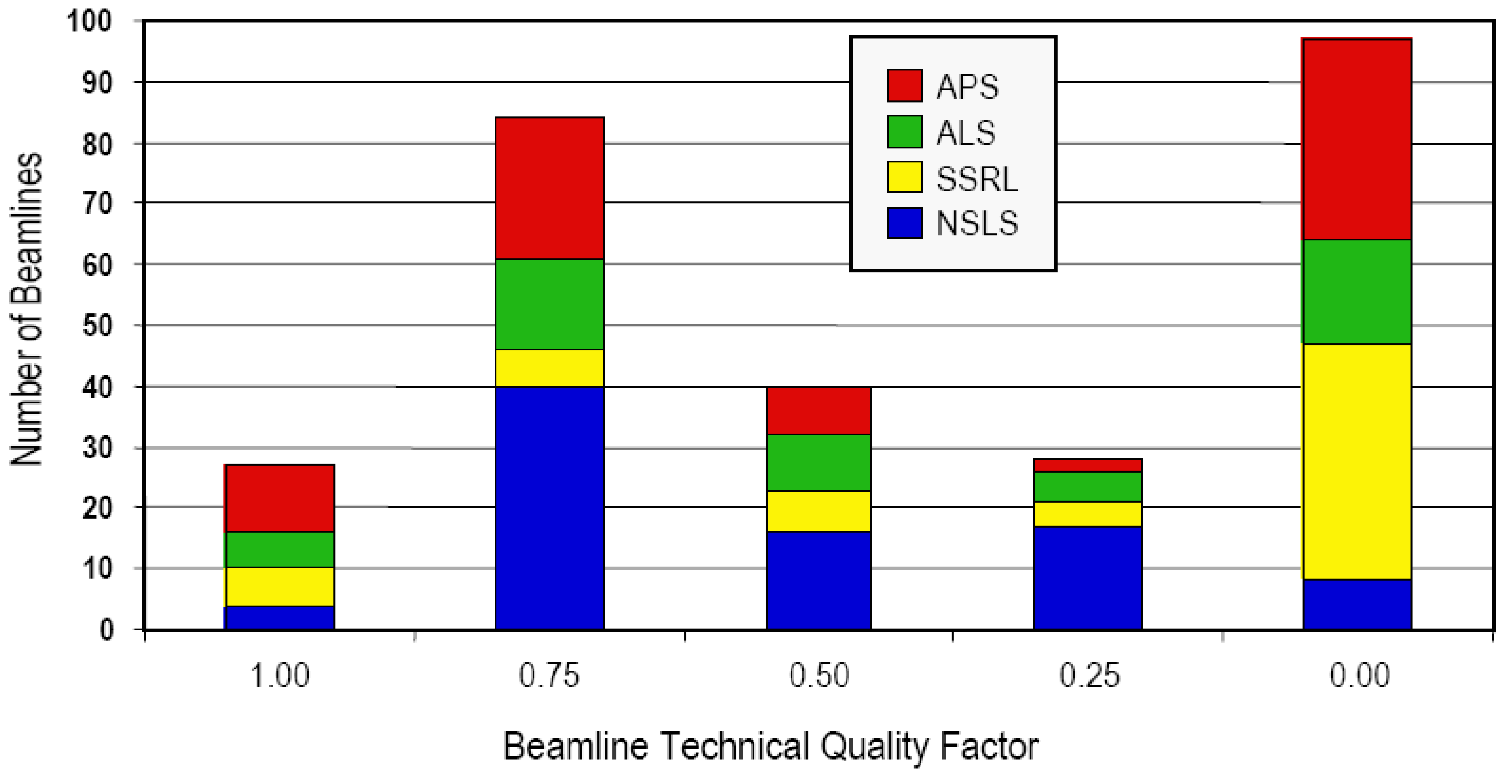
Beamline Quality Distribution by DOE Light Source Facility



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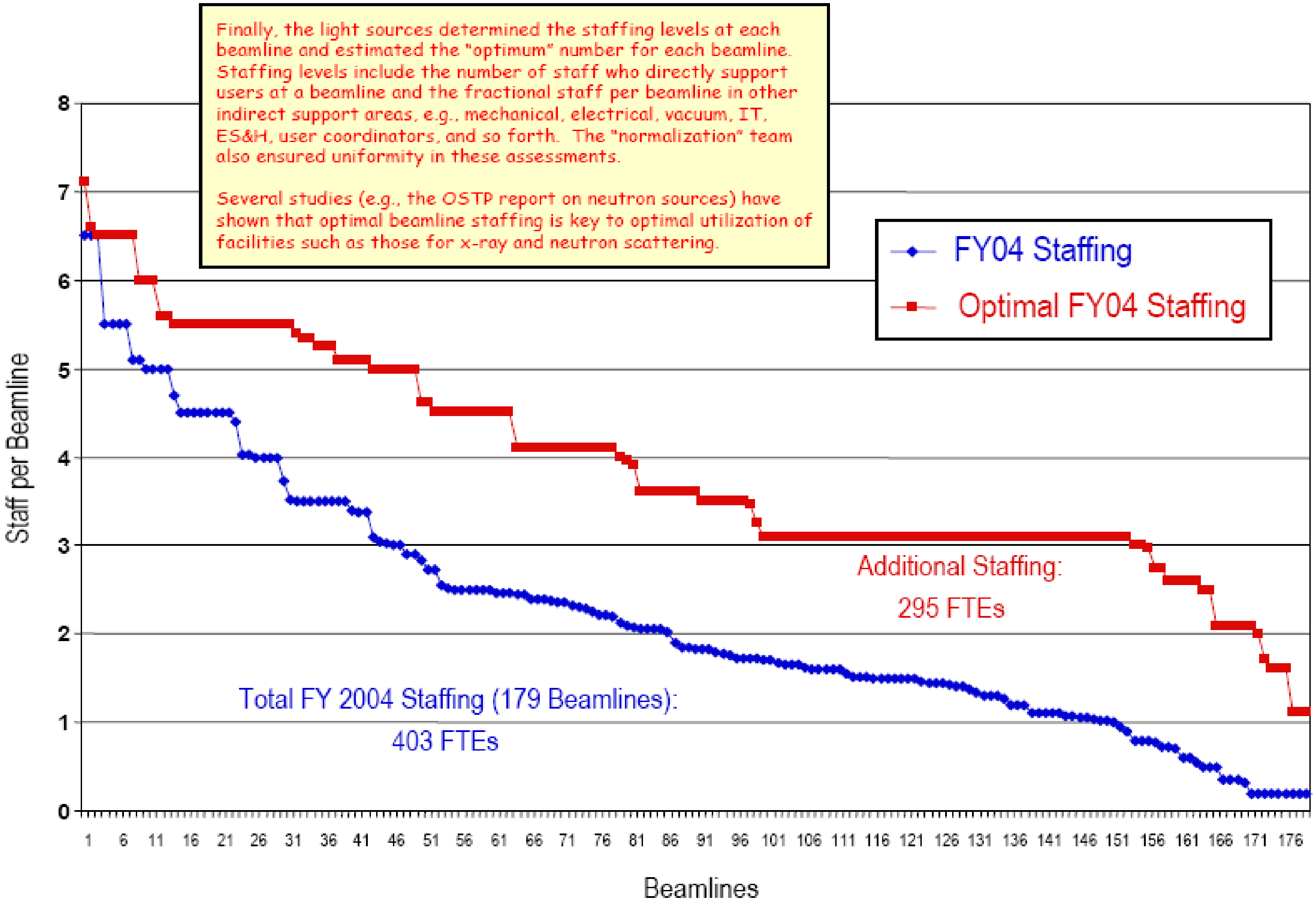
FY 2004 Beamline Staffing versus Optimal Staffing



Pat Dehmer's SSRL Talk

Light Sources – Findings and Conclusions from Assessment Study

I. **Light sources have proven to be indispensable for the study of materials structure and function. The number of users has increased by more than a factor of 30 since 1982 and by a factor of 2.5 since 1996, the year of the commissioning of the APS.**

II. **The light source accelerator complexes have high availability, dependability, and reliability, delivering more than 95% of scheduled beamtime to the beamports.**

III. **The 2005 study of utilization has shown:**

a. There is unused capacity – about 179 beamlines are in service, but another 100 beamlines are not in service.

b. Beamline instrument technical quality varies considerably, but overall it is below par. Only 15% of in-service beamlines are at optimal quality; 47% need minor upgrades; 22% need moderate upgrade; and 16% need major upgrade.

c. Beamline staffing is less than 60% of optimal.

IV. **Additional findings from the BES 2005 peer review of the light sources:**

a. Accelerator staffing is thin at all of the light sources.

b. Accelerator and beamline components are starting to show the effects of age, even at the newer 3rd generation sources.

c. Maintenance and improvements (such as top-off mode) are critical to the future success.

d. Automation employed for macromolecular crystallography beamlines could help overall efficiency in other techniques.

e. Power cost increases could reduce significantly the number of operating hours at the light sources.

V. **Additional findings from international benchmarking:**

a. Considering only beam ports on the 3rd generation sources, by 2009 the U.S. will be outnumbered by the rest of the world by 7:1.

VI. **Conclusions:**

a. The U.S. light sources are at a critical point and will fall far below optimum capabilities without increased funding.

b. Emphasis should be given to upgrading infrastructure and instruments and to providing beamline staff to the world-class facilities.

c. Investments should be made for minor upgrades such as top-off mode at the world-class facilities.

Pat Dehmer's SSRL Talk