

- NUFO represents the interests of all who conduct research at U.S. national scientific User Facilities.
- 45,000 scientists working at the 46 largest federally funded user facilities in the U.S. (6 BNL facilities).
- Users of all (nearly) the U.S. LightSource facilities are members:
  - Advanced Light Source (ALS)
  - Advanced Photon Source (APS)
  - Center for Advanced Microstructures and Devices (CAMD)
  - Cornell High Energy Synchrotron Source (CHESS)
  - Linac Coherent Light Source (LCLS)
  - National Synchrotron Light Source (NSLS)
  - Stanford Synchrotron Radiation Lightsource (SSRL)

- Educate and Advocate regarding the benefits and significance of research conducted at user facilities and their operational needs.
- Facilitate communication among users, user representatives, facility administrators and stakeholders.
- Provide a unified message at the national level on issues of resources for science, economic competitiveness and education for the next-generation scientific workforce.

- The NSLS/NSLS-II Transition will impact the **DOE** LightSource User Community
- Availability of resources **WILL** change.
- Our hope was to provide information to DOE LightSource User Community to help plan their research programs over next 5 year.



### **Goals:**

- Evaluate likely beamline availability (capacity) nationally over this time frame.
- Evaluate short and long term changes in availability by technique.
- On your behalf, provide feedback to BES on resource needs now and in the future.

# Benchmarking changes in beamline availability from 2012-2016

## Experimental techniques at Light-Source Beamlines

[http://science.energy.gov/~media/bes/pdf/Synchrotron\\_Techniques.pdf](http://science.energy.gov/~media/bes/pdf/Synchrotron_Techniques.pdf)

- Divides techniques into 3 broad categories
- 12 basic techniques

### **SPECTROSCOPY**

01 Low-Energy spectroscopy  
02 Soft X-ray spectroscopy  
03 Hard X-ray spectroscopy  
04 Optics/Calibration/Metrology

### **SCATTERING**

05 Hard X-ray diffraction  
06 Macromolecular X'tal  
07 Hard X-ray scattering  
08 Soft X-ray scattering

### **IMAGING**

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

Worked with peers across the complex -

- Produce a set of spreadsheets showing likely beamline availability by technique at the 4 DOE synchrotron LS facilities in 2012, 2014 and 2016.
- Goal – see what is available where through the transition
- For each technique we asked beamline scientists from a representative beamline to interface with their counterparts nationally to assemble benchmark values.
- These were then distributed to management at all four facilities for comment to ensure estimates are reasonable.
- These will be distributed to the user community and should provide guidance on what specific beamlines will be available to you in planning your research needs.

# Caveats

- These are estimates!
- Differences from what is projected are virtually guaranteed due to uncertainties in future funding.
- How individual facilities and beamlines define beamtime availability and techniques is highly variable.
- Usage statistics and categorization for beamlines is a best guess.
- General User vs. Stakeholder time fractions is not considered.
- Again, the goal is here is to provide users reasonable guidance...

# Techniques through the Transition

Number	Technique
<a href="#">01-01</a>	Infrared
<a href="#">01-02</a>	Photoemission
<a href="#">02-01</a>	Soft X-ray Spectroscopy
<a href="#">02-02</a>	Tender XAS
<a href="#">03-01</a>	EXAFS
<a href="#">04-01</a>	Metrology
<a href="#">05-01</a>	X-Ray Powder Diffraction
<a href="#">05-02</a>	Extreme Conditions
<a href="#">05-03</a>	Energy Dispersive
<a href="#">05-04</a>	Micro-Beam Diffraction
<a href="#">06-01</a>	Macromolecular Crystallography
<a href="#">06-02</a>	X-ray footprinting
<a href="#">07-01</a>	SAXS/WAXS/GISAXS/Liq Surface
<a href="#">07-02</a>	Resonant & High Magnetic-Field Scattering
<a href="#">07-03</a>	General Diffraction
<a href="#">07-04</a>	In-Situ Scattering
<a href="#">07-05</a>	XPCS
<a href="#">07-06</a>	Solution, BioSAXS
<a href="#">07-07</a>	Hard IXS
<a href="#">08-01</a>	Soft X-ray Scattering
<a href="#">08-02</a>	Pump/Probe
<a href="#">08-03</a>	Soft IXS
<a href="#">09-01</a>	HX Microprobe
<a href="#">09-02</a>	TXM
<a href="#">09-03</a>	Topography
<a href="#">09-04</a>	micro-CT
<a href="#">09-05</a>	Coherent Diffraction Imaging
<a href="#">10-01</a>	Soft X-ray Microprobe

- Collected a total of 28 subcategories
- Beamline Equivalents (BE) by facility

Technique	Photoemission	Resources Available - BE			
		Mid 2012	Mid 2014	Mid 2016	Mid 2017
Beamline	X-ray Source	Total	Total	Total	Total
<b>NSLS</b>		2.5	2.5	0	0
U5UA	undulator	1	1	0	0
U13	undulator	1	1	0	0
X1A1*	undulator	0.5	0.5	0	0
<b>APS</b>		0.3	0.3	0.3	0.3
4 ID C	undulator	0.3	0.3	0.3	0.3
<b>ALS</b>		4	4	4	4
7.0.1	U5 - undulator	0	0	0	0
10.0.1	U10 - undulator	1	1	1	1
12.0.1	U8 - undulator	1	1	1	1
11.0.1.1*	EPU5 - undulator	1	1	1	1
9.3.2**	bend	1	1	1	1
<b>SSRL</b>		1	1	1	1
BL5-4	undulator	1	1	1	1
<b>NSLS-II</b>		0	0	0	1
ESM	EPU - undulator	0	0	0	1
<b>Totals</b>		<b>7.8</b>	<b>7.8</b>	<b>5.3</b>	<b>6.3</b>

1						
2		<b>HX Microprobe</b>		<b>Resources Available - BE</b>		
3				<b>Mid 2012</b>	<b>Mid 2014</b>	<b>Mid 2016</b>
4		<b>Beamline</b>	<b>X-ray Source</b>	<b>Total</b>	<b>Total</b>	<b>Total</b>
5	<b>+</b>	<b>NSLS-I</b>		2	2	0
8	<b>+</b>	<b>APS</b>		3.4	4.8	4.8
19	<b>+</b>	<b>ALS</b>		1.2	0	0
22	<b>+</b>	<b>SSRL</b>		1	1	2
25	<b>+</b>	<b>NSLS-II</b>		0	0	3
30		<b>Total</b>		<b>7.6</b>	<b>7.8</b>	<b>9.8</b>

HX Microprobe		Resources Available - BE		
		Mid 2012	Mid 2014	Mid 2016
Beamline	X-ray Source	Total	Total	Total
<b>NLSL-I</b>		2	2	0
X26A	Bend	1	1	0
X27A	Bend	1	1	0
<b>APS</b>		3.4	4.8	4.8
2-ID-D	Undulator	0.5	0.5	0.5
2-ID-E	Undulator	1	1	1
8-BM-B	Bend	0.5	1	1
10-ID-B	Undulator	0	0	
13-ID-E	Undulator	0.3	1	1
18-ID-D	Undulator	0.1	0.1	0.1
20-ID-B <sup>a</sup>	Undulator	0.5	0.5	0.5
20-BM-B <sup>a</sup>	Bend	0.2	0.2	0.2
21-ID-D <sup>e</sup>	Undulator	0	0.2	0.2
26-ID-C <sup>f</sup>	Undulator	0.3	0.3	0.3
<b>ALS</b>		1.2	0	0
10.3.1	Bend	0.2	0	0
10.3.2 <sup>b</sup>	Bend	1	0	0
<b>SSRL</b>		1	1	2
BL2-3	Bend	1	1	1
BL2-2 <sup>g</sup>	Bend	0	0	1
<b>NLSL-II</b>		0	0	3
SRX <sup>c</sup>	Undulator	0	0	1
HXN <sup>c</sup>	Undulator	0	0	1
XFM <sup>d</sup>	3P Wiggler	0	0	1
<b>Total</b>		<b>7.6</b>	<b>7.8</b>	<b>9.8</b>

not open to general users because of staffing

CCD available for micro-diffraction

NxtGen

XRF only

XRF, XAFS

XRF, XAFS, XRD or XRF, XRD, FCMT

XRF, XAFS, XRD, FCMT

BE - Beamline equivalent - 1 BE is a station running the full operating schedule of the facility. Typically 5000 Hrs/yr

**Boldface** = oversubscribed

**Footnotes:**

a = Fraction of microprobe experiments somewhat flexible; might accommodate more if more proposals received.

b = Assumes termination of 10.3.2 microprobe studies

c = Commissioning in 2014

d = Approved but unfunded

e = Proposed retrofitting of current white light beamline

f = Additional time available through Center for Nanoscale Materials

g = Additional time available for TXM and tunneling probe

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- Estimates of Beamline availability in 2012, 2014 and 2016 for the specific technique.
- Variability in BE could reflect changes in operation status (i.e. upgrades) or fractional application of the technique on the beamline.
- Each table gives additional notes that may guide in selecting appropriate beamlines.
- This should be a good starting guide for understanding when resource availability will change and where you can go to continue to do your science.
- This is just a start, inquire with each facility and beamline staff.

Macromolecular Crystallography (MX)			Resources Available - BE		
Beamline	X-ray Source	GU*	Mid 2012	Mid 2014	Mid 2016
<b>NSLS</b>			<b>8</b>	<b>8</b>	<b>0</b>
X4A	bend	0.25	1	1	0
X4C	bend	0.25	1	1	0
X6A	bend	0.75	1	1	0
X12B	bend	0.75	1	1	0
X12C	bend	0.75	1	1	0
X25	undulator	0.75	1	1	0
X26C**	bend	0.75	1	1	0
X29	undulator	0.75	1	1	0
<b>APS</b>			<b>17</b>	<b>17</b>	<b>17</b>
14-BM-C BioCars	bend	1	1	1	1
14-ID-B BioCars	undulator	?	1	1	1
17-BM IMCA-CAT	bend	1	1	1	1
17-ID IMCA-CAT	undulator	0.25	1	1	1
19-BM SBC-CAT	bend	0.75	1	1	1
19-ID SBC-CAT	undulator	0.75	1	1	1
21-ID-F LS-CAT	undulator	0.25	1	1	1
21-ID-D LS-CAT	undulator	0.25	1	1	1
21-ID-G LS-CAT	undulator	0.25	1	1	1
22-BM SER-CAT	bend	0.25	1	1	1
22-ID SER-CAT	undulator	0.25	1	1	1
23-BM-B GM/CA-CAT	bend	0.25	1	1	1
23-ID-B GM/CA-CAT	undulator	0.25	1	1	1
23-ID-D GM/CA-CAT	undulator	0.25	1	1	1
24-ID-C NE-CAT	undulator	0.5	1	1	1
24-ID-E NE-CAT	undulator	0.5	1	1	1
31-ID LRL-CAT, Eli Lilly	undulator	0.25	1	1	1
<b>ALS</b>			<b>8</b>	<b>8</b>	<b>8</b>
4.2.2	super bend	0.25	1	1	1
5.0.1	wiggler	0.25	1	1	1
5.0.2	wiggler	0.25	1	1	1
5.0.3	wiggler	0.25	1	1	1
8.2.1	bend	0.25	1	1	1
8.2.2	super bend	0.25	1	1	1
8.3.1	super bend	0.25	1	1	1
12.3.1	super bend	0.25	1	1	1
<b>SSRL</b>			<b>6</b>	<b>6</b>	<b>6</b>
BL7-1	wiggler	1	1	1	1
BL9-1	wiggler	1	1	1	1
BL9-2	wiggler	1	1	1	1
BL11-1	wiggler	0.33	1	1	1
BL12-2	undulator	0.6	1	1	1
BL14-1	bend	0.25	1	1	1
<b>NSLS-II</b>			<b>0</b>	<b>0</b>	<b>3</b>
NYX	undulator	1	0	0	1
FMX	undulator	1	0	0	1
AMX	undulator	1	0	0	1
SM3**	3PW	1	0	0	0
<b>Totals</b>			<b>39</b>	<b>39</b>	<b>34</b>

Hard X-ray Inelastic Scattering			Resources Available - BE		
Beamline	Technique	X-ray Source	Mid 2012	Mid 2014	Mid 2016
<b>NSLS</b>			<b>0</b>	<b>0</b>	<b>0</b>
None					
<b>APS</b>			<b>3.9</b>	<b>3.9</b>	<b>5.2</b>
3-ID-B,D	NRIXS, 0.5-2 meV	Undulator	0.5	0.5	0.5
3-ID-C	HERIX, 1-3 meV	Undulator	0.5	0.5	0.5
9-ID-B	MERIX, 70-300 meV	Undulator	0.5	0.5	1 <sup>a</sup>
16-ID-B	NRIXS, 0.5-2 meV	Undulator	0.3	0.3	0.3
16-ID-B	XRS, (R)-XES, 1 eV	Undulator	0.6	0.6	0.6
20-ID	LERIX, 1 eV	Undulator	0.25	0.25	0.75 <sup>b</sup>
20-ID	XES (by miniXS), 1 eV	Undulator	0.25	0.25	0.75 <sup>b</sup>
30-ID-B	MERIX, 70-300 meV	Undulator	0.5	0.5	0 <sup>a</sup>
30-ID-C	HERIX, 1-3 meV	Undulator	0.5	0.5	0.8 <sup>a</sup>
<b>ALS</b>			<b>0</b>	<b>0</b>	<b>0</b>
None					
<b>SSRL</b>			<b>0</b>	<b>0</b>	<b>0</b>
BL6-2			1	1	1
<b>NSLS-II</b>			<b>0</b>	<b>0</b>	<b>1</b>
IXS	HERIX, 0.1-1 meV	Undulator	0	0	1
HIX	H-RIX, 10-50 meV <sup>c</sup>	Undulator	0	0	0
HIX	I-RIX, 200-300 meV <sup>d</sup>	Undulator	0	0	0
<b>Totals - NRIXS</b>			<b>0.8</b>	<b>0.8</b>	<b>0.8</b>
<b>Totals - HERIX</b>			<b>1</b>	<b>1</b>	<b>2.3</b>
<b>Totals - MERIX</b>			<b>1</b>	<b>1</b>	<b>1</b>
<b>Totals - LERIX</b>			<b>0.25</b>	<b>0.25</b>	<b>0.75</b>
<b>Totals - XRS, (R)-XES</b>			<b>0.85</b>	<b>0.85</b>	<b>1.35</b>
<b>Total</b>			<b>3.9</b>	<b>3.9</b>	<b>6.2</b>

- NRIXS, 0.5-2 meV: Nuclear Resonant IXS (momentum integrated vibrational dynamics, phonon density of states)
- HERIX, 1-3 meV: High Energy Resolution IXS (momentum resolved vibrational dynamics, phonons)
- MERIX, 70-300 meV: Medium Energy Resolution IXS (momentum resolved charge dynamics, including both resonant and non-resonant studies)
- LERIX, 1 eV: Low Energy Resolution IXS (momentum resolved charge dynamics, valence and core electronic excitations)
- XRS, (R)-XES, 1 eV: X-ray Raman Scattering, (Resonant) X-ray Emission Spectroscopy

BE - Beamline equivalent - 1 BE is a station running the full operating schedule of the facility. Typically 5000 Hrs/yr

**Boldface** = all IXS capabilities are oversubscribed by various amount

**Footnotes:**

a = Changes due to APS upgrade plan to combine MERIX of 30-ID with that of 9-ID into a fully dedicated beamline for MERIX experiments

b = Changes due to APS upgrade plan to create two beamlines out of the existing 20-ID using canted undulators

c = H-RIX is similar to MERIX but with improved energy resolution to 10-50 meV, designed for studies of momentum resolved charge dynamics.

d = I-RIX is similar to LERIX but with improved energy resolution to 200-300 meV, which matches the lifetime of the core holes

hard x-ray RIX/Raman  
 Project Funded and under construction in NSLS-II Project - Available 21  
 Approved but not yet funded  
 Approved but not yet funded

Technique	Resources Available - BE				Change in Resources available 2012-2016			
	FY2012	FY2014 (planned)	Oct. 2014	Mid 2016	Δ	Δ (no NxtGen)	%Δ	%Δ (no NxtGen)
<b>Spectroscopy</b>								
01 - Low Energy Spectroscopy	12.3	12.8	7.3	9.3	-3.00	-5.00	-24.39%	-40.65%
02 - Soft/Tender X-Ray Spectroscopy	10.4	11.4	7.7	9.6	-0.75	-1.75	-7.25%	-16.91%
03 - Hard X-ray Spectroscopy	17.6	18.3	11.3	12.3	-5.30	-6.30	-30.20%	-35.90%
04 - Optics/Calibration/Metrology	9.7	10.0	3.7	4.7	-4.95	-5.95	-51.30%	-61.66%
<b>Scattering</b>								
05 X-ray Diffraction	24.9	25.2	17.8	19.1	-5.80	-6.80	-23.34%	-27.36%
06 MX, footprinting	40.0	40.0	31.0	34.0	-6.00	-6.00	-15.00%	-15.00%
07 Hard X-ray Scattering	40.8	40.8	29.4	36.6	-4.25	-6.25	-10.42%	-15.32%
08 Soft X-Ray Scattering	11.4	11.6	9.7	12.0	0.60	0.60	5.26%	5.26%
<b>Imaging</b>								
09- Hard X-ray Imaging	15.2	15.5	11.5	15.5	0.25	-0.75	1.64%	-4.93%
10- Soft X-ray Imaging	4.5	4.6	4.6	4.6	0.10	0.10	2.22%	2.22%

- Overall beamline equivalent (BE) availability will decrease roughly 15-20% nationally. Expect increased competition for beamtime.
- Most generalized techniques will see less time available with “spectroscopy” techniques being the most highly impacted as a group.
- Be aware of dates when resources will change and consider deadlines for beamtime proposal submission at each facility to avoid gaps.

Number	Technique	FY12	FY14	Oct. 14	FY16*	% D (2012)	% D (no NxtGen)
<a href="#">01-01</a>	Infrared	4.5	5.0	2.0	4.0	-11.11%	-55.56%
<a href="#">01-02</a>	Photoemission	7.8	7.8	5.3	5.3	-32.05%	-32.05%
<a href="#">02-01</a>	Soft X-ray Spectroscopy	8.9	8.9	6.7	7.6	-14.12%	-14.12%
<a href="#">02-02</a>	Tender XAS	1.5	2.5	1.0	2.0	33.33%	-33.33%
<a href="#">03-01</a>	EXAFS	17.6	18.3	11.3	12.3	-30.20%	-35.90%
<a href="#">04-01</a>	Metrology	9.7	10.0	3.7	4.7	-51.30%	-61.66%
<a href="#">05-01</a>	X-Ray Powder Diffraction	14.2	14.2	9.0	10.0	-29.58%	-36.62%
<a href="#">05-02</a>	Extreme Conditions	7.0	7.2	5.5	5.8	-17.14%	-17.14%
<a href="#">05-03</a>	Energy Dispersive	0.4	0.4	0.1	0.1	-75.00%	-75.00%
<a href="#">05-04</a>	Micro-Beam Diffraction	3.3	3.4	3.2	3.2	-3.08%	-3.08%
<a href="#">06-01</a>	Macromolecular Crystallography	39.0	39.0	31.0	34.0	-12.82%	-12.82%
<a href="#">06-02</a>	X-ray footprinting	1.0	1.0	0.0	0.0	-100.00%	-100.00%
<a href="#">07-01</a>	SAXS/WAXS/GISAXS/Liq Surface	14.0	14.0	9.0	10.5	-25.00%	-32.14%
<a href="#">07-02</a>	Resonant & High Magnetic-Field Scattering	2.8	2.8	2.0	2.8	0.00%	-16.36%
<a href="#">07-03</a>	General Diffraction	9.6	9.6	6.7	6.8	-29.17%	-30.21%
<a href="#">07-04</a>	In-Situ Scattering	5.7	5.7	3.2	4.7	-18.42%	-26.32%
<a href="#">07-05</a>	XPCS	2.0	2.0	2.0	2.5	25.00%	25.00%
<a href="#">07-06</a>	Solution, BioSAXS	2.4	2.4	2.2	2.7	12.77%	12.77%
<a href="#">07-07</a>	Hard IXS	4.4	4.4	4.4	6.7	52.27%	52.27%
<a href="#">08-01</a>	Soft X-ray Scattering	5.8	5.8	4.3	6.3	9.57%	9.57%
<a href="#">08-02</a>	Pump/Probe	5.7	5.9	5.7	5.7	0.88%	0.88%
<a href="#">08-03</a>	Soft IXS	1.2	1.2	0.7	0.7	-41.67%	-41.67%
<a href="#">09-01</a>	HX Micro/Nano-probe	7.6	7.8	5.8	9.8	28.95%	15.79%
<a href="#">09-02</a>	TXM	1.9	2.1	1.1	1.1	-42.11%	-42.11%
<a href="#">09-03</a>	Topography	1.0	1.3	0.3	0.3	-75.00%	-75.00%
<a href="#">09-04</a>	micro-CT	2.8	1.9	1.9	1.9	-32.73%	-32.73%
<a href="#">09-05</a>	Coherent Diffraction Imaging	2.0	2.5	2.5	2.5	25.32%	25.32%
<a href="#">10-01</a>	Soft X-ray Microprobe	4.5	4.6	4.6	4.6	2.22%	2.22%
<b>Total:</b>		<b>187.8</b>	<b>191.2</b>	<b>134.9</b>	<b>158.2</b>	<b>-15.76%</b>	<b>-20.55%</b>

\*includes NxtGen

## Techniques nationally that will likely have additional capacity by 2016

Number	Technique	FY12	FY14	Oct. 14	FY16*	% D (2012)	% D (no NxtGen)
01-01	Infrared	4.5	5.0	2.0	4.0	-11.11%	-55.56%
01-02	Photoemission	7.8	7.8	5.3	5.3	-32.05%	-32.05%
02-01	Soft X-ray Spectroscopy	8.9	8.9	6.7	7.6	-14.12%	-14.12%
02-02	Tender XAS	1.5	2.5	1.0	2.0	33.33%	-33.33%
03-01	EXAFS	17.6	18.3	11.3	12.3	-30.20%	-35.90%
04-01	Metrology	9.7	10.0	3.7	4.7	-51.30%	-61.66%
05-01	X-Ray Powder Diffraction	14.2	14.2	9.0	10.0	-29.58%	-36.62%
05-02	Extreme Conditions	7.0	7.2	5.5	5.8	-17.14%	-17.14%
05-03	Energy Dispersive	0.4	0.4	0.1	0.1	-75.00%	-75.00%
05-04	Micro-Beam Diffraction	3.3	3.4	3.2	3.2	-3.08%	-3.08%
06-01	Macromolecular Crystallography	39.0	39.0	31.0	34.0	-12.82%	-12.82%
06-02	X-ray footprinting	1.0	1.0	0.0	0.0	-100.00%	-100.00%
07-01	SAXS/WAXS/GISAXS/Liq Surface	14.0	14.0	9.0	10.5	-25.00%	-32.14%
07-02	Resonant & High Magnetic-Field Scattering	2.8	2.8	2.0	2.8	0.00%	-16.36%
07-03	General Diffraction	9.6	9.6	6.7	6.8	-29.17%	-30.21%
07-04	In-Situ Scattering	5.7	5.7	3.2	4.7	-18.42%	-26.32%
07-05	XPCS	2.0	2.0	2.0	2.5	25.00%	25.00%
07-06	Solution, BioSAXS	2.4	2.4	2.2	2.7	12.77%	12.77%
07-07	Hard IXS	4.4	4.4	4.4	6.7	52.27%	52.27%
08-01	Soft X-ray Scattering	5.8	5.8	4.3	6.3	9.57%	9.57%
08-02	Pump/Probe	5.7	5.9	5.7	5.7	0.88%	0.88%
08-03	Soft IXS	1.2	1.2	0.7	0.7	-41.67%	-41.67%
09-01	HX Micro/Nano-probe	7.6	7.8	5.8	9.8	28.95%	15.79%
09-02	TXM	1.9	2.1	1.1	1.1	-42.11%	-42.11%
09-03	Topography	1.0	1.3	0.3	0.3	-75.00%	-75.00%
09-04	micro-CT	2.8	1.9	1.9	1.9	-32.73%	-32.73%
09-05	Coherent Diffraction Imaging	2.0	2.5	2.5	2.5	25.32%	25.32%
10-01	Soft X-ray Microprobe	4.5	4.6	4.6	4.6	2.22%	2.22%
Total:		187.8	191.2	134.9	158.2	-15.76%	-20.55%

\*includes NxtGen

**XPCS:**  
NSLS-2 CHX

**Solution/Bio-SAXS:**  
NSLS-2 LIX

**Hard IXS:**  
APS 9-ID, 20-ID, 30-ID  
NSLS-2 IXS

**Soft XRS:**  
APS IEX  
ALS COSMIC  
NSLS-2 CSX

**HX Micro/Nano-probe:**  
APS 13-ID, 8-BM, 21-ID  
SSRL BL2-2  
NSLS-2 SRX, HXN

**CDI:**  
ALS COSMIC

**Soft X-ray microprobe:**  
SSRL 13-1

## Techniques nationally that are served by few beamlines and face lowered availability or uncertainty in 2016

Number	Technique	FY12	FY14	Oct. 14	FY16*	% D (2012)	% D (no NxtGen)
01-01	Infrared	4.5	5.0	2.0	4.0	-11.11%	-55.56%
01-02	Photoemission	7.8	7.8	5.3	5.3	-32.05%	-32.05%
02-01	Soft X-ray Spectroscopy	8.9	8.9	6.7	7.6	-14.12%	-14.12%
02-02	Tender XAS	1.5	2.5	1.0	2.0	33.33%	-33.33%
03-01	EXAFS	17.6	18.3	11.3	12.3	-30.20%	-35.90%
04-01	Metrology	9.7	10.0	3.7	4.7	-51.30%	-61.66%
05-01	X-Ray Powder Diffraction	14.2	14.2	9.0	10.0	-29.58%	-36.62%
05-02	Extreme Conditions	7.0	7.2	5.5	5.8	-17.14%	-17.14%
05-03	Energy Dispersive	0.4	0.4	0.1	0.1	-75.00%	-75.00%
05-04	Micro-Beam Diffraction	3.3	3.4	3.2	3.2	-3.08%	-3.08%
06-01	Macromolecular Crystallography	39.0	39.0	31.0	34.0	-12.82%	-12.82%
06-02	X-ray footprinting	1.0	1.0	0.0	0.0	-100.00%	-100.00%
07-01	SAXS/WAXS/GISAXS/Liq Surface	14.0	14.0	9.0	10.5	-25.00%	-32.14%
07-02	Resonant & High Magnetic-Field Scattering	2.8	2.8	2.0	2.8	0.00%	-16.36%
07-03	General Diffraction	9.6	9.6	6.7	6.8	-29.17%	-30.21%
07-04	In-Situ Scattering	5.7	5.7	3.2	4.7	-18.42%	-26.32%
07-05	XPCS	2.0	2.0	2.0	2.5	25.00%	25.00%
07-06	Solution, BioSAXS	2.4	2.4	2.2	2.7	12.77%	12.77%
07-07	Hard IXS	4.4	4.4	4.4	6.7	52.27%	52.27%
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Total:		187.8	191.2	134.9	158.2	-15.76%	-20.55%

\*includes NxtGen

### Infra-red Spectroscopy:

Loss 4 NSLS beamlines  
New ALS 5.4.1, 5.4.3

### Tender XAS:

Loss NSLS X15B and X19A  
New SSRL 14-3

### X-ray Footprinting:

Loss NSLS X28C

### Resonant/High MF Scatter.:

Loss NSLS X21 and X22C  
Increase APS 6-ID  
NEXT ISR (2017)

### Soft IXS:

Loss NSLS X1B  
NEXT SIX (2017)

### TXM:

Loss NSLS X8C  
Increase APS 32-ID  
NEXT FXI (2017)

### Topography:

Loss NSLS X19C  
Increase APS 1-BM

## High User-volume techniques ( $\geq 9$ beamlines) nationally that will see notable losses in BE through 2016

Number	Technique	FY12	FY14	Oct. 14	FY16*	% D (2012)	% D (no NxtGen)
01-01	Infrared	4.5	5.0	2.0	4.0	-11.11%	-55.56%
01-02	Photoemission	7.8	7.8	5.3	5.3	-32.05%	-32.05%
02-01	Soft X-ray Spectroscopy	8.9	8.9	6.7	7.6	-14.12%	-14.12%
02-02	Tender XAS	1.5	2.5	1.0	2.0	33.33%	-33.33%
03-01	EXAFS	17.6	18.3	11.3	12.3	-30.20%	-35.90%
04-01	Metrology	9.7	10.0	3.7	4.7	-51.30%	-61.66%
05-01	X-Ray Powder Diffraction	14.2	14.2	9.0	10.0	-29.58%	-36.62%
05-02	Extreme Conditions	7.0	7.2	5.5	5.8	-17.14%	-17.14%
05-03	Energy Dispersive	0.4	0.4	0.1	0.1	-75.00%	-75.00%
05-04	Micro-Beam Diffraction	3.3	3.4	3.2	3.2	-3.08%	-3.08%
06-01	Macromolecular Crystallography	39.0	39.0	31.0	34.0	-12.82%	-12.82%
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<b>Total:</b>		187.8	191.2	134.9	158.2	-15.76%	-20.55%

\*includes NxtGen

### Soft X-ray spectroscopy:

Loss of 5 NSLS beamlines  
NSLS-2 CSX, SST

### EXAFS:

Loss of 10 NSLS beamlines  
No additional until NSLS-2  
ISS (2017)

### Metrology:

Loss of 10 NSLS beamlines  
Increase APS BM-6

### X-ray Powder Diff.:

Loss 7 NSLS beamlines  
NSLS-2 XPD

### MX:

Loss 8 NSLS beamlines  
3 NSLS-2 beamlines

### SAXS/WAXS/GISAXS:

Loss 5 NSLS beamlines  
NSLS-2 CHX

### General Diff.:

Loss 5 NSLS beamlines

# Conclusions/Discussion

- Come October 2014 (at the latest) beamtime availability nationally will decrease 15-20%.
  - Are you ready?
  - Where will you seek beamtime?
  - When do you plan to submit proposals?
  - Expect increased competition.
  - Are you accounting for this in submitting grant proposals and in supporting students?
  - How will facilities cooperate to mitigate these issues?
- Some techniques will be impacted significantly beyond 2016. What long term recommendations does the user community have?
  - Funds for additional beamlines at all facilities to increase capacity? If so which?
  - Funds to increase beamline efficiency rather than simply capacity (robotics, remote capabilities, software development, staffing, etc.)
- Are we at risk of sacrificing high demand synchrotron “bread-and butter” techniques (EXAFS, Diffraction, SAXS/WAXS) for high-risk, technically challenging beamlines that impact less users?