Charge to the Committee

- Scientific Productivity
  - Number of users
  - quality of science (pubs, premier pubs, PDB deposits)
  - comparison with other beamlines
- User satisfaction
- Technical and infrastructure development
  - quality
  - importance
  - relevance to user program
- Resource allocation
- Interaction with other programs at the NSLS
- Future plans

Life Sciences Planning for NSLS & NSLS-II

Lisa M. Miller
Division Head for Life & Environmental Science, NSLS
Deputy Associate Project Director for Life Sciences, NSLS-II

Outline

- Overview of strategic planning for life sciences
- Status of NSLS-II Project
- Status of life sciences planning for NSLS-II
- Next steps for X6A program

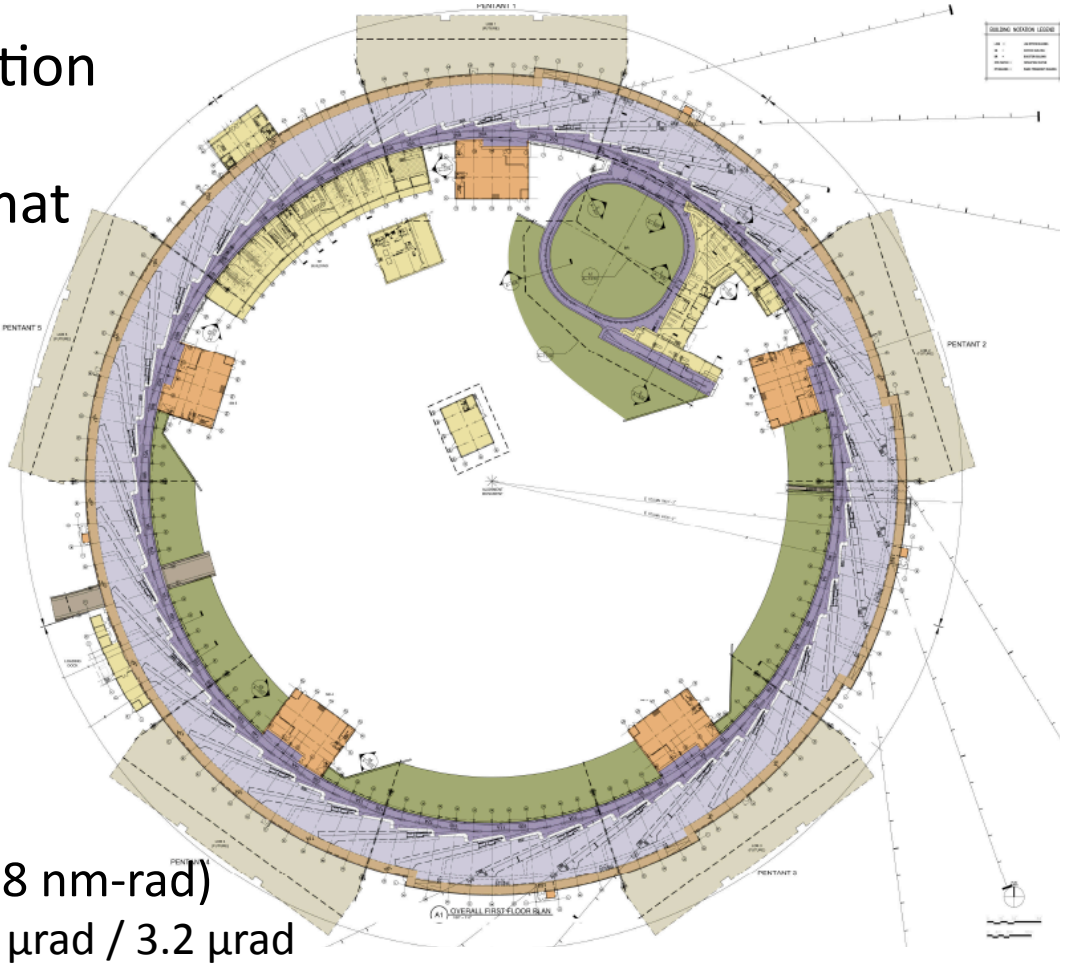
Strategic Plan for Life Sciences

- Maintain strong user community
  - Keep users engaged today and in building of NSLS-II
  - Continue funding for life sciences beamlines at NSLS
  - Secure funding for life sciences beamlines at NSLS-II
  - Develop Biology Village concept: best possible contiguous placement of beamlines; secure Biology Lab/Office Building (LOB)?
- Complementary scientific scope
  - Full complement of diffraction, scattering, spectroscopy and imaging
  - Take advantage of unique characteristics of NSLS-II
- NSLS-II as a research institution
  - Make NSLS-II research environment for attractive for staff and enhanced collaboration with users
- Staged development
  - Anticipation for space allocations and canted undulator deployment

NSLS-II Design Features

Design Parameters

- 3 GeV, 500 mA, top-off injection
- Circumference 791.5 m
- 30 cell, Double Bend Achromat
  - 15 long, hi-β straights (9.3 m)
  - 15 short, lo-β straights (6.6 m)



Novel design features:

- Damping wigglers
- Soft bend magnets
- Three pole wigglers
- Large gap IR dipoles

Ultra-low emittance

- Small beam size ($\varepsilon_x/\varepsilon_y$ = 0.6 / 0.008 nm-rad)
- σ_x / σ_x = 28 μm / 2.6 μm, σ_x' / σ_y' = 19 μrad / 3.2 μrad
- Diffraction limited in vertical at 10 keV

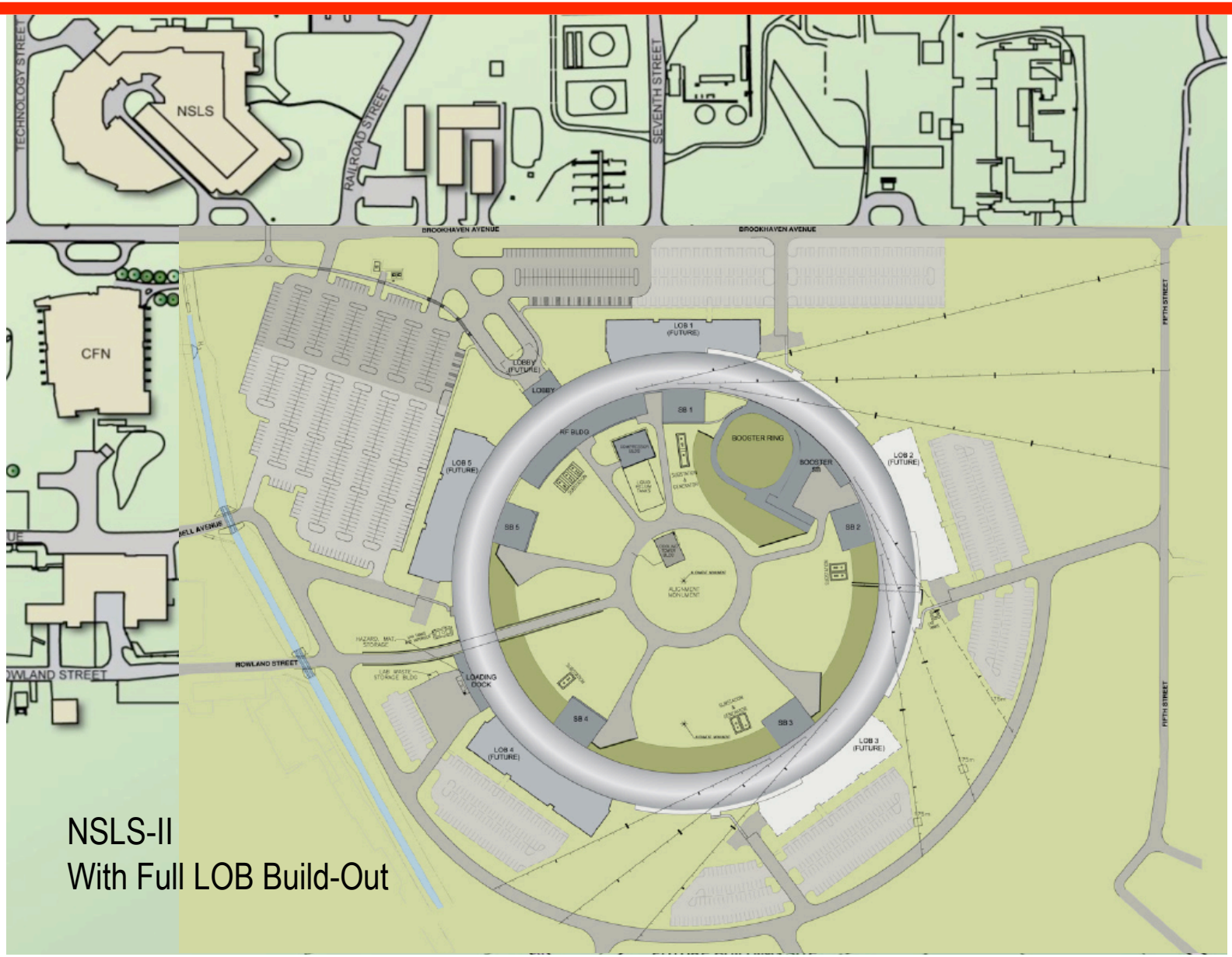
Pulse Length (rms) ~ 15 psec

Total Project Cost = $912M

Key Project Milestones

Aug 2005	**CD-0**, Approve Mission Need	**(Complete)**
Jul 2007	**CD-1**, Approve Alternative Selection and Cost Range	**(Complete)**
Jan 2008	**CD-2**, Approve Performance Baseline	**(Complete)**
Jan 2009	**CD-3**, Approve Start of Construction	**(Complete)**
Feb 2009	Contract Award for Ring Building	**(Complete)**
Aug 2009	Contract Award for Storage Ring Magnets	**(Complete)**
Mar 2010	Contract Award for Booster System	
Feb 2011	1st Pentant Ring Building Beneficial Occupancy; Begin Accelerator Installation	
Feb 2012	Beneficial Occupancy of Experimental Floor	
Oct 2013	Start Accelerator Commissioning	
Jun 2014	Early Project Completion; Ring Available to Beamlines	
Jun 2015	**CD-4**, Approve Start of Operations (NSLS ceases operations)	

NSLS-II Site Plan



NSLS-II
With Full LOB Build-Out

Lab-Office Building (LOB) Floor Plan

- SCIENTISTS
- SCI. ASSOCIATES
- POSTDOCS
- STUDENTS
- USERS
- TECHS
- LABS
- MACHINE SHOP
- FACILITY COORD
- CONFERENCE
- KITCHEN
- ADMIN
  MAIL & P/C

33,600 Gross Square Feet

- 120 Offices
- 10 labs
- Machine shop
- Conference Rooms
- Interaction Areas
- Loading/storage area

Current project scope:

- 2 built-out LOBs
- 1 shell (maybe 2-3)

NSLS-II Beamlines

- 19 straight sections for undulators
- 8 straight sections for damping wigglers
- 27 BM ports for IR, UV and Soft X-rays
- 4 Large Gap BM ports for far-IR

At least 58 beamlines
More beamlines by canting multiple IDs per straight
Multiple end-stations/beamline are also possible

For comparison, NSLS has 62 operating beamlines

Six Beamlines in Scope of Project

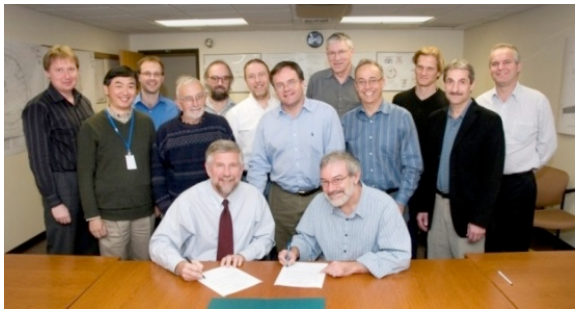
Coherent hard x-ray scattering

High-energy powder diffraction

Coherent soft x-ray scattering

Hard x-ray nanoprobe

Inelastic x-ray scattering



Sub-micron resolution x-ray spectroscopy

Beamline Acquisition Strategy

FUNDING	BEAMLINES
BES – Project	6 insertion device beamlines in base project scope
BES – Early Operations	~ 20 beamlines on bending magnet, 3-pole wiggler, and IR ports (will include transferred equipment from NSLS beamlines)
BES – MIE	~ 16 insertion device beamlines (est. 5-6 beamlines with funding beginning in 2012)
Non-BES	Life Science beamlines and other non-BES missions

MIE = Major Items of Equipment

NIH and BER Planning

- Biological Sciences Planning
  - April 27-28, 2008: NIH/DOE Workshop
  - September 11-12, 2008: NIH/DOE Imaging Workshop
  - February 19, 2009: NSLS-II visit to NIH
  - May 22, 2009: NSLS-II visit to BER
  - June 4-5, 2009: Bethesda NIH Workshop
  - October 30, 2009: visit by Sharlene Weatherwax (BER)
  - February 23, 2010: NSLS-II discussion at BERAC Meeting
- Current NIH Plans ($45M)
  - Four undulators and front ends ($12.1M, ARRA funding in 2010; $33M in NIH budget for FY11)
    - 2 macromolecular crystallography beamlines (canted)
    - 1 x-ray scattering beamline
    - 1 imaging beamline (specifics undecided)
- Current BER Plans
  - BER planning summary for NSLS-II (3 pages, October 2009)
  - White paper with 7 proposed beamlines (involved ~40 BER-funded investigators, submitted January 2010)

Currently Funded Beamlines at NSLS-II

BES Funded Project Beamlines

Technique	Source
Inelastic X-Ray Scattering	Undulator
Coherent Soft X-Ray Scattering	Undulator
Coherent Hard X-Ray Scattering	Undulator
X-Ray Powder Diffraction	Damping Wiggler
Hard X-Ray Nanoprobe	Undulator
Sub-Micron Resolution X-Ray Spectroscopy	Undulator

NIH Funded Beamlines

Macromolecular Crystallography #1	Undulator
Macromolecular Crystallography #2	Undulator
Solution X-Ray Scattering	Undulator
Coherent Diffraction Imaging	Undulator

Proposed Capabilities for BER at NSLS-II

Technique	Source	Total Cost
X-Ray Fluorescence & Absorption Nanotomography	Undulator	$ 6.5 M
Macromolecular Crystallography & Correlated Optical Spectroscopy	Undulator	$ 13.5 M
X-Ray Footprinting	Damping wiggler	$ 6.0 M
Infrared Microscopy	Bending magnet	$ 2.5 M
Soft X-Ray Spectromicroscopy & Nanotomography	Undulator	$ 13.5 M
X-Ray Absorption Spectroscopy	3-pole wiggler	$ 2.5 M
Solution X-Ray Scattering	3-pole wiggler	$ 4.5 M

Call for Beamline Development Proposals

Scope

•Any area of science
•Any beamline type –ID, BM, 3PW, IR
•Independent of funding source and implementation approach (i.e. all new construction or partially incorporating existing equipment)

In support of the call for proposals, we will provide:

•User Access Policy
•Beamline Development Policy
•Photon Source Document (Updated)

Schedule

•Issue call in March
•Letters of Intent due in April
•Will hold two informational sessions, one in March, one in April
•Proposals due in June
•Reviewed in June/July
•Responses by August

In the future, intend to have an annual call for proposals

Light Sources Directorate Scientific Advisory Committee

- Keith Hodgson, SLAC (Chair)
- Simon Bare, UOP
- Murray Gibson, APS
- Ernie Hall, GE
- Jerry Hastings, SLAC
- Russel Hemley, Carnegie
- John Hemminger, Irvine
- Leemor Joshua-Tor, CSH
- Steve Kevan, Univ. Oregon
- Sine Larsen, Univ. Copenhagen
- Gerd Materlik, Diamond
- Simon Mochrie, Yale
- Harald Reichert, ESRF
- Janet Smith, Univ. Michigan
- Friso van der Veen, SLS
- Pierre Wiltzius, UCSB

MX and X6A Planning for NSLS-II

- Ensure continued support for X6A until NSLS ceases operation
  In light of NIGMS review in Sept 2009 that said "future support should be reduced with the anticipated closing of this beamline in 3-4 years if the hardware endurance justifies this length of extension," a response to reviews will be prepared and discussed in person with program directors
  •Beamline X6A at NSLS is entirely supported by the NIGMS supplement funds (Actually, X6A funding is leveraged by NSLS support of admin, budget, and technical services)
  •No opportunities for remote data collection (Actually, remote data collection is taking place)
  •Positioned on a bending magnet is a disadvantage for X6A compared to insertion device beamlines supported by these funds at other facilities (Actually, productivity is better than all other BM and on par with ID beamlines at NSLS)
  •Concern was expressed that if there were a catastrophic failure of a detector, funds will not be available for replacement. (Actually, we have Q210 backup detector.)

MX and X6A Planning for NSLS-II

- Continue X6A productivity in out years at NSLS
  - User access to X6A and X25, remote access, protein express
  - Synergy with other NSLS programs (e.g. SAXS/WAXS at X9)

- Include X6A Program in plans for NSLS-II beamlines
  - NIH has agreed to fund 2 MX beamlines at NSLS-II; we have asked BER to fund a third
  - Call for NSLS-II proposals is imminent and Wayne Hendrickson will be coordinating plans for these beamline proposals
  - X6A program will be included in these plans