

Advanced Photon Source Upgrade Project Status



George Srajer for the APS Upgrade Team

APS Users Monthly Meeting
April 16, 2014

APS Upgrade Project Overall Goal

- Enable scientific community to deliver transformational science and meet global challenges for many decades to come by building the best and brightest storage ring in the world



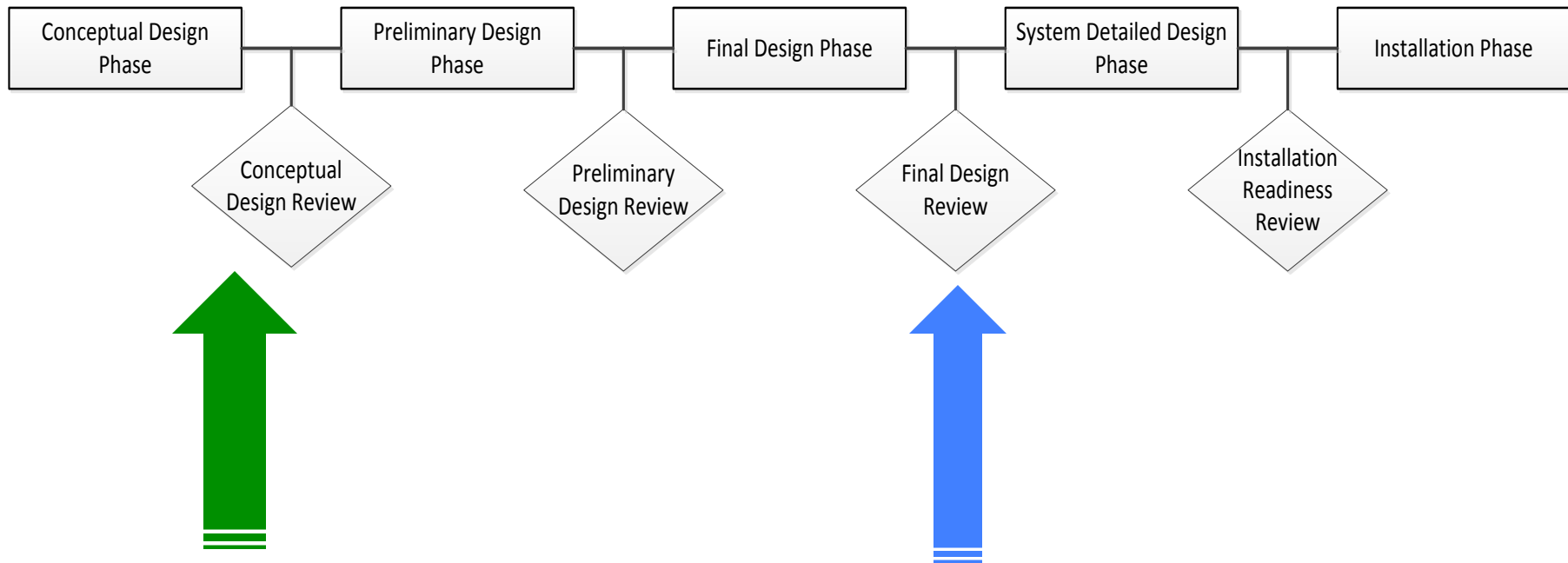
Funding

- Total FY14 budget authority to-date: \$15M
 - 75% of the \$20.0M
- President's FY15 request: \$20M
- Plan to develop conceptual and preliminary designs, develop R&D plans and build prototypes (magnets, vacuum systems, power supplies, support systems,...)



Overview & Status of System/Component

INTEGRATED SYSTEM – Storage Ring, Beamlines e.g.



We are here...
(~15%)

This is at least two years
away

Successful MBA Beam Physics Review

- February 13-14, 2014
- Reviewers concluded that **“the team has made outstanding progress in a short time period towards the conceptual design”** and that the APS Upgrade program has **“an excellent and very competent team”**

REVIEW COMMITTEE

Weiming Guo – BNL

Simon Leeman – MAX IV,
Sweden

Ryutaro Nagaoka – SOLEIL,
France

Pantaleo Raimondi – ESRF,
France

Christoph Steier – Chair LBNL

Richard Walker – Diamond, UK



Calendar of Technical Design Reviews

Review Title	Date	Reviewers
Diagnostics / Controls (CDR)	March 20-21, 2014	David Gurd – SNS John Sebek – SLAC Barry Lai – ANL Mark Rivers - UofC
Vacuum Systems Review (CDR)	March 25, 2014	Alex Chen – FNAL H.C. Hseuh – BNL (Chair) Robert Kersevan – CERN Dean Walters - ANL
Storage Ring Installation	March 27-28, 2014	Sushil Sharma – BNL Greg Fries – BNL Joseph Harkins – LBNL B. Alan Tatum – ORNL Dave Augustin – FNAL
Magnet and Mechanical Support (CDR)	April 1-2, 2014	Sushil Sharma – BNL Ramesh Gupta – BNL Martin Johansson – MAX-Lab Gael Le Bec - ESRF
Power Supplies (CDR)	April 3-4, 2014	Howard Pfeffer – FNAL Bob Lambiase – BNL Fernando Rafael - SLAC
Pulsed Injection Systems (CDR)	April 8, 2014	John Byrd – LBNL Chris Jensen – FNAL Wu (Arlene) Zhang - BNL



Storage Ring Installation Challenges

Material to be Removed: Estimate

Item Description	Weight [tons]	Volume [cu yd]	Type of Waste	Quantity	Type of Containers
Girder assemblies	1761	1449	30% Low level rad	196	B-25 bin
			70% Richardson suspension	45	40 cu yd dumpster
Power cables	73	22	100% Richardson suspension	4	20 cu yd dumpster
DC Converter electronics	27	40	Electronics recycling	4	40 ft semi-trailer
Other electronics	24	88	Electronics recycling	8	40 ft semi-trailer
Totals	1885	1599			

NOTE: Number of bins, dumpsters, and semi-trailers was calculated by volume and adjusted by weight capacity.

Week of May 5th to start discussion

High Level Summary of Technical Reviews

- The APS MBA effort is overall at a level consistent with Conceptual Design
 - Excellent technical progress, no show stoppers
 - Excellent interaction with the community
 - A lot work remains -> “known knowns”
- Radiation safety calculations
- Study the effect of boundary conditions, e.g. assumed beam parameters entering the MBA storage ring from the injector
- Push the prototyping of critical magnets, the vacuum system, power supplies
- Develop magnetic measurement capabilities; continue to develop the tolerances / uncertainty calculations
- Integration of beam physics and engineering solutions is critical to success of an MBA design



Next Steps

- Incorporate feedback from technical reviews into a revised Conceptual Design Report
- Complete revised Conceptual Design Report by July 2014
 - Subsequent review of the CDR
 - Develop a science case
- Ready for CD-1 review by September 2014



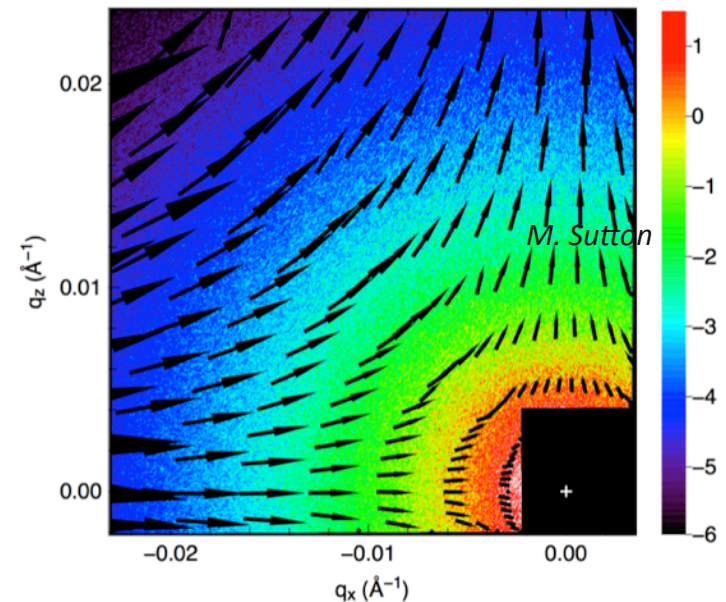
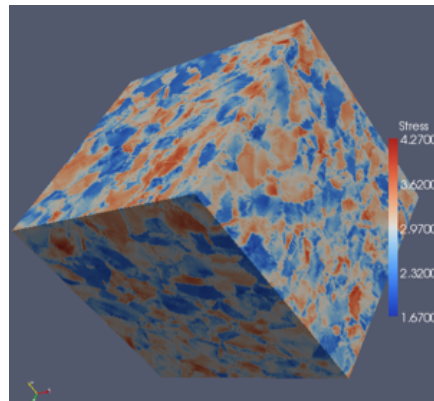
Developing a Science Case

- Several leading experts signed on:
 - Oleg Shpyrko, Peter Abbamonte (condensed matter)
 - George Crabtree (energy materials)
 - Antony Rollett, Robert Sutter, Paul Fuoss (advanced materials)
 - Paul Nealey (soft materials)
 - Gordon Brown (environmental)
 - Soichi Wakatsuki (life sciences)
 - Etc.

Validation of models

Computational model of elastic response inside a polycrystalline metal

A.D. Rollett et al., Modeling Simul. Mater. Sci. Eng. 18, 074005 (2010)



M. Sutton and Julien Lhermitte, unpublished



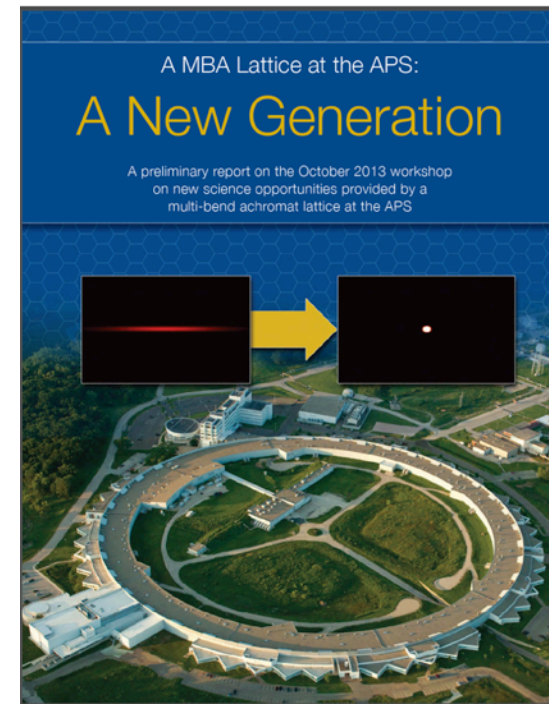
Resonant Inelastic X-ray Scattering Beamline

- Construction of enclosures completed
- Construction of Control room/utilities in progress
- 27-ID front end installation in May
- PSS/BLEPS installation in final stages
- Control systems implementation has started
- Mono shutter/white beam slit parts in-house
- Shielding verification planned for June 4, 2014.



Outreach Activities

- Complete final version of October workshop report
- Topical Workshops
 - User Meeting:
 - Introduction to the APS-U
 - “Inhomogeneities and Defects in Functional Materials: Future Opportunities with the APS MBA Lattice Upgrade”
 - In progress:
 - Satellite one day workshop to “Coherence”, Sept. 7, 2014
 - Full-field imaging, Jan. 19-20, 2015
- Seminar series
 - Possibly coordinate with APS colloquium
 - Invited (so far): Christian Schroer and Peter Cloetens



APS Upgrade Summary

- Excellent progress continues to be made incorporating the MBA lattice design
- Technical reviews so far have validated our approach
- FY14 and FY15 (proposed) funding sufficient to execute our plan
- User community remains engaged and supportive
- APS Upgrade Project near term goal: ready for DOE CD-1 review by September 2014
- APS Upgrade Project overall goal: deliver capabilities that will enable transformational science



In-Tunnel Arrangement of 7-BA Components: Side View

