

The APS Upgrade Project - an Update

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Presentation to Joint Meeting of the APSUO Steering
Committee and PUC Executive Board

January 21, 2011

Agenda for my talk....

1. Important dates for the next 6 months
2. Technical Design Reviews of the beamline proposals
3. Review process for the Science Cases
4. Director's External Review of the APS-U Project
5. R&D Activities



Advanced Photon Source Upgrade - Important Dates

- Critical Decision-0 (Approval of Mission Need) for the APS-Upgrade was approved on April 22, 2010.
- Development of the Science Cases in support of beamline proposals.
 - First drafts were due Monday January 17 (14 received to date)
 - Final drafts due February 7, 2011
 - Two weeks for internal review and editing
 - Make available to SAC members and guest reviewers by Feb 21, 2011
- APS SAC Meeting March 7-9, 2011
 - Prioritized list of Science Cases at the end of the meeting.
- ANL CD-1 External Director's Review of the APS-U Project March 14-16, 2011
 - Prep for Lehman Review - See charge to the Committee later in this talk.
- DOE Lehman Review May 17-19, 2011

Technical Design Reviews - the Charge

- The Charge to the Ultrafast Beamlines Committee is:
 - Evaluate technical feasibility and appropriateness of the proposed approach and potential for delivering the promised performance in the following areas:
 - Compatibility of proposed experimental programs
 - Overall beamline layout
 - Choice of insertion devices
 - Beamline optics
 - End station instrumentation
 - Detectors
 - Comment on how the proposed facilities compare to other facilities with similar missions worldwide.
 - Suggest ways to improve design to increase performance, reduce cost, and improve likelihood of success.
 - Comment on any R&D that is proposed or that might be needed to successfully achieve the stated goals.

BL Technical Design Reviews Dates and Reports

- Review Dates:

- Spectroscopy Beamline Review; October 26, 2010
- Imaging Beamline Review: November 10, 2010
- Diffraction Beamline Review: November 18-19, 2010
- Ultrafast Beamline Review: December 13-14, 2010

- Results:

- Reports go back to presenters to share with:
 - their colleagues who helped with the design
 - the authors of the associated Science Case
- All of the recommendations and "actionable" comments and findings are being tracked by the project and will be addressed.
- The recommendations and our responses will be presented at the Lehman Review in May.



The Science Cases

CDR	Title	Rev Pnl	Theme	Theme Leaders	Scientific Team Spokesperson
4.2.2	SPX Facility Hard X-ray BL - Diffraction & Imaging	1	Ultrafast Dynamics	Evans/Young	Paul Evans (U of Wisc)
4.2.2	SPX Facility Hard X-ray BL - Spectroscopy	1	Ultrafast Dynamics	Evans/Young	Lin Chen (ANL)
4.2.2	SPX-ray Facility Soft X-ray Beamline	1	Ultrafast Dynamics	Evans/Young	Dave Keavney (APS)
4.2.3	Laser Initiated Time Resolved XAFS/WAXS	1	Ultrafast Dynamics	Evans/Young	David Tiede (ANL)
4.4.2	Advanced Spectroscopy Beamline	1	Spectroscopy	Burns/Heald	Daryl Crozier (SFU)
4.4.3	LERIX-2 Beamline	1	Spectroscopy	Burns/Heald	Gerry Seidler (U of Wash)
4.4.7	Catalyst Center	1	Spectroscopy	Burns/Heald	Peter Stair (ANL)
4.3.5	XPCS and Coherent GIXS	2	Imaging & Coherence	Sutton/Jacobsen	Larry Lurio (NIU)
4.5.4	High-Energy Diffraction	2	Extreme Conditions	Shen/Lang	Bob Suter (Carn. Mel. U)
4.6.2	XIS - Tunable ID Beamlines	2	Interfaces	Fuoss/Zschack	Mike Bedzyk (NWU)
4.6.2	XIS - Fixed Angle ID Beamlines	2	Interfaces	Fuoss/Zschack	Tai Chang (U of I)
4.6.2	XIS - BM Beamline	2	Interfaces	Fuoss/Zschack	Mike Toney (SSRL)
4.6.3	Liquid Surface Scattering	2	Interfaces	Fuoss/Zschack	Mark Schlossman (UIC)
4.6.4	Micro and 3D Diffraction	2	Interfaces	Fuoss/Zschack	John Budai (ORNL)
4.6.5	Resonant Interface Scattering	2	Interfaces	Fuoss/Zschack	Paul Fentor (ANL)
4.4.4	Resonant Inelastic X-ray Scattering (MERIX)	3	Spectroscopy	Burns/Heald	John Hill (BNL)
4.4.5	HERIX	3	Spectroscopy	Burns/Heald	R. McQueeney (ISU)
4.4.6	Nuclear Resonant Scattering	3	Spectroscopy	Burns/Heald	Brent Fultz (Caltech)
4.5.2	High-Magnetic-Field Scattering	3	Extreme Conditions	Shen/Lang	Bruce Gaulin (McMasters)
4.5.3	High Pressure Studies Using Sub-micron Beams	3	Extreme Conditions	Shen/Lang	David Mao (Carnegie Inst)
4.5.5	Magnetic Spectroscopy	3	Extreme Conditions	Shen/Lang	Eric Fulerton (UCSD) and Kevins Moore (LLNL)
4.3.2	Wide-Field Imaging Beamline	4	Imaging & Coherence	Sutton/Jacobsen	Jake Socha (Virginia Tech)
4.3.2,4.3.3	High Speed Imaging	4	Imaging & Coherence	Sutton/Jacobsen	Todd Hufnagel (Hopkins)
4.3.3	Coherent Diffraction Imaging	4	Imaging & Coherence	Sutton/Jacobsen	Lee Makowski (NE)
4.3.4	High-Energy Tomography	4	Imaging & Coherence	Sutton/Jacobsen	Nikhilesh Chawla (ASU)
4.3.6	Fluid Dynamics Imaging Beamline	4	Imaging & Coherence	Sutton/Jacobsen	Alan Kastengren (ANL)
4.3.7,4.3.8	In Situ Nanoprobe/Cryonanoprobe	4	Imaging & Coherence	Sutton/Jacobsen	Tonio Buonassissi (MIT)
4.3.3,4.3.7	TXM	4	Imaging & Coherence	Sutton/Jacobsen	Wilson Chiu (UConn)
4.7.2	BioNanoprobe	5	Proteins to Organisms	Fischetti/Vogt	Gayle Woloschak (NWU)
4.7.3	Cryo Sample Preparation Facility	5	Proteins to Organisms	Fischetti/Vogt	Chris Jacobsen (ANL)
4.7.4	Enhanced SAXS/WAXS	5	Proteins to Organisms	Fischetti/Vogt	Yun-Xing Wang (NIH/NCI)
4.7.5	Microfocus MX Beamline	5	Proteins to Organisms	Fischetti/Vogt	A. Joachimiak (ANL)
4.7.6	Enhanced Time-Resolved MX Beamline	5	Proteins to Organisms	Fischetti/Vogt	Keith Moffat (U of C)
X.X.X	Long Wavelength PX Beamline	5	Proteins to Organisms	Fischetti/Vogt	B.C. Wang (U of Georgia)



Criteria for Evaluation

■ SCIENCE

- scientific excellence (basic, applied, and/or engineering)
- world-leading / frontier research
- intrinsic scientific merit
- societal and sponsor relevance
- timeliness
- transformational research
- “enabling” science

■ APS RELEVANCE

- exploitation of APS source after Upgrade
- synergy with other APS/ANL activities
- match to APS Upgrade themes
- requirement for APS capabilities

■ USER COMMUNITY

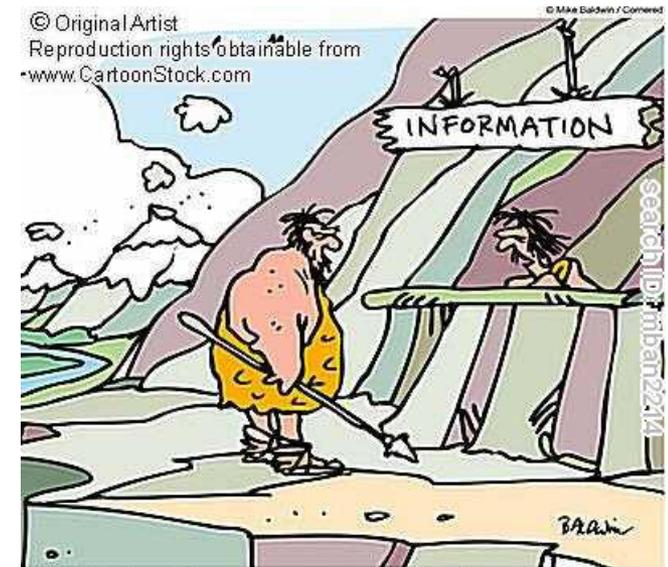
- size / impact of community
- effect on existing communities
- fulfillment of user community needs (universities, labs, industry ...)
- overall program balance
- enable/foster new communities

■ TECHNICAL FEASIBILITY

- feasibility / technical risk

Ongoing APS-U Activities: Gathering additional information from the beamline staff

- Dean Haeffner, Gary Navrotski, and Mohan Ramanathan have been organizing meetings with groups from each of the beamlines to discuss:
 - beamline operations
 - energy ranges
 - favorite energies
 - distribution of users
 - use of GUP time
 - future ID choices, in particular revolvers or APPLEs
 - expected performance of the beamline optics at 150 and 200 mA
 - The staff's general impression of higher current operations
 - any future upgrade plans for the beamline
 - detectors (recent addition)



"I don't have any yet. We just opened."

SAC and Invited Guest Reviewers

Panel Number	Number of Proposals	Primary Areas Covered	SAC Members	Invited Guest Reviewers
1	8	Ultrafast Dynamics	P. Bucksbaum	J. Wark (Oxford) B. Bunker (ND)
		Spectroscopy	J. Corlett	
			B. Hedman	
2	8	Coherence	K.Y. Lee	J. Brock (Cornell) S. Kevan (Oregon)
		Materials Science	F. Van der Veen	
		Interfaces	D. Newmann	
3	7	Inelastic Scattering	M. Klein	T. Egami (UT) TBD J. Kortright (LBNL)
		High pressure	W. Stirling	
		High magnetic fields	G. Waychunas	
4	7	Imaging	J. Kirz	P. Pianetta (SSRL) Q. Shen (BNL)
		Coherence	S. Wakasuki	
			R. Leach	
5	6	Bioscience	H. Einspahr	R. Leapman (NIH) M. Kiskinova (Trieste)
			L. Johnson	

SAC Review Agenda for March 7-9, 2011

- ***Monday, March 7, 2011 (SAC Members and Invited Reviewers)***
 - Panel Reviews all day (5 separate breakout sessions)
 - **Combined Panels Discussion** (First look at individual panel rankings by score and combined panel rankings by score)

- ***Tuesday, March 8, 2011 (SAC Members and Invited Reviewers)***
 - **Individual Panel Discussions** (Final Scoring and Final Ranking) - morning
 - **Presentations from Individual Panels, General Discussion-** afternoon

- ***Wednesday, March 9, 2011 (SAC Members only)***
 - Discussion and Final Combined Prioritization -morning
 - General APS Update - afternoon
 - Adjourn

ANL Director's External Review of the APS-U Project

- The Committee should respond to the following questions:
 - Is the conceptual design technically sound and likely to meet the performance expectations in the APS-U Mission Need Statement approved by DOE? Is there an R&D plan that adequately supports the design effort and mitigates the technical risks?
 - Are the project's scope and specifications sufficiently defined to support preliminary cost and schedule estimates?
 - Are the cost and schedule estimates credible and reasonable for this stage of the project based on the funding guidance from BES? Do these estimates include adequate contingency margins that are based on a project-wide risk analysis? Are any changes recommended?
 - Is the project ready to proceed to CD-1? Does the project have a credible plan, as reflected in the Preliminary Project Execution Plan, to manage the APS-U Project? Is the management team organized and staffed adequately to carry out both the current preliminary design and future phases of the project?
 - Is the appropriate planning in place to provide coordination between the on-going APS program activities while simultaneously installing and commissioning the project hardware?
 - Are ES&H and Quality Assurance aspects being properly addressed given the project's current stage of development?

Developing the APS-U Project Baseline Scope

- Based on input from the SAC prioritization process plus comments and/or recommendations from the Director's External Review, we will be able to define the scope of the APS-U Project in preparation for the Lehman Review in May 2011.
- Note that changes in baseline scope can still be made as we refine the CDR and begin work on a Preliminary Design Report (PDR) after the Lehman Review.

R&D Activities on Superconducting Undulators

- Confirmed that SCU0 will fit through tunnel by moving a mockup in Zone 1.
- 42-pole magnetic assembly was successfully tested in vertical cryostat.
 - Quenched at 700 A, but only need 500 A ($B = 0.61$ T) for 20 keV in first harmonic with $\lambda = 1.6$ cm
 - RMS phase error only 5° without shimming
- Cryostat fabrication will start (at the contractor) in the next week or so.
- Beam chamber extrusion has been received.
- Cores for SCU magnetic structures are ordered.



R&D Activities on the SPX Project

- Cavity Design:
 - Completed baseline cavity fabrication and preliminary tests in collaboration with Jlab
 - Started the alternative deflecting cavity fabrication in collaboration with Jlab
 - Started RF and mechanical simulations of cavity dampers system
- Power Systems:
 - Started the design of HLRF, LLRF, and beam diagnostics systems
 - Characterized rf performance of a 4kW Klystron amplifier system
 - Started assembly of a mobile 300W TWT amplifier system
- Designed and procured a stand-alone cryogenic system for testing at PHY-ATLAS.
- Develop a dynamic model of the SPX cavity including beam-based feedback for rf amplitude and phase noise characterization.
- Started collaboration with LBNL on requirements and design of timing and synchronization for SPX.

Questions?

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