

# Advanced Photon Source Upgrade Update



George Srajer

APS Users Monthly Meeting  
November 28, 2012

# Outline: DOE CD-2 Lehman Review

Date: December 4-6, 2012

- Charge, Agenda and Committee Members
- Scope
- Key Performance Parameters
- Proposed Funding Profile and Schedule
- ESH and Quality Assurance
- Response to Past Recommendations
- Summary

# Charge to the Review Committee

1. Project Scope: Is the project's scope and specifications sufficiently defined to support the established cost and schedule performance baseline? Is the preliminary design sound and likely to meet the technical performance requirements in the Mission Need Statement?
2. Cost and Schedule: Are the cost and schedule estimates, including life cycle costs, credible for this stage of the project to establish the project performance baseline; and do they include adequate scope, cost and schedule contingency?
3. ES&H/QA: Are the Environment, Safety & Health, and Quality Assurance requirements being properly addressed given the project's current stage of development?
4. Management: Is the project being properly managed at this stage? Does the project organization possess the leadership and staff with sufficient technical expertise and experience to successfully execute the proposed baseline?
5. Prerequisites: Have all of the prerequisite activities and documents necessary to support CD-2 approval been completed? Is the project ready for CD-2?
6. Recommendations: Have the Recommendations from past reviews been appropriately addressed?

# DOE CD-2 Review Agenda: Day 1

Tuesday, December 4, 2012 – APS 402 Lower Gallery

8:00 AM Executive Session  
Lutha

Daniel Lehman/Ron

8:45 AM ANL Welcome

Eric Isaacs

8:55 AM The Advanced Photon Source - Present and Future

G. Brian Stephenson

9:15 AM The APS Upgrade Project

George Srajer

10:00 AM ES&H

Tom Barkalow

10:15 AM Coffee Break

10:30 AM APS Upgrade Project Management

Jim Kerby

11:10 AM APS Upgrade Integration

Tom Fornek

11:50 PM Committee Working Lunch

401 Upper Gallery

12:35 PM Tour

1:50 PM Accelerator Systems

Marion White

2:30 PM Infrastructure and Enabling Technologies

Mohan Ramanathan

3:10 PM Experimental Facilities

Dean Haeffner

3:50 PM Summary

George Srajer

4:00 PM Coffee Break

4:30 PM Subcommittees (Accelerators and Experimental Facilities)

Borland/Haeffner

5:30 PM Executive Session

Daniel Lehman



# DOE CD-2 Review Agenda: Day 2

## Subcommittee Breakout Sessions

**Wednesday, December 5, 2012**

SC #	BREAKOUT SESSIONS TOPICS	LOCATION
1	Front End, IDs, Long Straight Sections and Diagnostics	401/B4100
2	Accelerator Physics, Short Pulse X-ray Systems	401/Lower Gallery
3	Ultrafast Beamlines (SPXSS, SPXIM, HFPP)	401/E1100
4	Diffraction and Imaging Beamlines (WFI, ISN, HEXD, XIS, S3DD)	401/A1100
5	Spectroscopy Beamlines ( RIXS,MS-H, MS-S, ASL)	401/E1200
6	Management	401/A5000

# DOE CD-2 Review Agenda: Final Day

**Thursday, December 6, 2012 – APS 402 Lower Gallery**

- |          |                                  |
|----------|----------------------------------|
| 8:00 AM  | Follow up questions              |
| 9:00 AM  | Review Committee Writing/Dry Run |
| 12:00 PM | Committee Working Lunch          |
| 1:00 PM  | Closeout                         |



# DOE CD-2 List of Reviewers

Department of Energy/Office of Science (CD-2) Review of the  
Advanced Photon Source-Upgrade (APS-U) Project  
December 4-6, 2012

Daniel R. Lehman, DOE/SC, Chairperson

## SC1 Front Ends, Diagnostics, IDs, and Long Straight Sections

\$53M (WBS 1.05.02, 1.03.02, 1.03.04)

\* Kem Robinson, LBNL  
Lonny Berman, BNL

## SC2 Short Pulse X-Ray Systems and Accelerator Physics

\$51M (WBS 1.02.01, 1.03.03)

\* Sam Krinsky, BNL  
Mark Champion, ORNL  
Sang-Ho Kim, ORNL

## SC3 Ultrafast Beamlines

\$19M (WBS 1.04.02)

\* Bill White, SLAC  
Uwe Bergmann, SLAC

## SC4 Diffractions and Imaging Beamlines

Dif, \$33M (WBS 1.04.02);  
Imag, \$36M (WBS 1.04.02, 1.05.03)

\* Tony Warwick, LBNL  
Don Brown, LANL  
Yong Chu, BNL  
Eric Dooryhee, BNL  
Rich Sheffield, LANL

## SC5 Spectroscopy Beamlines

\$23M (WBS 1.04.02)

\* Mike Toney, SLAC  
Yong Cai, BNL

## SC6 ES&H

\* Steve Hoey, BNL  
Jim Floyd, LBNL

## SC7 Cost and Schedule

\* Richard Boyce, SLAC  
Rick Blaisdell, OAPM  
Brian Huizenga, OAPM  
Hannibal Joma, DOE/SSO  
Ethan Merrill, DOE/SC  
Ray Won, DOE/SC

## SC8 Management

\* John Galayda, SLAC  
Kurt Fisher, DOE/SC  
Steve Hulbert, BNL

Number of reviewers: 26

# DOE CD-2 List of Observers

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Harriet Kung, DOE/SC

Ron Lutha, DOE/ASO

Jim Murphy, DOE/SC

Frank Gines, DOE/ASO

Phil Kraushaar, DOE/SC

Jerry Kao, DOE/ASO

Peter Lee, DOE/SC

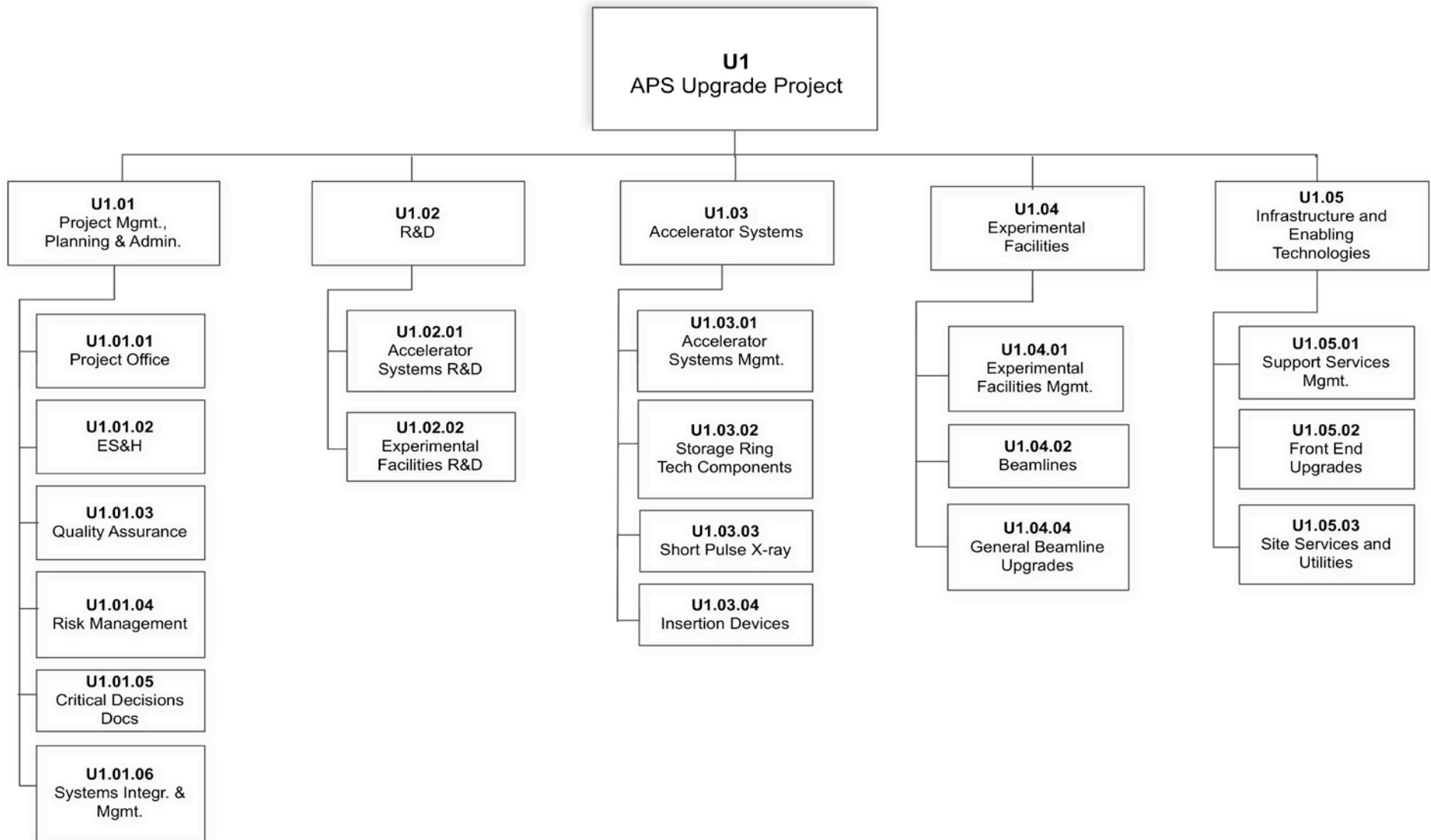
Ted Lavine, DOE/SC

Total count (reviewers + observers): 34

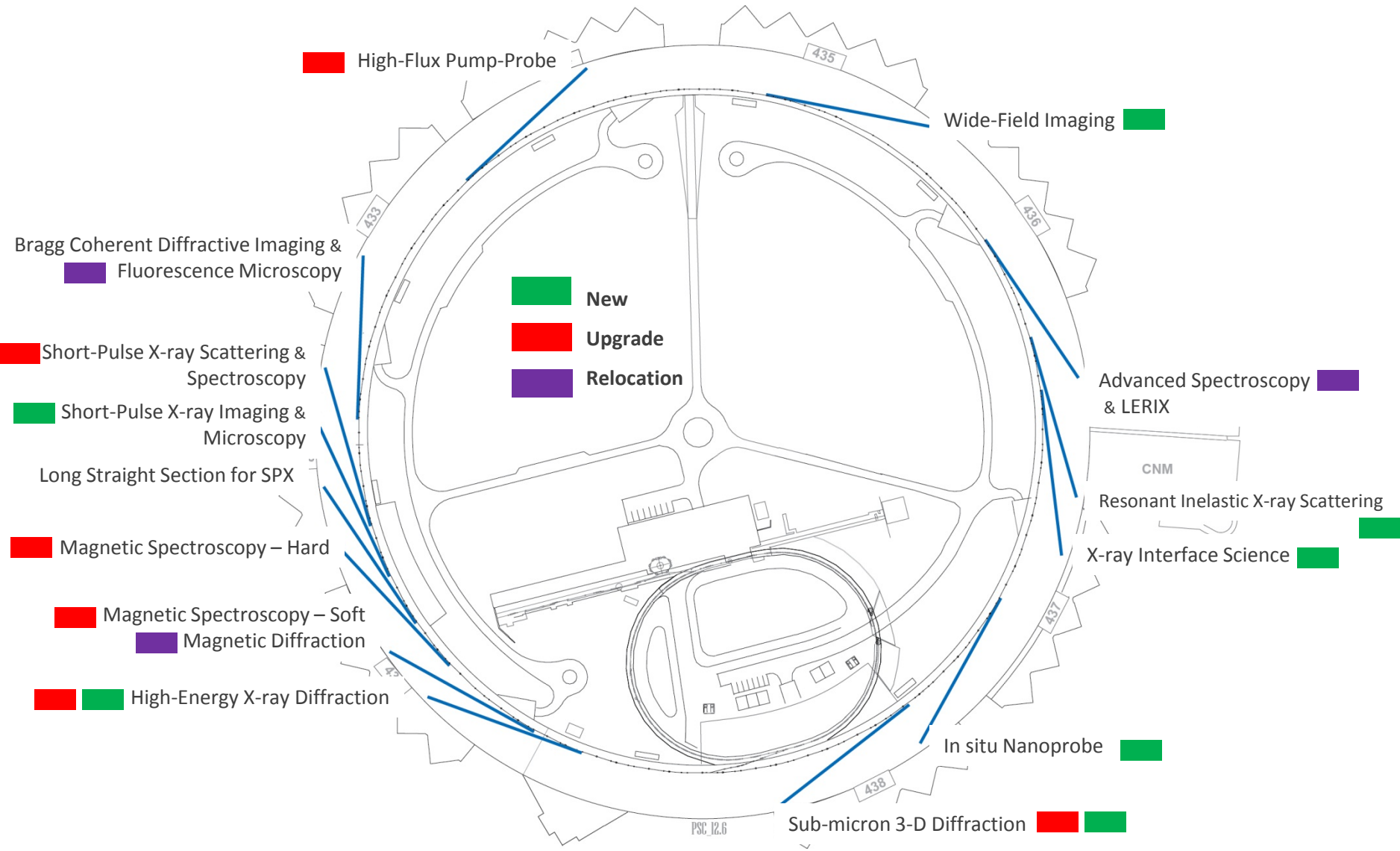




# APS Upgrade Work Breakdown Structure



# APS Upgrade Baseline Beamlines Scope



# APS Upgrade Scope

## **WBS 1.02.01/1.03: Accelerator Systems and Associated R&D**

- Short Pulse X-rays (SPX) by transverse rf deflection
- Increased beam stability and 150 mA operation
- 2 Superconducting undulators
- 5 Revolver undulators
- 3 Planar undulators
- 3 Polarizing undulators
- 3 Long straight sections (7.7 m)

## **WBS 1.02.02/1.04: Experimental Facilities and Associated R&D**

- 8 New beamlines; 6 Beamline upgrades; 6 Beamline relocations
- Nanofocusing optics development
- High speed detector development
- Resonant inelastic x-ray scattering optics
- High heat load upgrades to beamline optics and components

## **WBS 1.05: Infrastructure and Enabling Technologies**

- 15 New front ends
- 7 Renovated front ends
- Physical infrastructure for Wide Field Imaging beamline
- Next generation beam position monitors



# Key Performance Parameters Table

Key Performance Parameter	Thresholds (Performance Deliverable)	Objectives
Operating current capability for all front end components	150 mA	150 mA
Undulators installed	12	21
X-ray brightness* at 23.7 KeV or above for an installed insertion device	$2 \times 10^{20}$	$2 \times 10^{20}$
X-ray brightness* at 70 KeV or above for an installed insertion device	$1 \times 10^{19}$	$1.6 \times 10^{19}$
New beamlines installed and ready for commissioning with x-ray beam	6	9
Beamlines upgraded and ready for commissioning with x-ray beam	6	8
Resolution of a delivered x-ray focusing optic at 25KeV	20 nm	10 nm

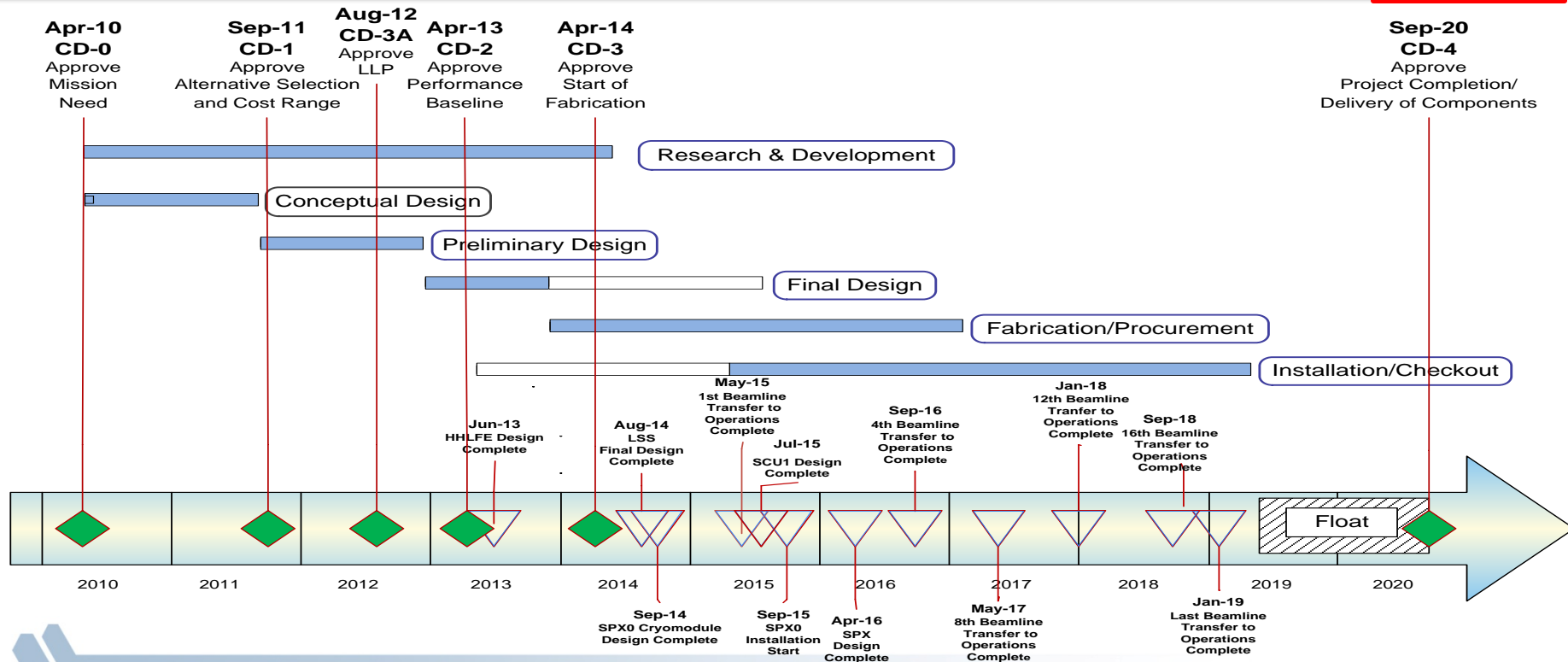
\*photon/second/0.1%bw/mm<sup>2</sup>/mrad<sup>2</sup>

Key Performance Performance (KPP) parameters represent APS-U Project scope



# Proposed Funding Profile and Schedule

	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	F19	FY20	Total
(OPC)	\$1M	\$7.5M										\$8.5M
(MIE)			\$20M	\$20M	\$38M	\$69.5M	\$103M	\$99M	\$33M			\$382.5M
<b>Total Funding Profile</b>	\$1M	\$7.5M	\$20M	\$20M	\$38M	\$69.5M	\$103M	\$99M	\$33M	\$0	\$0	<b>\$391M</b>



# High Level Project Cost Roll-Up

WBS		DIRECT (\$k)		ESCALATION (\$k)	DIV OH + ANL G&A (\$k)	TOTAL (\$k)
		Labor	Non-Labor			
<b>U1</b>	<b>APSU PROJECT</b>					
	01 - PROJECT MANAGEMENT PLANNING & ADMINISTRATION	14,018	16,241	2,833	2,444	35,536
	02 - RESEARCH & DEVELOPMENT (R&D)	7,438	7,909	397	2,043	17,786
	03 - ACCELERATOR SYSTEMS	22,644	38,684	7,679	7,339	76,347
	04 - EXPERIMENTAL FACILITIES	18,359	89,035	13,414	8,119	128,927
	05 - INFRASTRUCTURE & ENABLING TECHNOLOGIES	<u>6,756</u>	<u>19,335</u>	<u>3,134</u>	<u>2,412</u>	<u>31,636</u>
	Sub-total	69,215	171,205	27,457	22,357	290,233
	Available Contingency					100,767
	<b>Total Project Cost</b>					<b>391,000</b>

**Contingency = 34.7%**

# Safety and Quality Assurance

- **Safety**

- Safety support is in place
- 150,816 Argonne Project hours or ~ 86 man-years without incident
- Hazards Analysis Report in final draft, addressing comments

- **Quality Assurance**

- Development of QA Plan tailored to Project requirements is completed
- QA provided by Photon Sciences and Argonne in place for this phase of the Project

# APS Upgrade Staffing

- Assignments of Individuals to work on the APS-U is captured in the **Effort Request Agreements (ERA)** between the APS-U and each division
- In FY2013, working on Upgrade:

Division	FTE
XSD	10.36
AES	39.16
ASD	23.40
<b>TOTAL</b>	<b>72.92</b>

- Project Management and Support: 8 people
- Additional critical hires: 5 positions
- **Grand total for FY13: 85\* FTEs**

\*Contractors (6) and staff from other ANL Divisions (3) not included



# Director's CD-2 Review of APS Upgrade Management

## *Recommendation:*

- *The number of individuals who are full-time on the APS-U Project remains too small. Continue to increase the number of core full time APS-U people.*

## Response:

- 35 APS staff currently assigned  $\geq 90\%$  on the APS-U Project
- 5 new positions identified; in various stages of hiring

## *Recommendation:*

- *Others from PSC who work on APS-U should have a significant ( $>50\%$ ) fraction of their effort dedicated to the Project.*

## Response: In FY13 ERAs, percentage of staff with $\geq 50\%$ effort assigned

- XSD: 30% (out of 35 staff)
- AES: 48% (out of 56 staff)
- ASD: 43% (out of 42 staff)

# Update on Long Lead Procurement

- Enclosures for RIXS (\$854.4K) and *option for ASL (\$404k)*
  - Pre-contract meeting held on November 8
  - Five contractors invited
  - Proposals received November 26
  - Contract to be awarded by December 17
  - Construction will begin in May and September 2013 (during shutdown)
- Monochromator for RIXS (\$562K)
  - In procurement
- Front End Components and Grid XBPM (\$200K)
  - Procurement package in approval process

# Summary

- Scope of APS Upgrade is sufficiently defined to support cost and schedule
- Scope of APS Upgrade fits in the funding profile with current 34.7% contingency and is supported by risk analysis
- Cost estimate is credible
- ES&H, Quality Assurance and Risk Registry (207 items) are appropriate at this stage of the Project
- R&D activities to mitigate risks are proceeding well
- **APS Upgrade is ready for CD-2**