APS Upgrade Project Update

Stuart Henderson
Director, APS Upgrade Project
Argonne National Laboratory

All Hands Meeting
December 14, 2016

APS Upgrade CD-3B Approval

Advanced Photon Source Upgrade
At Argonne National Laboratory
CD-3B ESAAB – Equivalent Review

Approval:

Based on the information presented above and at this review, Critical Decision-3B, Approve Long Lead Procurement, is approved for APS-U.

Franklin M. Orr, Jr., Project Management Executive
Under Secretary for Science and Energy

10/6/2016
Date

CD-3B Strategy

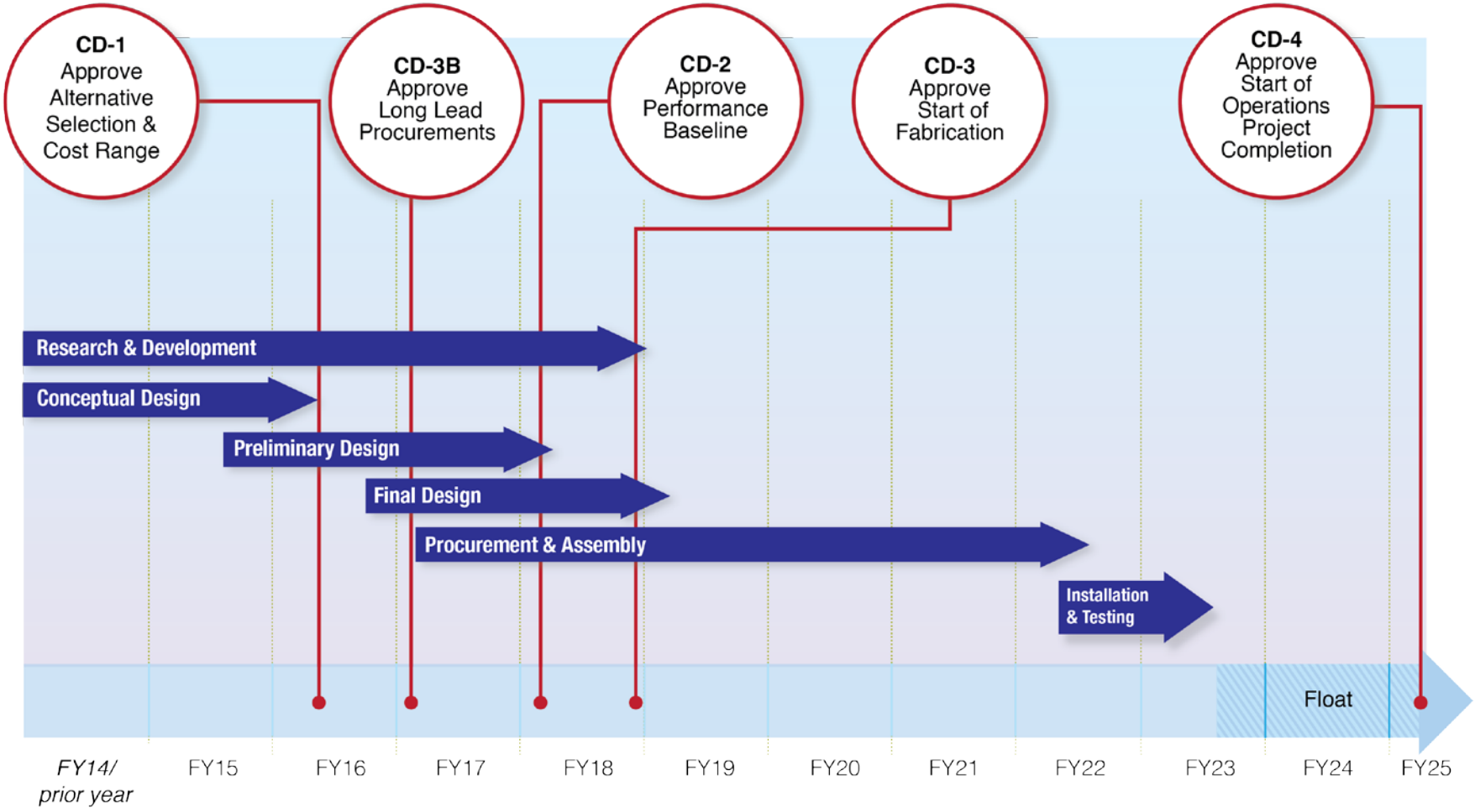
Our overarching goal: Timely completion of the Project within an extremely competitive environment, while minimizing risk

- APS-U received long-lead procurement (LLP) authority for a set of advance procurements to be let in FY17-19
- CD-3B approval provides the Project with the means to:
  - Relieve critical path
  - Reduce/mitigate risks.
  - Maximize flexibility with respect to funding
- LLP Plan totals $89M including contingency
  - Accelerator scope: magnets and support structure, power supplies, vacuum systems, diagnostics hardware etc.
  - Experimental facilities scope: initiate early buildout of a beamline, optical components, etc.
  - Front-end/ID scope: Front-end components (glidcop), ID vacuum chambers, magnetic structures

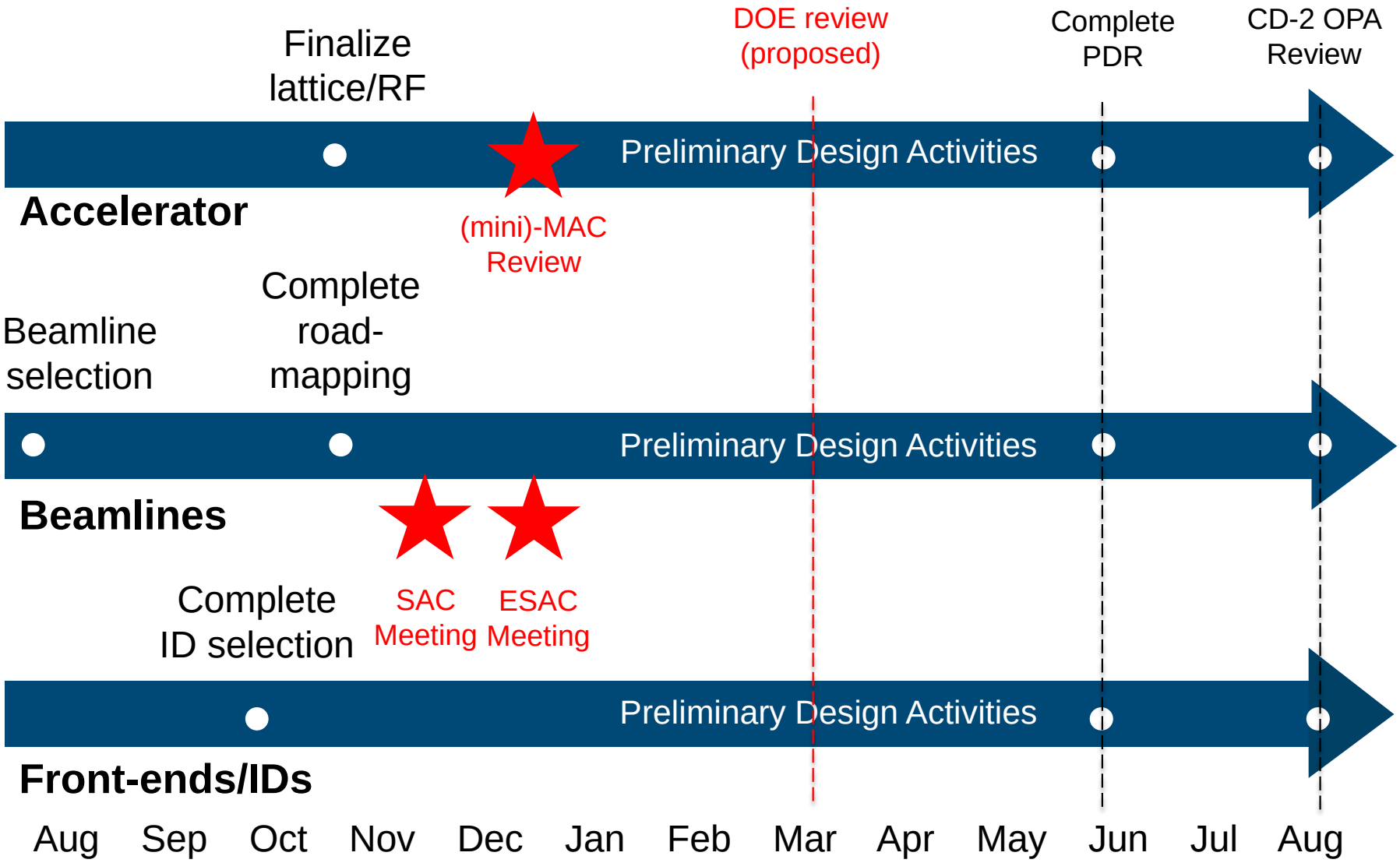
APS Upgrade Project Funding

- Administration's Request was for $20M in FY17, flat w.r.t. prior years
- Senate appropriations (passed) had $50M for APS-U in FY17
- House markup (not passed) included $35M for APS-U
- Continuing Resolution holds APS-U funding flat through late April
- Strong support within DOE:
  - Littlewood, Streiffer, Henderson met with Steve Binkley, DOE Deputy Director for Science Programs

APS Upgrade Project Schedule



Path to CD-2


DOE review (proposed)
Complete PDR
CD-2 OPA Review
Finalize lattice/RF
Preliminary Design Activities
Accelerator
(mini)-MAC Review
Complete road-mapping
Beamline selection
Preliminary Design Activities
Beamlines
SAC Meeting
ESAC Meeting
Complete ID selection
Preliminary Design Activities
Front-ends/IDs
Aug
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug

Key Decisions: Accelerator

Accelerator Lattice Finalization

- We are adopting a higher-performing “41-pm reverse-bend lattice”
  - ~60% brighter than 67-pm lattice
- Good bang for the buck: little difference between new and previous nominal 67-pm lattice in terms of technical implications and cost

Storage Ring RF System

- Short lifetime in timing-mode motivated consideration of a lower-frequency RF system.
- A low-frequency rf (LFRF) system produces longer bunches which reduces detrimental effects
- Completed full analysis of scientific impact, technical, cost, schedule implications
- Bottom line: We are sticking with our baseline plan to use the existing 352 MHz system

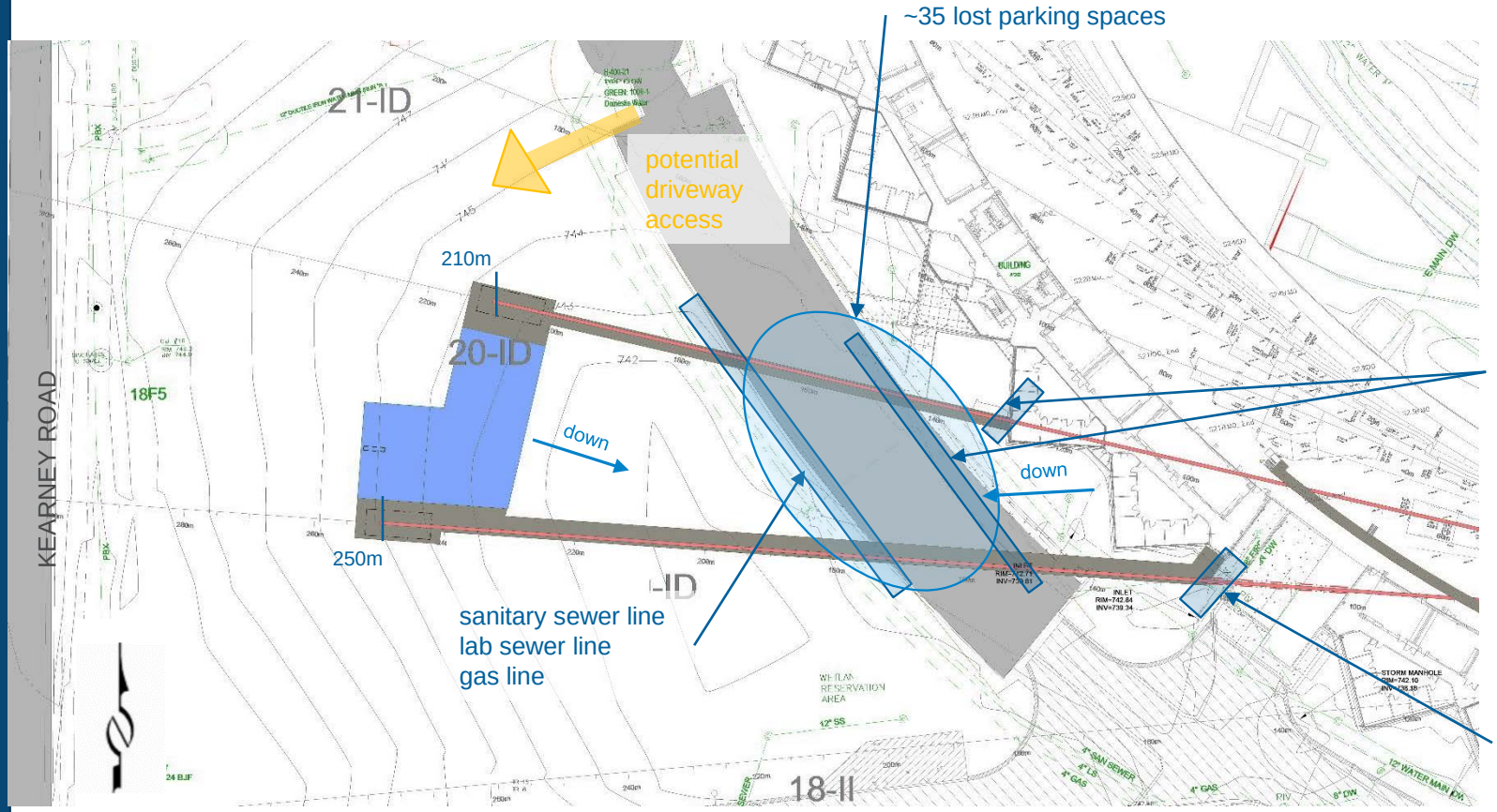
Selected Beamline Proposals

Name	Title	Technique
CHEX	Coherent High-Energy X-ray Sector for In Situ Science	*In situ*, surface high-energy coherent scattering
Polar	Polarization modulation spectroscopy	Magnetic spectroscopy
HEXM	A High-Energy X-ray Microscope	High-energy microscopies & CDI
SAXPCS	Development of a Small-Angle X-ray Photon Correlation Spectroscopy Beamline for Studying Dynamics in Soft Matter	Small-angle XPCS
WAXPCS	Wide-Angle X-Ray Photon Correlation Spectroscopy and Time-Resolved Coherent X-Ray Scattering Beamline	Wide-angle XPCS
Ptycho	PtychoProbe	Ultimate resolution, forward scattering ptychography/spectromicroscopy
InSitu	In Situ Nanoprobe Beamline	*In situ*, forward scattering ptychography/spectromicroscopy Long working distances
CSSI	Coherent Surface Scattering Imaging Beamline for Unraveling Mesoscopic Spatial-Temporal Correlations	Coherent GISAXS, XPCS
Atomic	Atomic – A beamline for extremely high resolution coherent imaging of atomistic structures	Diffraction microscopy & CDI Bragg CDI
3DNano	3D Micro & Nano Diffraction	Upgrade of current 34-ID

Key Decision: Beamline Roadmap

- Selected proposals contain two long beamlines that will extend beyond the Experiment Hall floor
  - None currently at the APS, yet common feature at ESRF, NSLS-II, Spring-8, Diamond, etc.
- Assignment of selected proposed beamlines to sectors is complex
  - Budget constraints
  - Impact on existing programs
  - Reuse of equipment
  - XSD, CAT strategic plans
  - Logistical factors: LOMs, environmental impact, roads, utilities, etc…
- Working Committee composed of APS and APS-U management considered options, selected a preferred option
- Long beamlines at Sectors 19 & 20 preferred
- Full roadmap analysis presented by J. Lang at *APS-U Forum* last week
- Conversations have been initiated with impacted sectors and programs
- APS SAC and ESAC have endorsed proposed plan

Long Beamlines – Sectors 19 & 20 Scenario



SITE CONSIDERATIONS EVALUATION												
BEAM LINES	**TOPO**	**SOILS & FOUND.**	**ROADWAY DISRUPTION**	**LOST PARKING**	**UTILITIES *(scale 1-20)***	**NATURAL RESOURCES**	**STORM WATER DETENTION**	**RING ACCES.**	**LOM RECONFIG**	**LOM SUPPORT**	**BUILDING 400 SUPPORT**	**OVERALL SCORE**
19+20	8 **	7	10	5	12	10	6	5 *(elec panel)*	6	8	6	**83**

** *Approximately 2' drop and/or gain in elevation*

Scale: 1-10, 1 being the least desirable

Beamline Enhancements

- In addition to the new beamlines, APS-U includes a program of enhancements to all other beamlines
- Enhancement funds will be distributed according to need and best use
  1. Ensure x-ray optics and other beamline instrumentation function, at a minimum, as well under upgraded source conditions as they do with the current source “Do no harm” **(non-discretionary)**
  2. Upgrade current beamlines (sources, optics, vibration isolation, sample environment, end-station instrumentation, etc.) to take advantage of the ultra-low emittance delivered by the MBA lattice **(discretionary)**
- Process for Discretionary Enhancements
  - Call for proposals to be issued this year
  - Proposals are reviewed and prioritized by *ad hoc* committee
  - Prioritized list vetted by SAC and ESAC
  - Top proposals (limited by funding) incorporated into APS-U Project and the remainder held for possible funding with contingency
  - Complete process late-Spring/Summer of 2017 for inclusion in Project plan before the CD-2 review

Next Steps: Timeline to CD-2

- November
  - Complete beamline roadmapping
  - SAC Meeting Nov. 9-10
  - Complete Lattice Selection
  - Finalize RF decision
- December
  - ESAC Meeting Dec. 1-2
  - Mini-MAC Meeting week of Dec. 12
  - Issue Enhancements call for proposals
- January
  - Begin follow-up prelim design reviews (as needed)
- February
  - Begin full EVMS to have 3 months of data for CD2 review (tied to CD-2 date)
  - Work plan based on funding profile
- March
  - Complete ES&H/QA doc updates
  - Specification/interface docs
  - DOE Review (placeholder)
- April
  - Complete Draft Preliminary Design Report for MAC/ESAC Review
- May
  - Complete Preliminary Design Report
- June
  - Director's Review
- July
  - Finalize documents for DOE Review
- August
  - DOE Review

Finally

- Thanks again for all your hard work that has brought us to this point
- Thanks to the user community for the engagement and support
  - **Your support is essential for our moving ahead!**
- We have a lot of work ahead
- I'm confident that together, we can make APS-U a reality

Thank You!