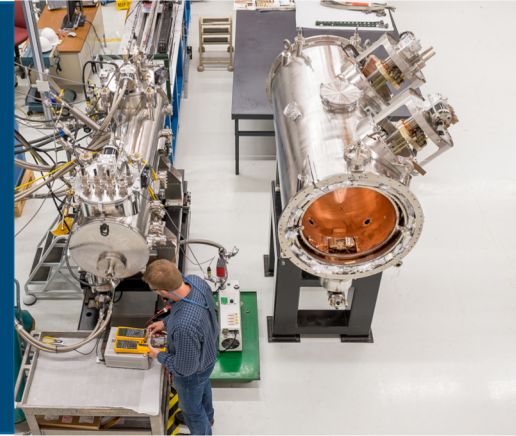


# APS-U Project: Status and FY2021 Goals



## **Robert Hettel**

APS Upgrade Project Director  
Argonne National Laboratory

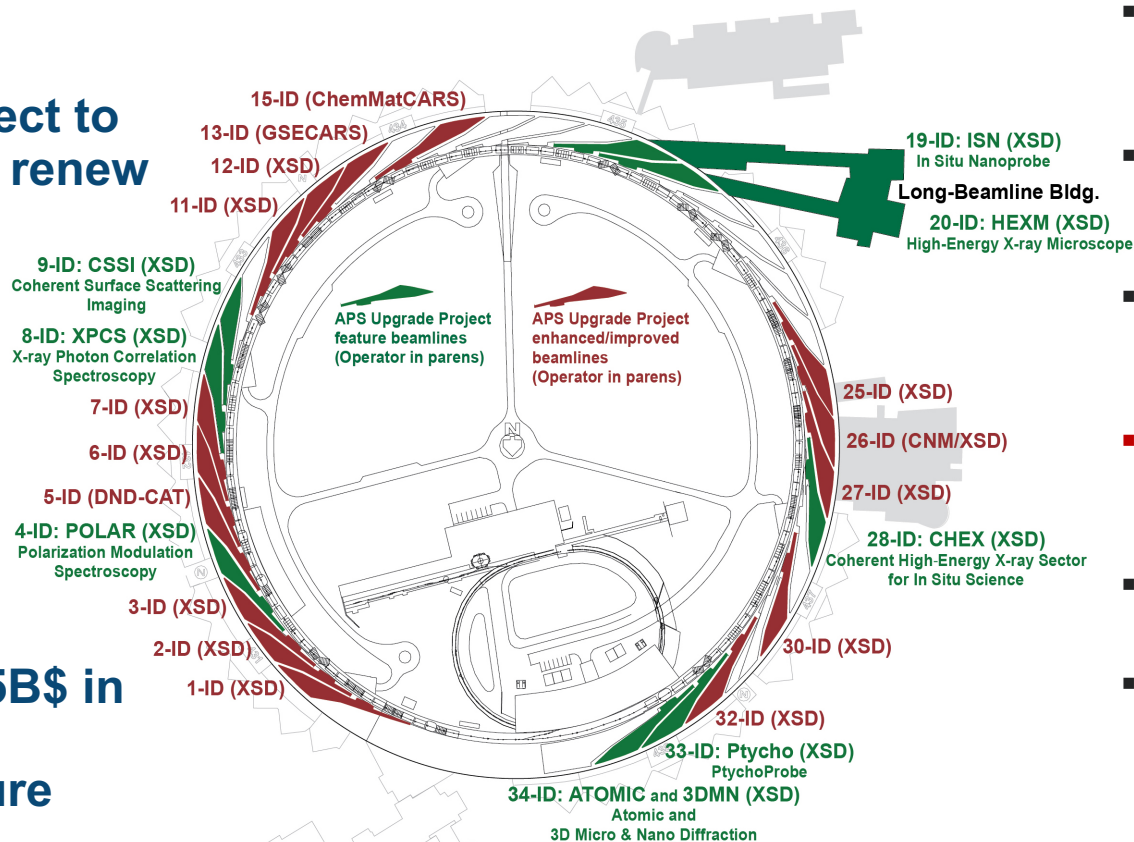
## **PSC All-Hands Meeting**

August 3, 2020

# APS-U Feature and Enhanced Beamlines

815M\$ project to update and renew the facility

Re-uses 1.5B\$ in existing infrastructure



- New storage ring, **42 pm** emittance @ 6 GeV, 200 mA
- New and updated insertion devices, including SCUs
- Combined result in **brightness increases of up to 500x**
- **9 new feature beamlines + Long Beamline Building**
- 15 enhanced and improved beamlines
- Exploit high performance computing,  $\Delta I$



# APS-U Director's Review July 27-29, 2020

SC1 Accelerator Physics	SC2 Accelerator Systems	SC3 Experimental Systems/Beamlines	SC4 Front Ends and IDS	SC5 Accelerator Removal and Installation	SC6 ES&H	SC7 Cost and Schedule	SC8 Project Management
Timur Shaftan	Fulvia Pilat	Erik Johnson	Tom Rabedeau	Scott DeBarger	Ian Evans	Dianna Jacobs	Thomas Glasmacher
Marco Venturini	Steve Hartman	Piero Pianetta	Toshi Tanabe	Roy Cutler	Craig Ferguson	Deepa Rasalkar	Robert Wunderlich
John Seeman	Ken Chow					Kathy Bailey	Aesook Byon
	Guenther Rehm						Jorge Pearce

# APS-U Director's Review: Charge to the Committee

In preparation for a DOE Review on September 1-3:

1. Technical: Is the project team effectively overcoming technical challenges and executing the work? Is the remaining work on track to be completed as planned? Is the long beamline building specified appropriately for supporting the mission need?
2. Cost and Schedule: Are the schedule and spend plans credible for completing the scope of work within the allotted time and budget? Are there appropriate cost and schedule contingencies to address the identified project risks, including COVID-19?
3. Procurements: Are the major procurements being managed successfully and on track to support the scheduled storage ring removal and installation?
4. Management: Is the project being appropriately planned, managed, and staffed at this stage to successfully deliver the scope and Key Performance Parameters within the baseline cost and schedule? Does the project have the necessary resources? Are project risks, including the response to the COVID-19 pandemic and return to normal execution, being appropriately identified and managed?
5. Environment, Safety & Health and Quality Assurance (ES&H/QA): Are Environment, Safety, and Health and Quality Assurance (ES&H/QA) requirements and plans, including COVID-19 protections and safety measures, being properly addressed?
6. Recommendations: Have past review recommendations been appropriately addressed?

## APS-U Director's Review: General Conclusions

- The APSU Project is well managed by a competent and committed Team with considerable progress being made since the last review.
- Overall Project performance is consistent with plans. Cost and schedule variances are small. Procurement experience has been positive.
- Good coordination between the APSU Project and APS Operations.
- The most significant risk is the impact of COVID-19. Some personnel shortages, SCU fabrication, and vendor relationships are key risk factors being managed. Injection scheme decision has the potential for being a schedule driver. Additional attention to completing final designs is needed.

## APS-U Director's Review: General Conclusions – cont.

- The presentation material needs to clearly and concisely articulate that the APSU Project status, progress, and plans are consistent with meeting the baseline requirements (scope (KPPs), cost, and schedule) while responding to OPA Charge Questions.
- The APSU is an important Project and needs to be successfully completed.
- Congratulations to the APSU Project Management and Staff for providing the review information and answering questions needed to make this review successful.
- Proceed to a successful OPA Review.

## APS-U Director's Review: Key Recommendations.

1. Develop and document, prior to the September 2020 DOE Review, the criteria for evaluating performance of the Lambertson septum and the process for making the injection scheme decision.
2. Complete final design for all systems by end of Q3 FY2021.
3. Starting now, carefully track and manage the remaining final designs in order to meet the schedule and timely letting of the remaining procurement contracts
4. Consider creating a short document regarding Covid-19 impact which can concisely state the basis of assumptions, methodology used and results of analysis, prior to the OPA review.

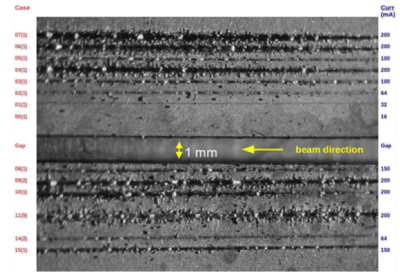
18 other recommendations, including one that we need to communicate our good progress more clearly...

# Project Status

The \$815 million project is >50% complete by costs + obligations. We have costed over \$150M since the CD-3 review.

Storage ring designs and contracts well advanced:

- Advanced accelerator physics and commissioning studies continue
- ~425 of 1321 lattice magnets (end of May) have been received and accepted... all magnet contracts in place
- Magnet support and plinth systems in fabrication
- ~400 of 1200 bipolar power supplies received; unipolar power supply contract was awarded in July
- Most copper and stainless vacuum chambers (of 1104 m total) in fabrication; contracts for other vacuum chamber components (e.g. RF seals, BPM assemblies, etc.) will be placed soon
- Testing of superconducting bunch lengthening cavity in progress; some cryogenic plant components received
- Injection stripline kicker design in progress at BNL; injection septum magnet from FNAL will be ready for magnetic measurement in August.
- First article BPM processing electronics in acceptance tests



Whole beam dump test



First article CAEN power supplies



Superconducting bunch lengthening cavities



# Project Status – cont.

- Beam size monitors, HLS, current monitors, etc., in final design
- Radiation protection system design is progressing
- Control system design group in place

## Front Ends and Insertion Devices

- Many beamline front end components received; other contracts in process
- First of ~50 HPMUs assembled, measured and corrected with very few shims
- Super Conducting Undulator (SCU) cores and cryo-vessels in fabrication
- ID vacuum chambers in fabrication
- New gap separation mechanisms in fabrication

## Experimental Systems

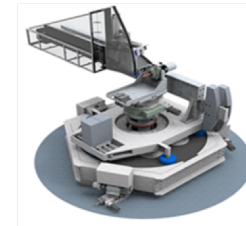
- 3 shielded enclosures installed on 28-ID; 5 enclosures to be installed on 25-ID by end of year; contract for remaining enclosures to be awarded in July
- High heat load mirror contracts expected to be ordered in August
- Monochromators bid to go out in August
- Final design reviews for feature beamline instruments



Keyhole gaskets



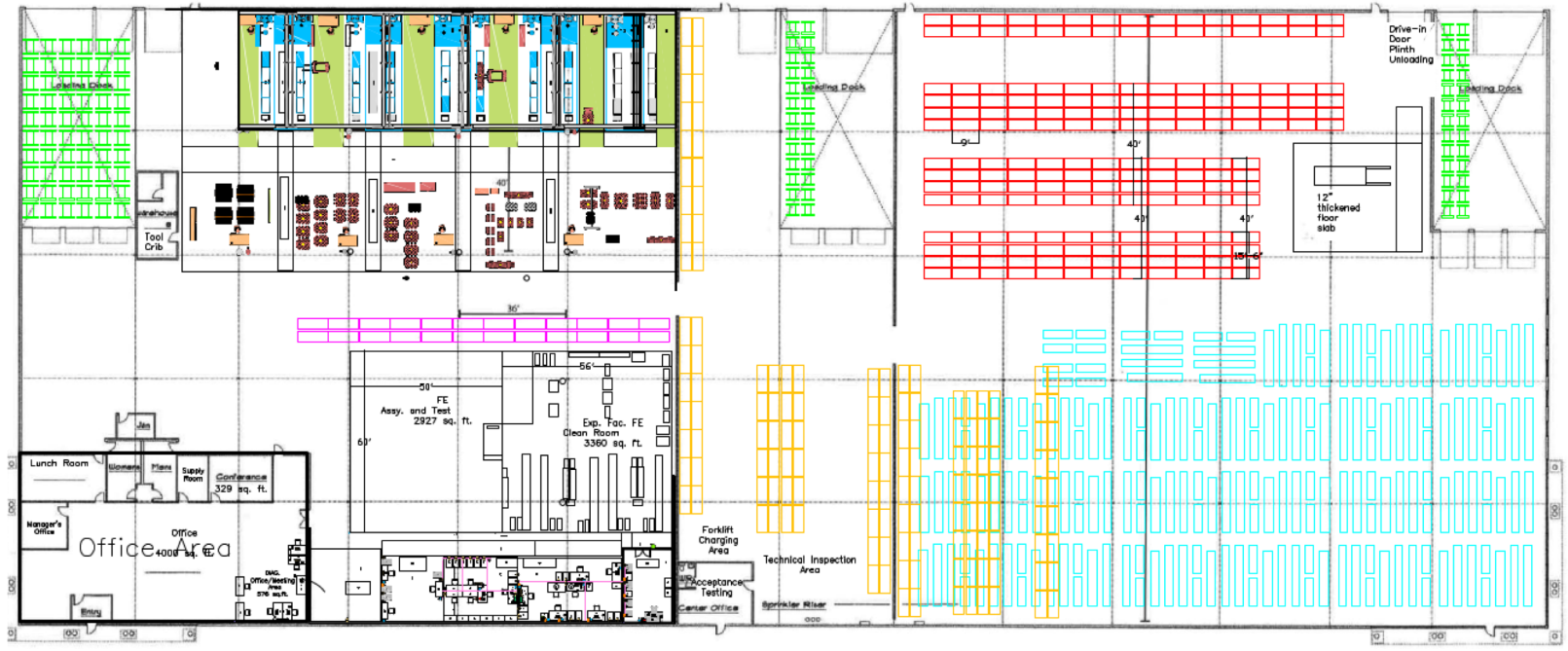
ID vacuum chamber test piece



RIXS-II spectrometer  
designed by BNL

HPMU monokeeper  
assembly

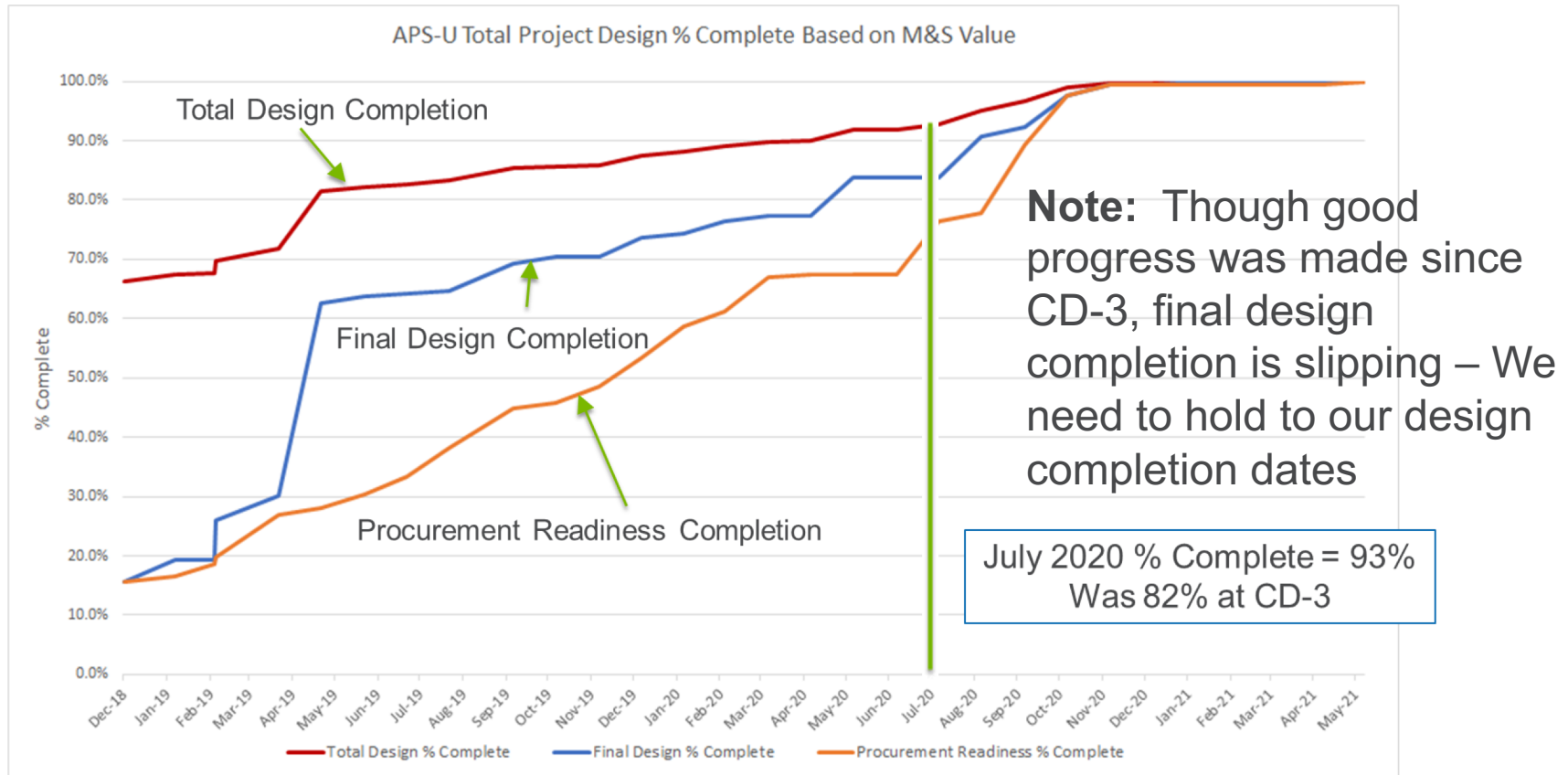
# APS-U Offsite Space



108,000 ft<sup>2</sup>

- Magnet (945) and SR Vac. Chamber (450) Pallet Racks
- Magnet Module Storage (200)
- Assembled Magnet Structures (120) Pallet Racks
- Standard Pallet Racking (1860)
- Power Supply Cable Spools (111)

# APS-U Design Completion Status



# COVID-19 Impact

APS-U continues to closely monitor the impact of COVID-19 on project cost and schedule. We update BES every 2 weeks with news, including comparison with modeling efforts at other labs / projects.

Vendor delivery schedules have slipped in some instances.

COVID-19 and teleworking have hindered efficiency for some work.

Our best estimate at this point, informed by Monte Carlo analysis of risks, indicates the start of the installation period could slip 6 months.

It is too early to fix a new date; we will keep everyone fully informed but in the meantime will work to execute the schedule we have.

# Going Forward

Work in the upcoming months includes:

- Award LBB construction contract
- Award shielded enclosures contract
- Award primary mirror systems contract for feature beamlines
- Begin operations in off-site space
- Continue work on Injector complex in preparation for APS-U
- Decide on vertical vs. horizontal injection scheme
- Complete full-sector magnet/chamber mock-up
- Define radiation protection plan for top-up injection
- Complete SAD and ASE; prepare for ARR (with APS Ops engagement)
- Complete complex beamline instrument designs

# Upgrade related Impact Argonne Awards:

- Mark Jaski
- Jie Liu
- Aric Donnelly
- Heath Wayman
- Jade Thomas
- Megan Szubert
- Katie Martin
- Betsy Dunn
- Jeff McGhee
- Tiffany Freedman
- Ralph Bechtold
- Glenn Moonier
- Mike Johnson
- Robert Furst
- Tyler Malas
- Gentillo Curescu
- Chuck Doose
- Bill Jansma
- Spiro Skiadopoulos
- Jamal Pegues
- Evan Carter
- Roberto Lopez
- Kris Mietsner
- Jason Lerch
- John TerHaar
- Joe Gagliano III
- Mark Furman
- Joseph Castillo
- Eric McCarthy
- Bill Guszczco
- Joe Vanis
- Byron Jordan
- Rob Vargas
- Tom Meier
- Ron Blake
- Adam Brill
- Matt Kasa
- Quentin Hasse
- Susan Bettenhausen
- Jason Ackley
- Michelle Leighton

**THANK YOU!**

## Summary

- The APS-U project is progressing well: ~50% complete by cost and commitments with many issued contracts and delivered components. Funding is adequate and reasonable secure.
- We have executed a great deal of work in the past year, and done it well. We still have work to do to ensure we deliver the baseline.
- Some schedule delays related to the COVID-19 impact on vendor production and to delays in system design completion and getting procurements out the door. Close attention is being given to manage this situation, for example by expediting vendor schedules.
- Based on current schedules, the start of the shutdown could be delayed by 6 months, or potentially more. It is too early to fix a new date; we will keep everyone fully informed but in the meantime will work to execute the schedule we have.
- The project is well-staffed with some hires yet to be made; technician staff will be ramped up as we move to acceptance, testing and assembly.
- Conducting the project in a safe manner is a high priority.