

APS Update

G. Brian Stephenson

APSUOSC and APS PUC Joint
Meeting

July 5, 2012



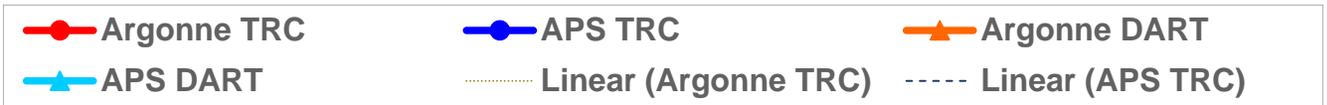
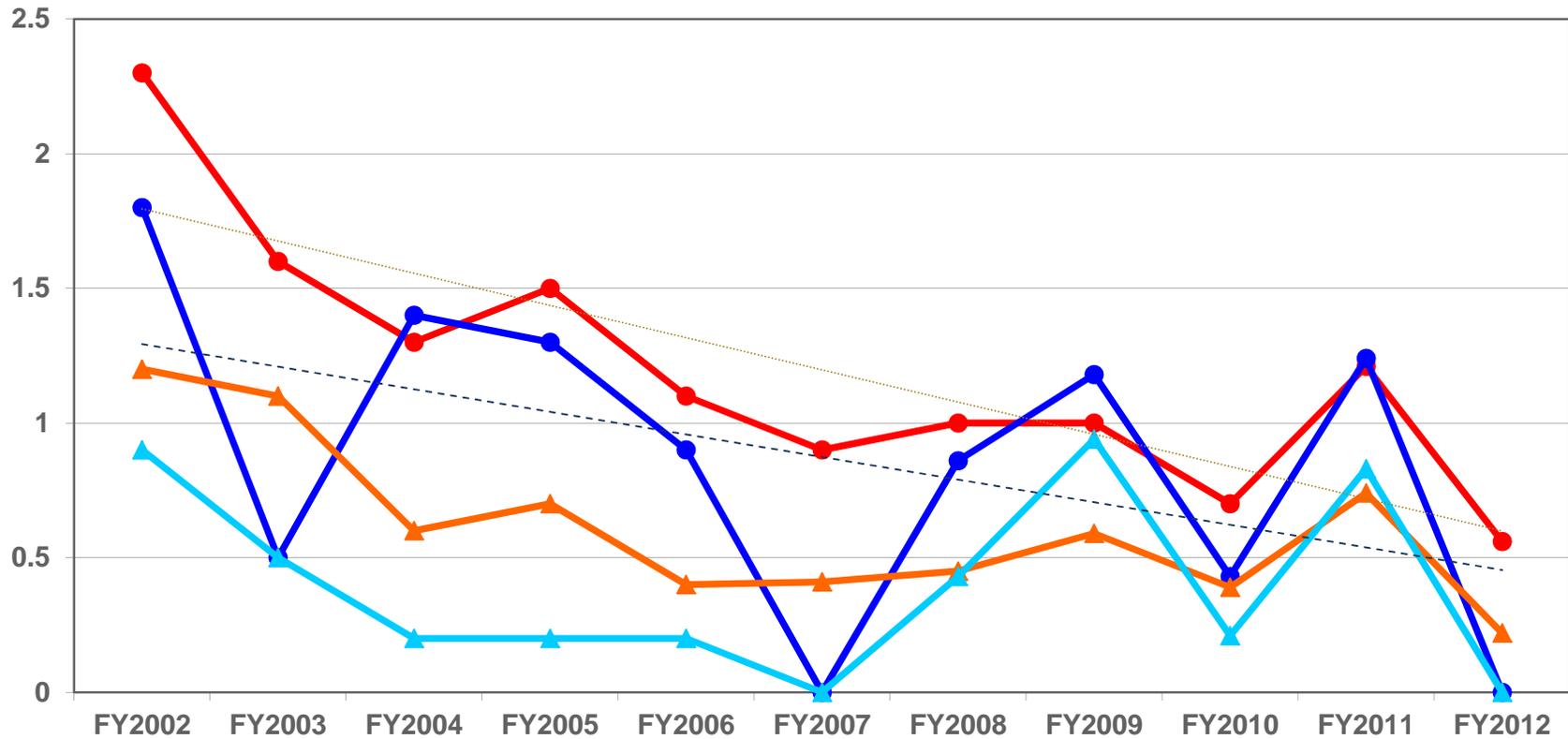
APS Update

- Safety
- Operations
- Budget
- GM/CA Transition
- Beamline Reviews
- Construction Updates: 400A, APCF
- Vibrations Task Force
- Planning for NSLS 'dark period'
- LOM Expansion



APS Has Been Doing Well on Injury Rates

Data as of May 31



TRC = Total OSHA Recordable Case Rate per 200,000 Hours Worked

DART = Days Away, Restricted Duty, or Job Transfer Case Rate per 200,000 Hours Worked

FY2002-4 APS Divs.

FY2005-8 SUF (APS Divs.+ IPNS)

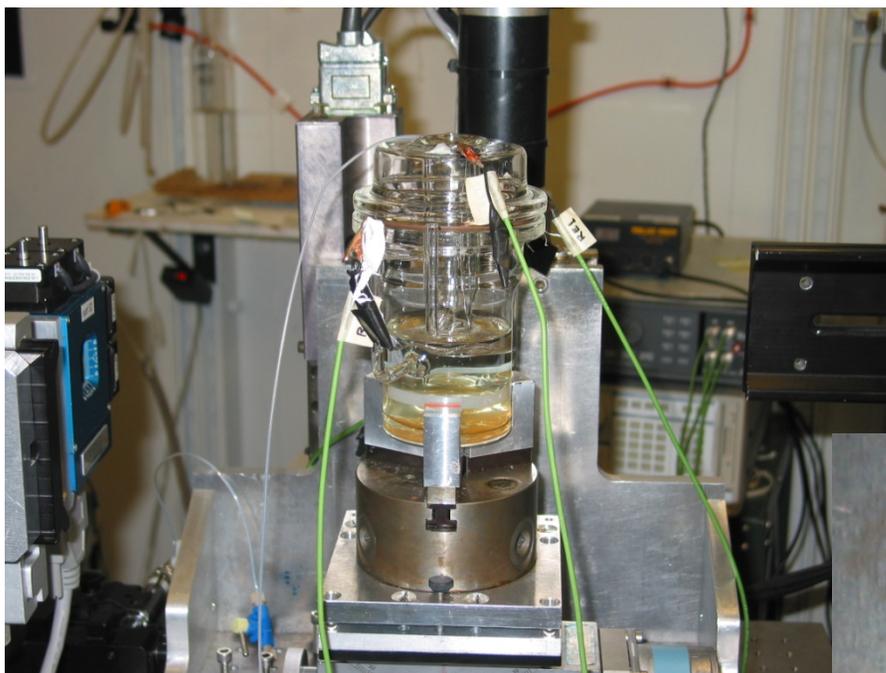
FY2009-12 PSC (APS Divs. Only)

Recent Safety Incidents

- On June 22 Argonne filed a management concern ORPS report due to 3 recent minor chemical exposures:
 - An experienced ESQ staff member moved an old plastic bottle from a shelf and it disintegrated. It contained dilute HF and he did not have gloves on so was potentially exposed to HF. He called 911. No injury or symptoms of HF exposure. Potential issues include safe handling and storage, appropriate PPE necessary and periodicity for bottle replacement.
 - An APS UofC post-doc user went into a hutch with the PI to troubleshoot an experiment. A small Teflon tube popped off a closed valve and the user was sprayed in one eye with approximately 50 microliters of 1,2 dichloroethane. She used an eyewash station to wash out her eye, but waited until the next morning to notify beamline staff. She was taken to an ER for examination; there was no lasting injury to her eye and she was returned to work same day. Potential issues include the requirement for additional PPE when conducting trouble shooting in response to an unexpected event.
 - A post doc filling a reagent squeeze bottle with methanol spilled approximately one liter on his pants/leg. He reported to medical but did not call 911 or report the spill to his supervisor. He was examined and sent to an ER for examination and observation. He showed no negative symptoms and was returned to work. Potential issues include appropriate precautions when handling chemicals, appropriate notifications for spills and review of training provided to post docs.
- On June 26 we had another minor chemical eye-splash incident at APS



First Eye-Splash Incident

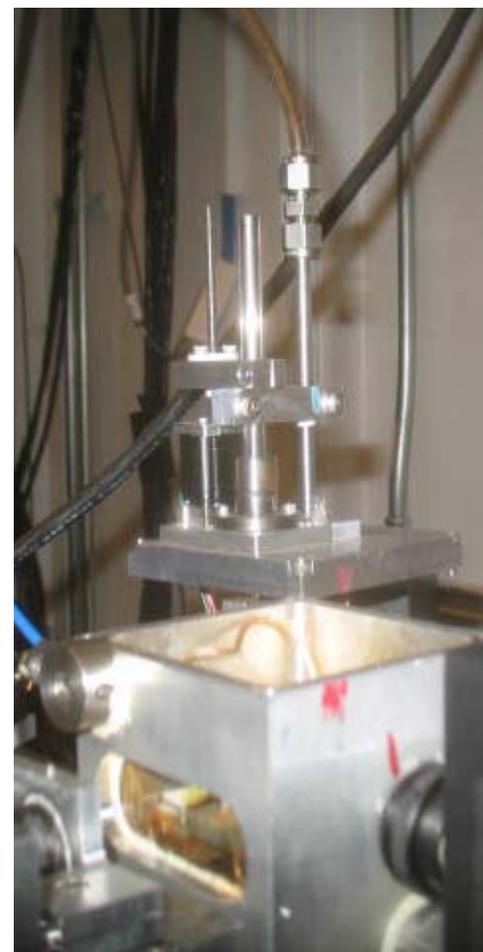
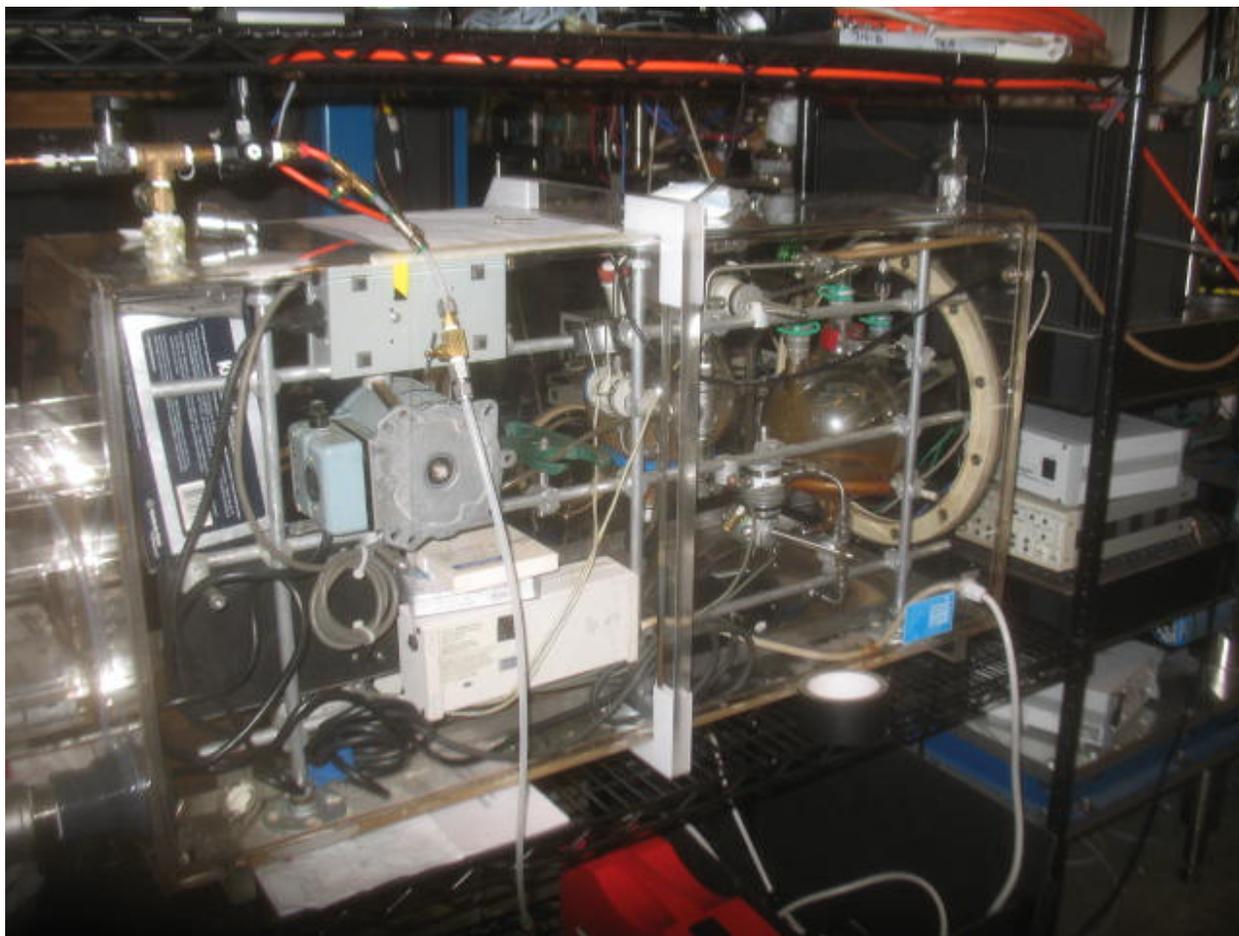


Tubing containing solvent
popped off while
troubleshooting apparatus



Second Eye-Splash Incident

During set-up of experiment, tubing still contained solvent from previous cleaning.



Recent Safety Incidents - Response

- We have had an increase in 'near miss' incidents.
- There are some common themes: chemical issues, incidents not immediately reported (although they all ultimately were). In the case of chemical exposure timely medical treatment can be critical.
- In the APS incidents there was no explicit requirement for PPE; however, the troubleshooting and setup aspects were not considered in the safety analyses. This provides an opportunity to revisit safety issues.
- June 27 I issued a notice to all staff and resident users, and the wording regarding chemical hazards in all ESAF's was updated, to correct problems with wearing safety glasses during chemical experiments.
- Tomorrow Tom Barkalow and I will be meeting with all beamline Safety and Chemical Safety officers to discuss how it is going with implementing ESAF's and whether further improvements are needed.



Record Runs 2011-3, 2012-1

Run 2011-3: MTBF 220 hours (7 faults), 99.6% available
Run 2012-1: MTBF 287 hours (6 faults), 99.7% available

Argonne Today



Daily Newsletter for Argonne Employees

March 1, 2012

SAFETY FOCAL POINT
PPE Road Show

INSIDE ARGONNE 

- Community
- Cost Savings Ideas
- Event Calendar
- Freecycle@Work
- Green Lab Initiative
- Job Board
- Safety
- Travel

FOOD

- 213 Cafe
- 401 Grill
- Guest House



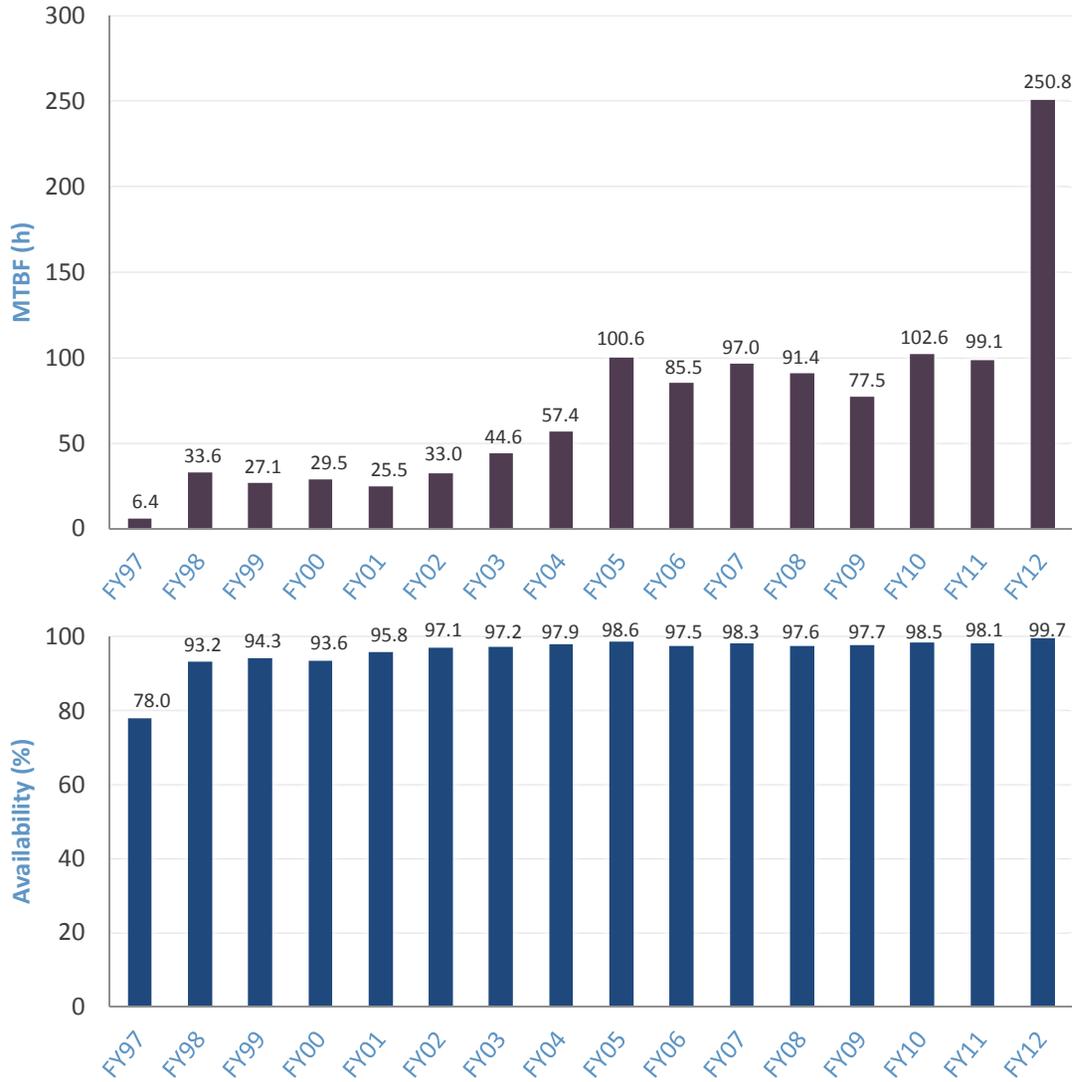
Record-setting run at APS

The recently completed user-beam run at Argonne's Advanced Photon Source set a new record for machine availability and reliability.

[Read more >](#)

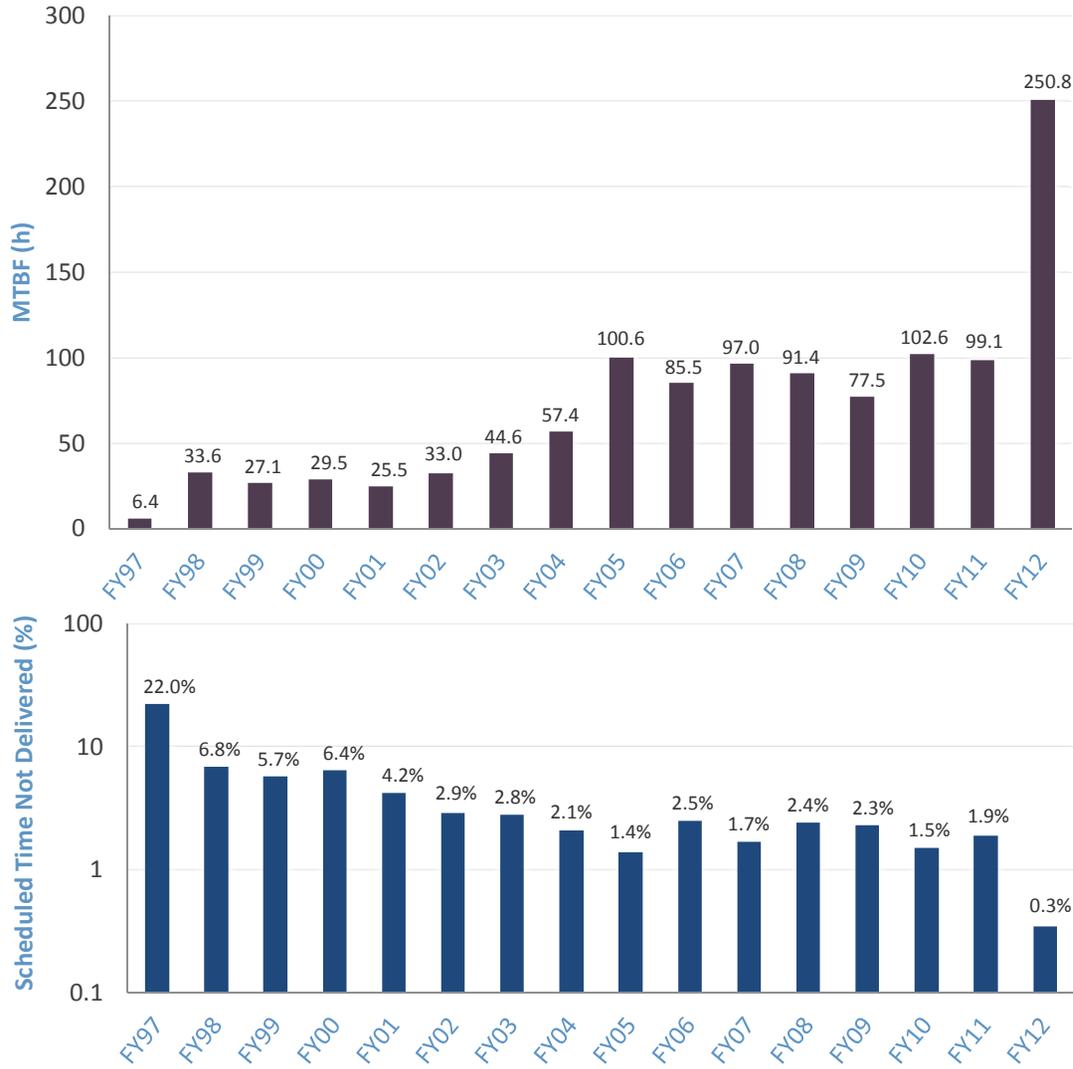


Trends: Accelerator Performance



- Outstanding performance through first 2/3 of FY12:
- Mean Time Between Faults: Approx. Two Weeks
- Availability: > 99.6%

Trends: Accelerator Performance



- Outstanding performance through first 2/3 of FY12:
- Mean Time Between Faults: Approx. Two Weeks
- Scheduled Time Not Delivered: 0.35%

Current Operations

- Run 2012-2 has started well, after 680 hours of operation we are at 99.5% availability with three faults (226 hour MTBF)
- However, we had to work very hard during the May shutdown to overcome challenges
- On May 16th at 1 AM the electrical supply for the injectors faulted. It took 4 days to restore power and resume machine conditioning
- On May 25th we encountered a problem with the newly installed vacuum chamber at sector 6 for the superconducting undulator prototype SCU0
- ASD and AES staff worked for 3 days over the holiday weekend to replace the chamber, avoiding a delay in the start of user operations

- An FMS risk analysis of electrical utilities has been initiated. It will address potential problems, MTTR, and mitigation (water systems to follow)
- A review of the SCU0 vacuum chamber has been held to diagnose the design issue and evaluate improved designs

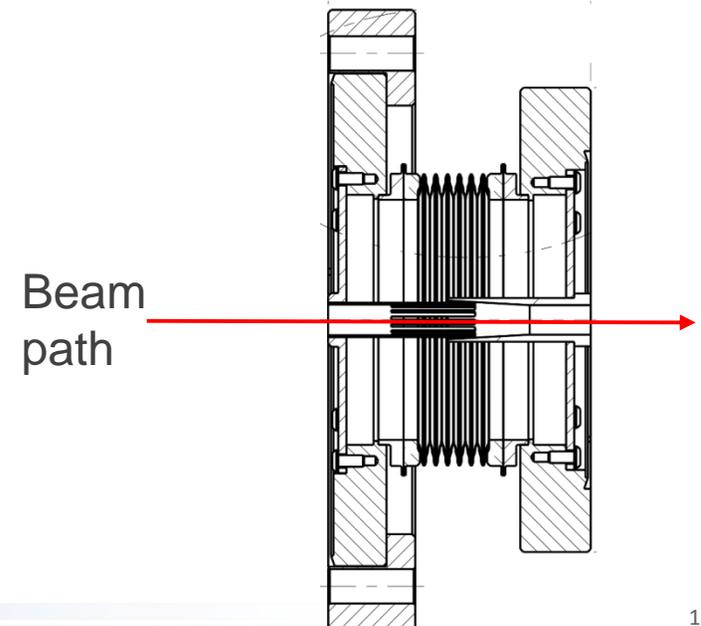
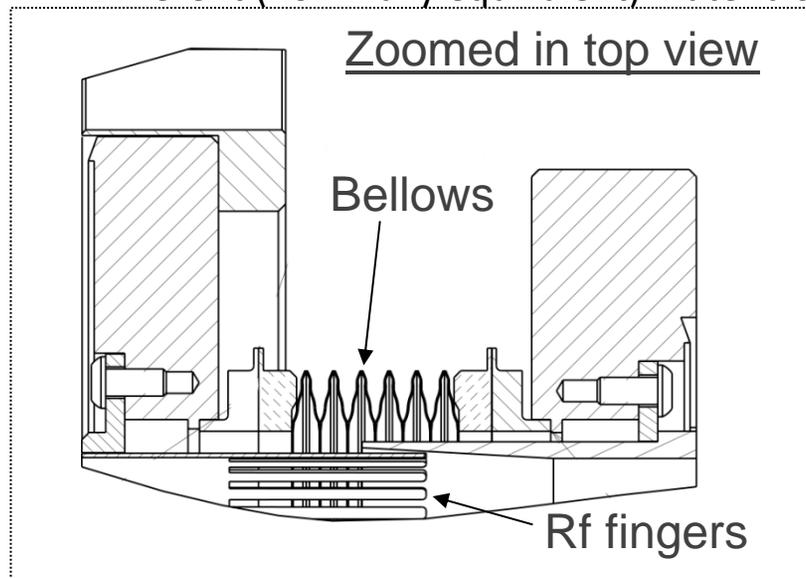


Faulted Electrical Feeder



RF Finger Problem

- “Rf fingers” are used as liners to hide the bellows convolutions from the beam
 - Prevents overheating of the bellows
 - Prevents beam instabilities
 - Many of these installed in APS
- As part of Sector 6 modifications for SCU0, a new type was installed
 - Much smaller vertical beam aperture
 - Normal is 40mm, this needed to be 7mm
 - Different (nominally equivalent) materials



FY13 Budget Status

| \$M | FY10 | FY11 | FY12 | FY13 President | FY13 House | FY13 Senate |
|-----------------------|-------|-------|-------|-------------------|---------------|----------------|
| DOE Office of Science | 4904 | 4843 | 4889 | 4992 | 4801 | 4909 |
| Basic Energy Sciences | 1637 | 1678 | 1694 | 1800 | 1657 | 1712 |
| Facility Ops | - | - | 731 | 810 | 777 | 781 |
| APS Ops | 128.3 | 129.7 | 123.0 | 134.8 | - | - |
| APS Upgrade | 0 | 7.5 | 20.0 | 20.0 | 20.0 | 20.0 |



FY13 Budget Status: Language in Bills

President: BES continues support for the operations of its suite of scientific user facilities ... In FY2013, increases are requested **to operate facilities at near optimum levels**. The upgrade of the APS is continued, ...

House: The recommendation includes \$776,568,000 for facility operations, \$46,000,000 above fiscal year 2012 and \$33,426,000 below the request. The increase above fiscal year 2012 is for preliminary operations of the NSLS-II as it completes construction and **to increase operating time of other Basic Energy Sciences facilities to near-optimal levels**.

Senate: Of the remaining funds for BES, ... \$908,725,000, which is \$49,698,000 above fiscal year 2012 enacted levels, is **to increase operating times to near optimum levels of world-class scientific user facilities**.



Jim Murphy appointed to lead DOE/BES/SUF effective July 15

Degrees from Penn State, Wisconsin-Madison and Dartmouth

at NSLS from postdoc to Senior Scientist

Deputy Department Chairman overseeing Accelerators & Operations

Led NSLS-II accelerator design team through CD-0

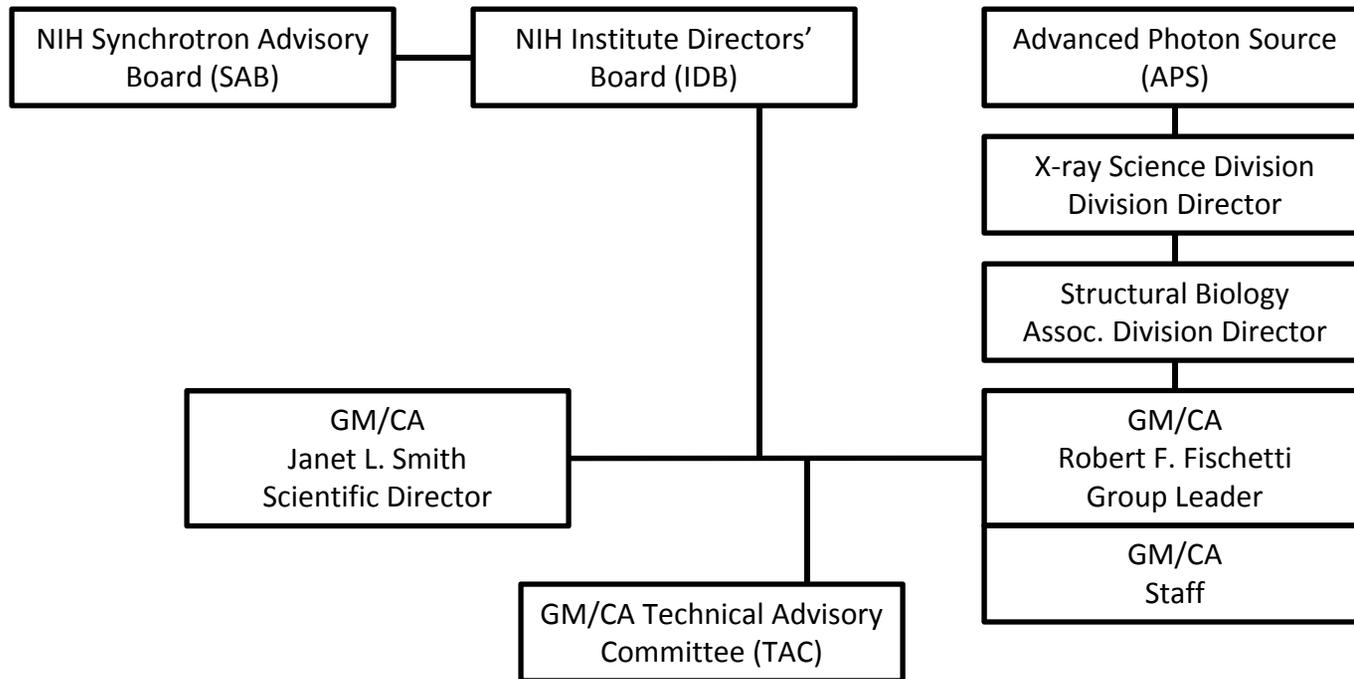
Research on physics of high brightness beams and free electron lasers, design of novel low momentum compaction storage rings, the understanding of coherent synchrotron radiation wakefields, and the physics of high gain free electron lasers



GM/CA staff have transferred from Argonne Biosciences Division to APS/XSD effective June 1

GM/CA Structural Biology Facility at APS

GM/CA@APS



Administration

Janet Smith
Director



Robert Fischetti
Assoc. Director



Sheila Trznadel
Admin. Specialist



Crystallographic Support

Craig Ogata
Crystallographer



Nukri Sanishvili
Crystallographer



Michael Becker
Crystallographer



Naga Venugopalan
Crystallographer



Computing Support

Sergey Stepanov
Control Systems,
Group Leader



Oleg Makarov
Control Systems
Developer



Mark Hilgart
Software Developer



Sudhir (Babu) Pothineni
Software Developer



Engineering & Technical Support

Shenglan Xu
Engineer



Derek Yoder
Instrumentation
Specialist



Steve Corcoran
Engineering Specialist



Dale Ferguson
Engineering Specialist



SAC Beamline Review Process

- Guidelines for reviews issued (copy in your packet)
- Question about how to count CAT publications
 - Not all CAT publications belong in APS Publication Database (e.g. theory, software, equipment; not APS supported and no APS acknowledgement)
 - These can be separately listed in CAT review materials
 - APS-supported publications (e.g. from experiments) should correspond with APS Publication Database





SAC Beamline Reviews: October 3, 2012

Panel A: HERIX and NRS

- Beamlines to be reviewed: 3-ID and 30-ID (HERIX)
- Review Panel:
 - Dan Neuman (SAC, NIST), Chair
 - Mark Sutton (SAC, McGill)
 - Chi-chang Kao (SSRL)
 - Jay Bass (UIUC)
 - Steve Durbin (Purdue)
 - Laura Edwards (UIUC), invited





SAC Beamline Reviews: October 3, 2012

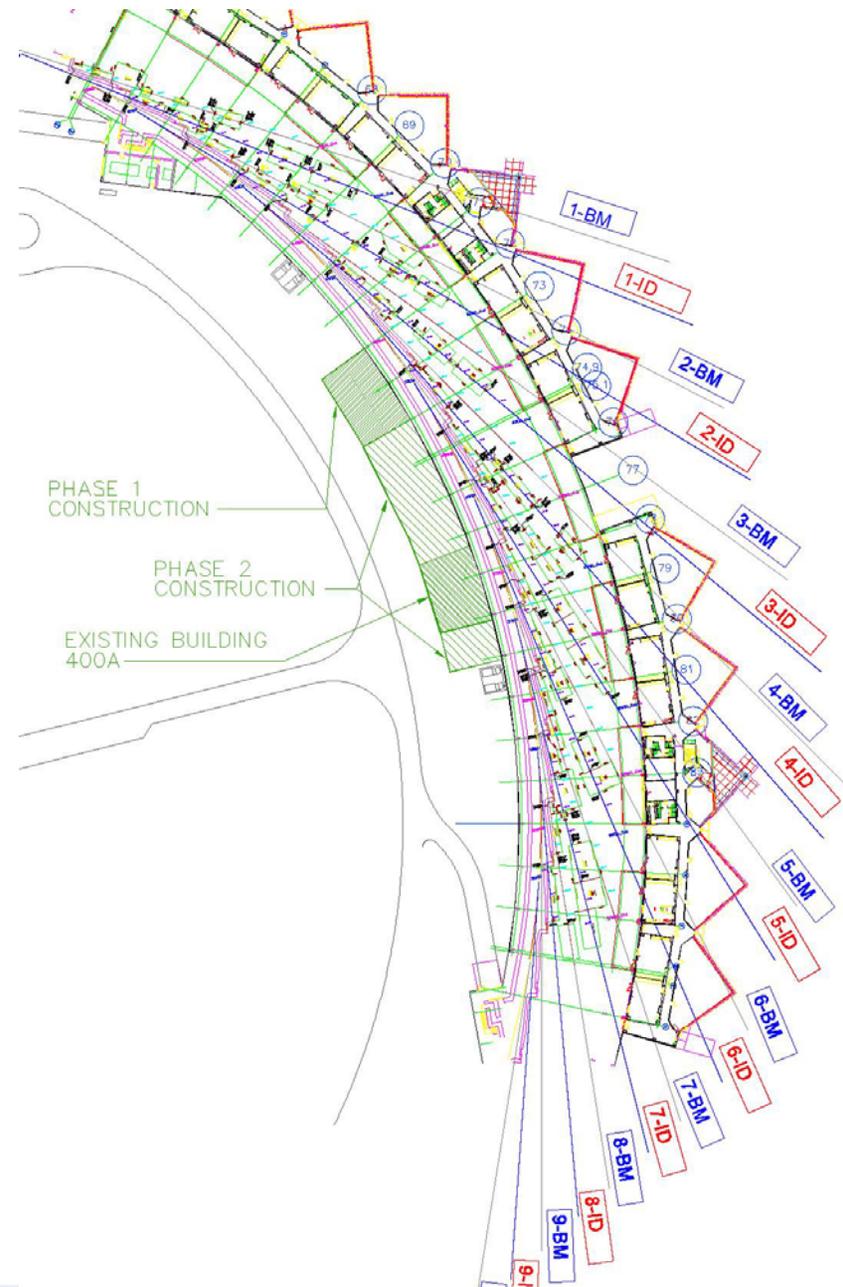
Panel B: SAXS, WAXS, GISAXS, USAXS, and XPCS

- Beamlines to be reviewed: 8-ID-E, 8-ID-I, 12-ID-B, 12-ID-C/D, (SAXS/WAXS only), 15-ID (USAXS only)
- Review Panel:
 - KaYee Lee (SAC, UofC), Chair (invited)
 - Friso van der Veen (SAC, Paul Scherrer)
 - Roger Leach (SAC, DuPont)
 - Jack Johnson (SAC, Scripps)
 - Soichi Wakatsuki (SAC, Photon Factory)
 - Andrei Fluerasu (BNL)

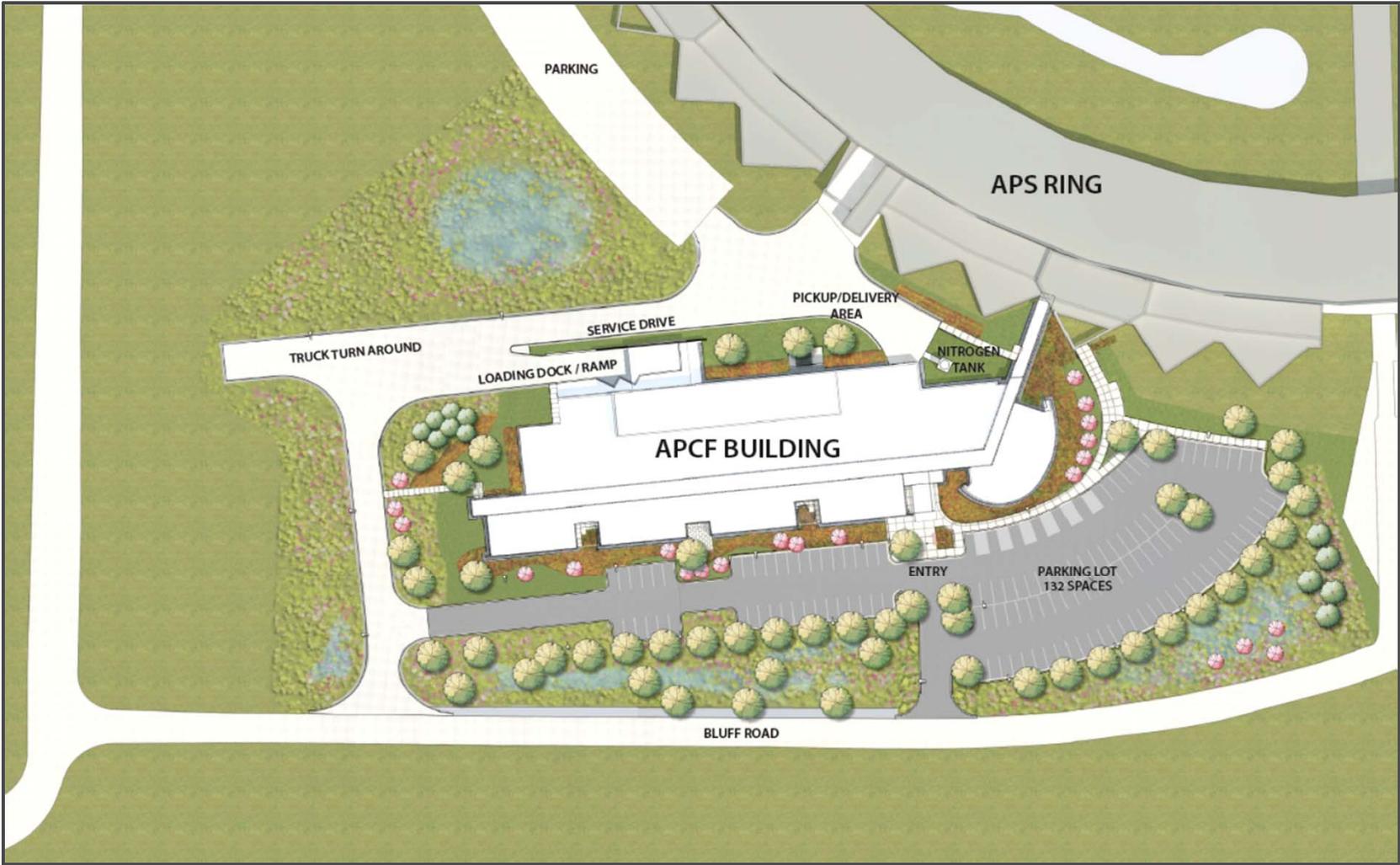


Building 400A Project

- Building 400A is being extended to house RF and cryo plant for the Short Pulse X-ray facility.
- Phase 1: 3/18/12 – 7/8/12
 - All foundations and slab
 - All work below finish floor
 - Completion of North section of building (steelwork, roofing, paneling, life safety etc.)
 - All other site work (driveway, etc)
- Phase 2: 7/9/12 – 9/30/12
 - Completion of the rest of the building



APCF Site Near 435 (Sectors 18-20)





APCF Construction Schedule

- Start Construction: August, 2012
 - LOM 435 Parking relocation: Fall, 2012
 - Foundation/ Subgrade: Fall, 2012
 - Steel Erection: Winter, 2012/2013
 - Paving/ Final Sitework: Late Summer/ Fall, 2013
-
- We are installing initial vibration sensor network

(Construction) Vibrations Task Force

- A Construction Vibration Measurement Task Force has been formed.
 - Bruce Glagola is Leader of Task Force
- Four Sub-Teams created
 - Subteam 1: Coordinates construction vibration equipment tests and on site schedules of construction details. (FMS based)
 - Subteam 2: This subteam ensures readiness of beamline accelerometers to collect data and to connect with EPICS as appropriate when construction equipment is being tested and utilized.
 - Subteam 3: Ensures the MCR is ready to monitor SR electron movement while construction equipment testing is being performed. As requested this subteam will communicate when electron beam motion is out of norm
 - Subteam 4: Supplies a scientist to work with designated beamlines when construction vibration measurements are to be monitored, or when problems are noted.
- Task Force has begun meeting, and is prepared to address APCF construction
- Vibration measurement system will be built and commissioned for facility long term use.



APS Beamline Office Space Planning

- Part of APS Space Assessment, carried out in first half of FY12
- Drivers for expansion of beamline office space:
 - Current overcrowding
 - Accommodating NSLS-I to NSLS-II transition
 - APS Upgrade
- APS Roadmap completed May 2012 gave planned locations of future beamlines and thus needed offices



Current Beamline Office Space Overcrowding

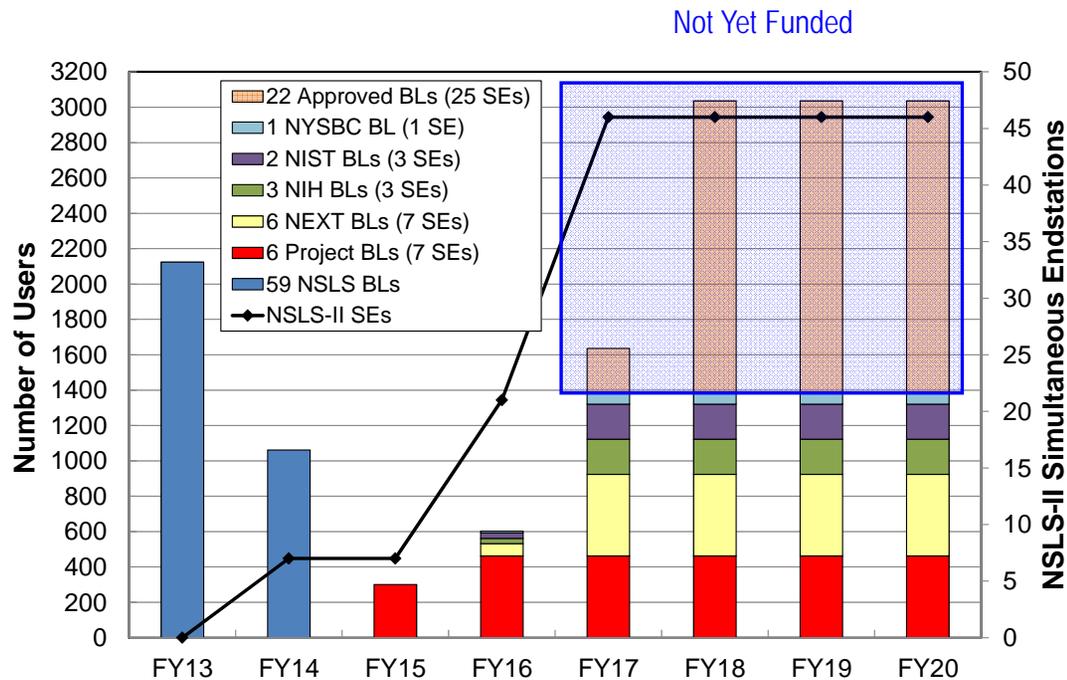
To handle current overcrowding, offices are being created in hallways of LOMs



The Advanced Photon Source is an Office of Science User Facility operated for the U.S. Department of Energy Office of Science by Argonne National Laboratory



Reduced Capacity for Synchrotron Users at Brookhaven during NSLS-I to NSLS-II Transition



- NSLS stops & NSLS-II starts mid-FY14
- NSLS-II will host
 - ~ 300 users with 7 BLs in FY 15
 - ~ 600 users with 21 BLs in FY16
 - At least 1400 users with 21 BLs in FY17 (more if additional beamlines are funded)
- NSLS-II provides net capacity increase before end of decade (with additional beamline funding)
- *But substantial capacity reduction for several years starting FY14*



NSLS-I to NSLS-II transition

- APS is proposing to increase capacity at up to 14 existing bending magnet beamlines
- At 11 operating beamlines, can add the equivalent capacity of 3 full additional beamlines
- Have 3 more that are not currently operating
- Total added capacity: up to 6 beamline equivalents (about 650 users per year)
- Resources needed: 15 staff, \$3M in equipment, **increased office space for users and staff**
- Some staff and support could come from current NSLS PRTs



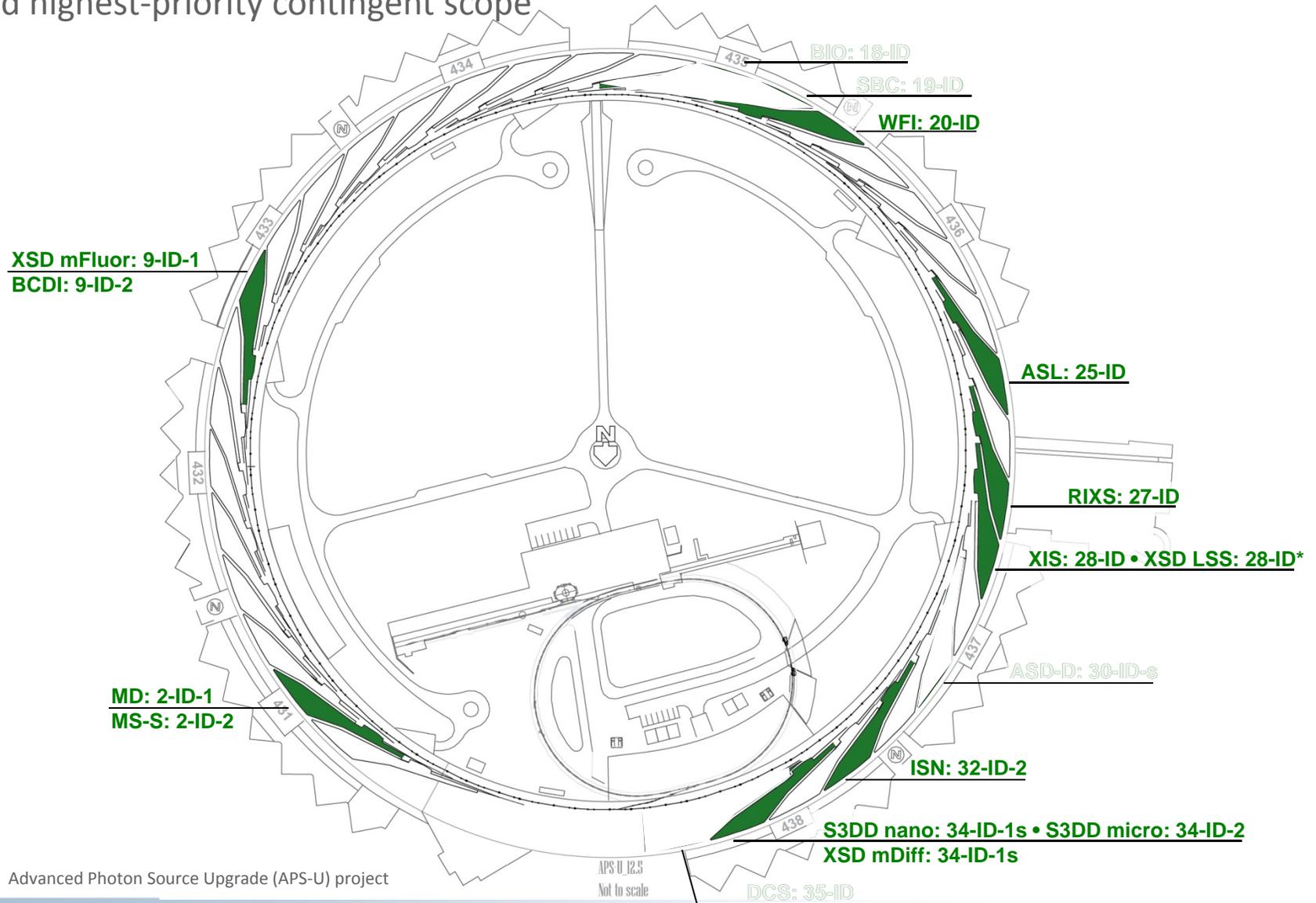
NSLS-I to NSLS-II transition

| Beamline (Operator) | Current Techniques | Potential Techniques | Estimated Capacity Increase (in BLs) | Estimated Increase in Unique Users * | One-time Costs for Increased Capacity (K\$) | Recurring Costs for Increased Capacity (K\$) | Comments on Costs |
|---------------------|---|---|--------------------------------------|--------------------------------------|---|--|---|
| 1-BM (XSD) | Powder diffraction | Scattering & topography | 0.50 | 50 | 85 | 225 | optical microscope and custom goniometer; Staff Scientist |
| 2-BM (XSD) | Tomography | Tomography | 0.20 | 20 | 0 | 175 | Scientific Assoc. |
| 5-BM-C (DND CAT) | Powder diffraction & microCT | Powder diffraction & microCT | 0.10 | 10 | 110 | 0 | high throughput detector in APS detector pool |
| 8-BM (XSD) | Microfluorescence | Microfluorescence | 0.25 | 25 | 125 | 225 | KB mirror; Staff Scientist |
| 9-BM (XSD) | XAFS | XAFS | 0.50 | 50 | 550 | 400 | quick EXAFS mono; Staff Scientist and Scientific Assoc. |
| 11-BM (XSD) | Powder diffraction | Powder diffraction | 0.20 | 20 | 0 | 0 | |
| 12-BM (XSD) | XAFS and general diffraction | XAFS and general diffraction | 0.25 | 25 | 480 | 0 | mirror for 10X flux, fluorescence detector |
| 17-BM-B (IMCA/XSD) | Protein crystallography | Powder diffraction & diamond anvil | 0.25 | 25 | 0 | 175 | Scientific Assoc. (COMPRES could contribute part) |
| 22-BM-B (SER CAT) | Protein crystallography | Protein crystallography | 0.25 | 25 | 0 | 0 | |
| 23-BM-B (GM/CA CAT) | Protein crystallography | Protein crystallography | 0.25 | 25 | 0 | 0 | |
| 33-BM-C (XSD) | General diffraction /surface scattering | General diffraction /surface scattering | 0.25 | 25 | 0 | 175 | Scientific Assoc. |
| TOTAL | | | 3 | 350 | 1350 | 1375 | |
| 6-BM (XSD) | Currently not operating | High pressure - white beam | 1 | 100 | 500 | 400 | white beam slits, high pressure instrument; Staff Scientist and Scientific Assoc. (COMPRES could contribute part) |
| 14-BM-D (BioCARS) | Currently not operating | High pressure - mono beam | 1 | 100 | 700 | 625 | mirror, mono, controls/IT; 2 Staff Scientists and Scientific Assoc. (COMPRES could contribute part) |
| 24-BM-B (NE CAT) | Currently not operating | Various/ white beam capable | 1 | 100 | 500 | 625 | PSS, optics installation, controls/IT; 2 Staff Scientists and Scientific Assoc. |
| TOTAL | | | 3 | 300 | 1700 | 1650 | |
| GRAND TOTAL | | | 6 | 650 | 3050 | 3025 | |



APS Upgrade Beamline Locations

Net increase of 11 new experimental stations in APS-U base and highest-priority contingent scope



Advanced Photon Source Upgrade (APS-U) project



APS Lab Office Modules (LOMs)

- There are currently seven Lab-Office Modules (LOMs) that provide lab and office space adjacent to the APS floor (plus one shell at 437 in the area of the open sectors with early Upgrade beamlines)

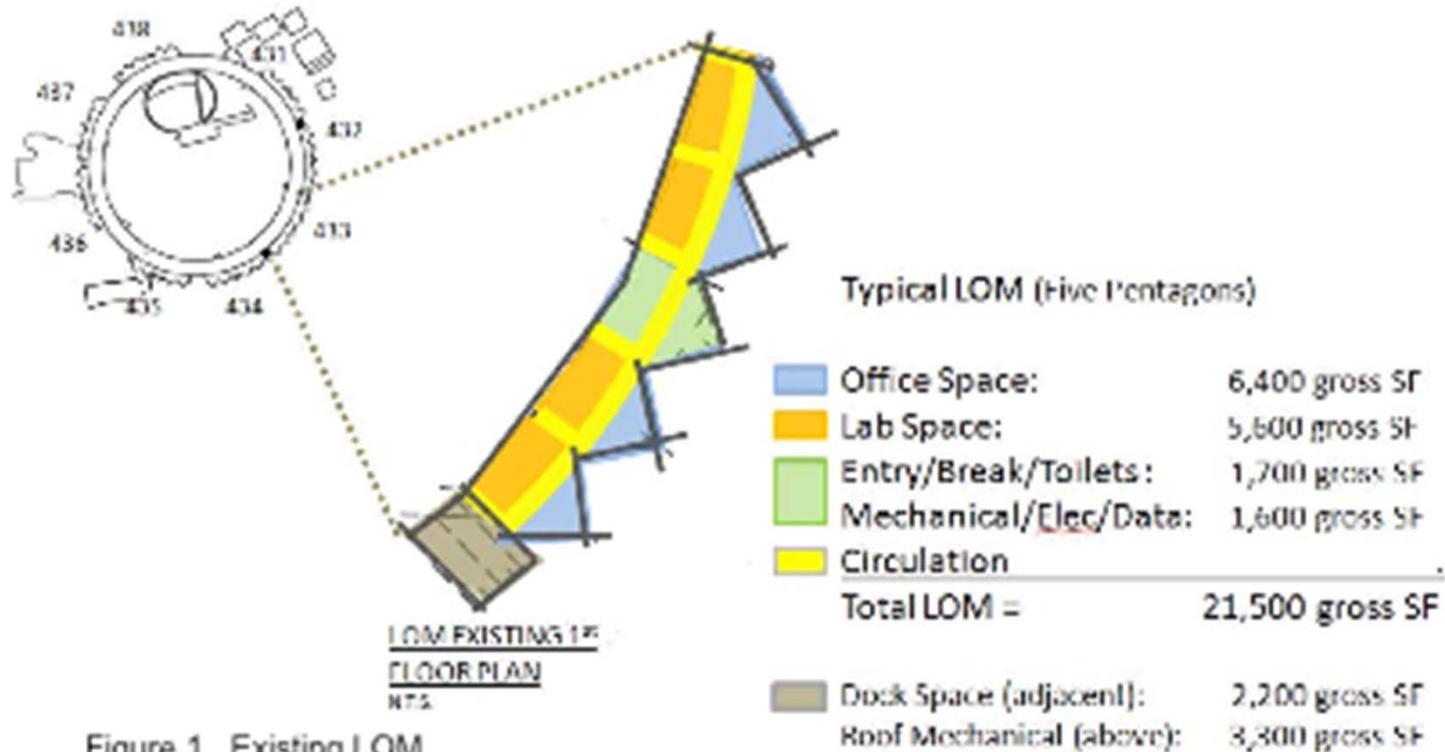


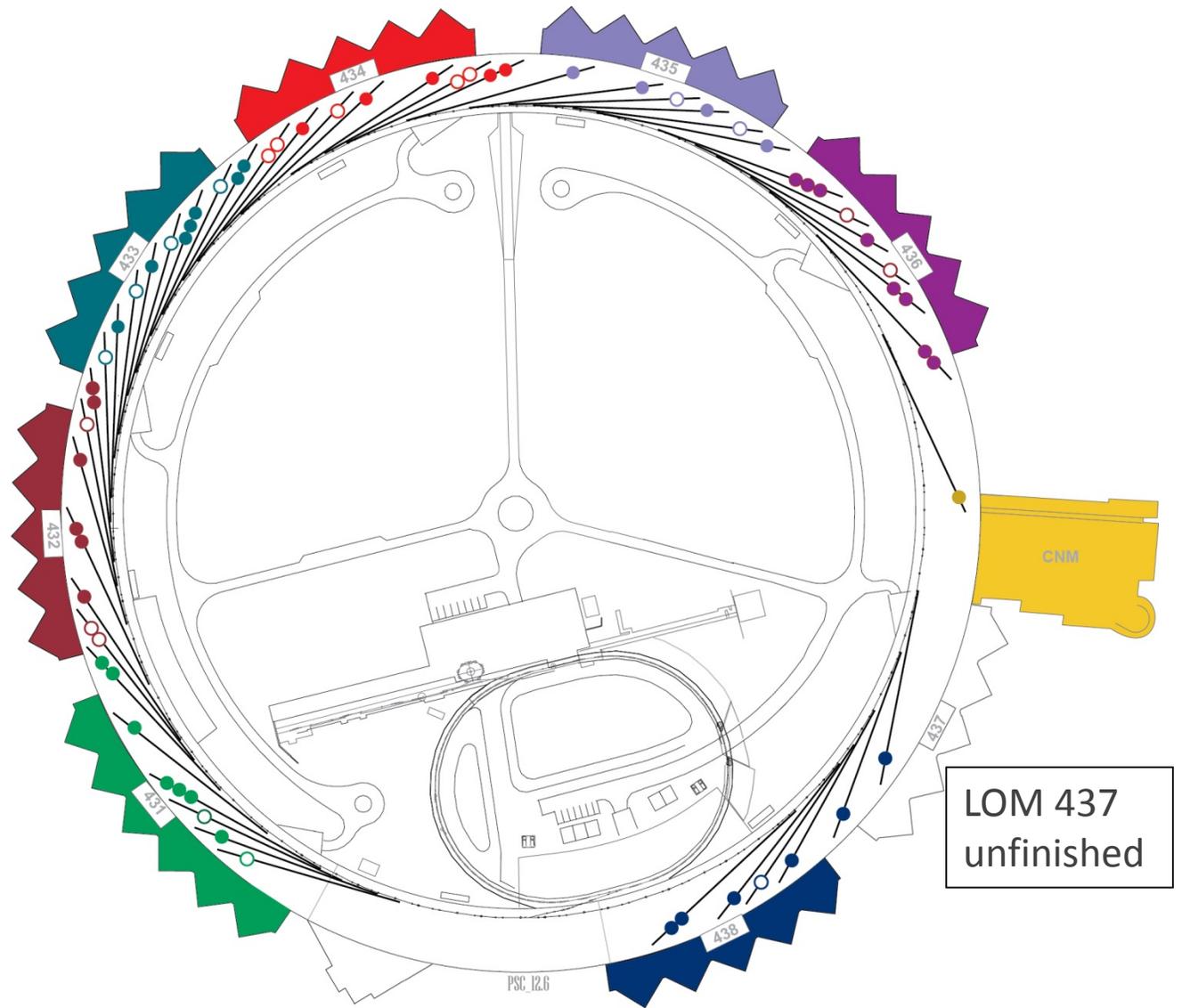
Figure 1. Existing LOM

APS Beamline and LOM Staffing Projection (partial image)

| LOM | Current Config. | Status Now | Current Program(s) | Current staff in LOM | Status in 2-3 yrs | Program(s) in 2-3 Years | Change in Staff in 2-3 years | After Upgrade (in scope) | Status After Upgrade | Program(s) after Upgrade (J') | Change in Staff After Upgrade | Beyond Upgrade | Status Beyond Upgrade | Program(s) Beyond Upgrade | Change in Staff Beyond Upgrade |
|------------------|-----------------|------------|--------------------|----------------------|-------------------|-------------------------|------------------------------|--------------------------|----------------------|-------------------------------|-------------------------------|----------------|-----------------------|---------------------------|--------------------------------|
| 431-Z | | | det pool/heaphy | 15 | | | 15 | | | | | | | | |
| 431-A | 01-BM | Oper | powder | | Oper | Optics/HEX | | 01-BM | Oper | Optics/HEX | | 01-BM | Oper | Optics/HEX | |
| 431-A | 01-ID | Oper | HEX | 15 | Oper | HEX | 4 | 01-ID-1 | Oper | HEX1 | | 01-ID-1 | Oper | HEX1 | |
| | | | | | | | | 01-ID-2 | Oper | HEX2 | 5 | 01-ID-2 | Oper | HEX2 | |
| 431-B | 02-BM | Oper | Tomography | | Oper | Tomography | 1 | 02-BM | Oper | Tomography | | 02-BM | Oper | Tomography | |
| 431-B | 02-ID-B | Oper | Soft Imaging | | Oper | Soft Imaging | | 02-ID-1 | Oper | MD | 6 | 02-ID-1 | Oper | MD | |
| 431-B | 02-ID-D | Oper | mdiff/mflur | | Oper | mdiff/mflur | | 02-ID-2 | Oper | MS-S | | 02-ID-2 | Oper | MS-S | |
| 431-B | 02-ID-E | Oper | mflur | 12 | Oper | mflur | | | | | 12 | | | | |
| | 3-BM | Open | | | Open | | | 3-BM | Open | | | 3-BM | Open | | |
| 431-D | 03-ID | Oper | NRS/HERIX | 10 | Oper | NRS/HERIX | | 03-ID | Oper | NRS/HERIX | | 03-ID | Oper | NRS/HERIX | |
| | 4-BM | Open | | | Open | | | 4-BM | Open | | | 4-BM | Open | | |
| 431-E | 04-ID-C | Oper | MS-S | 8 | Oper | MS-S | | | | | | | | | |
| 431-E | 04-ID-D | Oper | MS-H | 8 | Oper | MS-H | | 04-ID | Oper | MS-H | | 04-ID | Oper | MS-H | |
| LOM Total | | | | 68 | | | 18 | 50 | | | 1 | 49 | | | 0 |
| 432-A | 05-BM-C | Oper | powder/tomo | | Oper | powder/tomo | | 05-BM-C | Oper | powder/tomo | | 05-BM-C | Oper | powder/tomo | |
| 432-A | 05-BM-D | Oper | XAFS/diffraction | | Oper | XAFS/diffraction | | 05-BM-D | Oper | XAFS/diffraction | | 05-BM-D | Oper | XAFS/diffraction | |
| 432-A | 05-ID | Oper | powder/SAXS | 12 | Oper | powder/SAXS | | 05-ID | Oper | powder/SAXS | | 05-ID | Oper | powder/SAXS | |
| | 6-BM | Open | | | Oper | COMPRES | 4 | 6-BM | decom | COMPRES | 4 | 6-BM | | SPX-soft | 5 |
| 432-B | 06-ID-B,C | Oper | MD | | Oper | MD | | 06-ID | Oper | SPX - XAFS | 7 | 06-ID | Oper | SPX - XAFS | |
| 432-B | 06-ID-D | Oper | HEX | 9 | Oper | HEX | | | | | 9 | | | | |
| 432-D | 07-BM | Cons | high speed imaging | | Oper | high speed imaging | | 07-BM | decom | | | 07-BM | decom | | |
| 432-D | 07-ID | Oper | TR XAFS/diff | 14 | Oper | TR XAFS/diff | | 07-ID | Oper | SPX - diff | 5 | 07-ID | Oper | SPX - diff | |
| 432-E | 08-BM | Oper | mflur | | Oper | mflur | 1 | 08-BM | Oper | mflur | | 08-BM | Oper | mflur | |

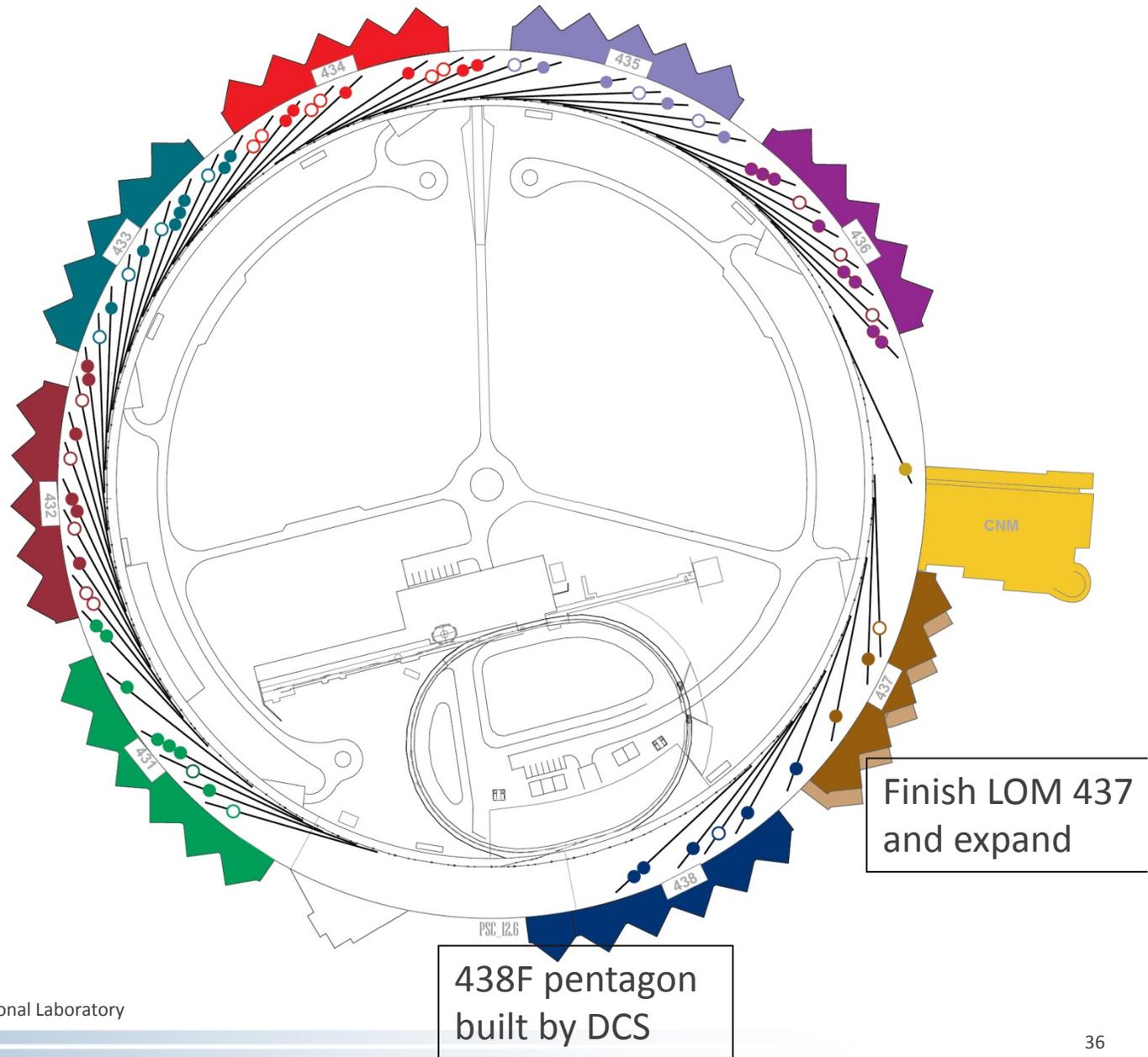
APS Operating Beamlines & LOMS - Current Configuration

- 63 beamlines
- 343 occupants
- 290 capacity



APS Operating Beamlines & LOMS - in 2-3 Years

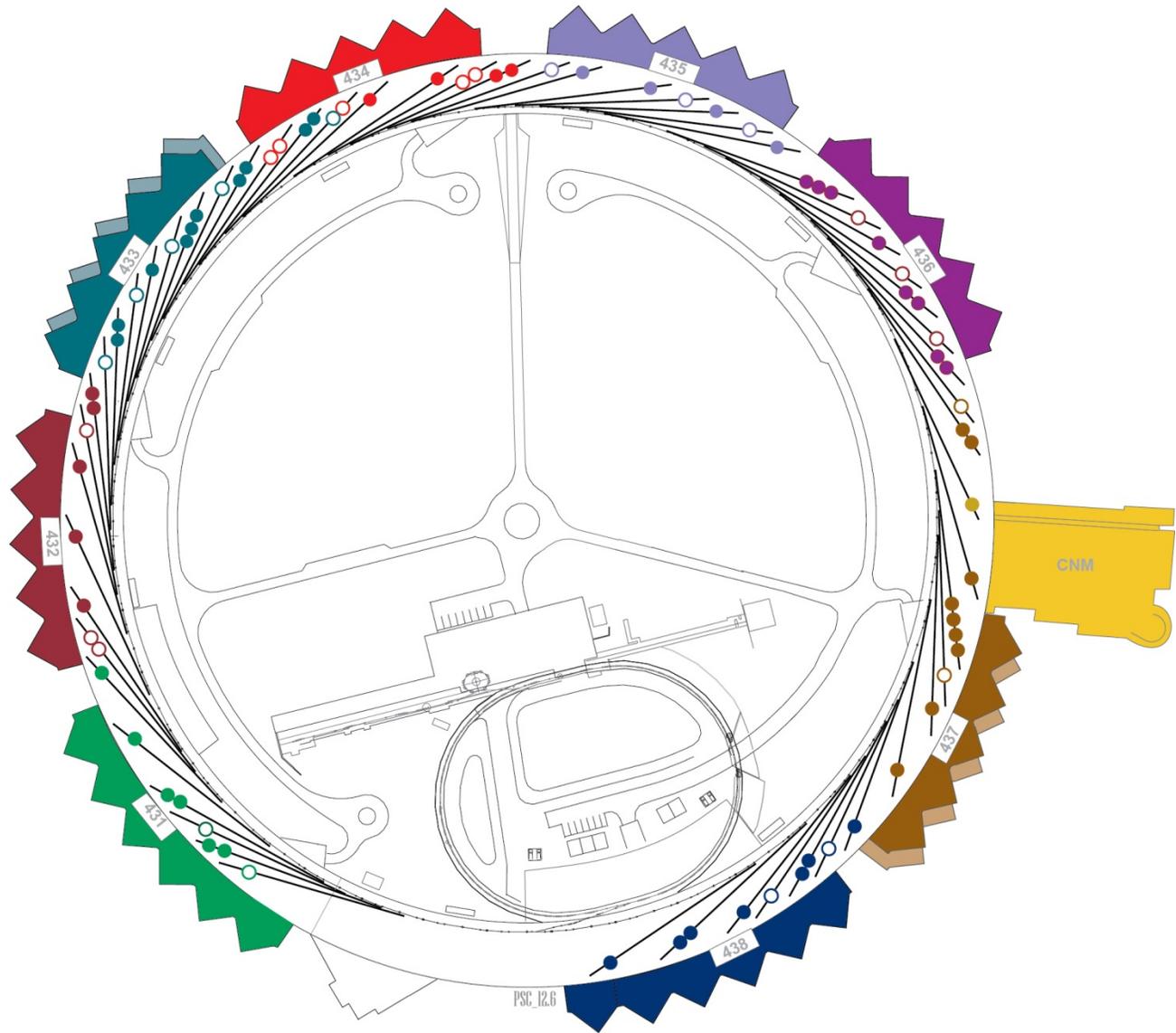
- 71 beamlines
- 386 occupants
- 380 capacity



APS Operating Beamlines & LOMS - After Upgrade

- 79 beamlines
- 441 occupants
- 420 capacity

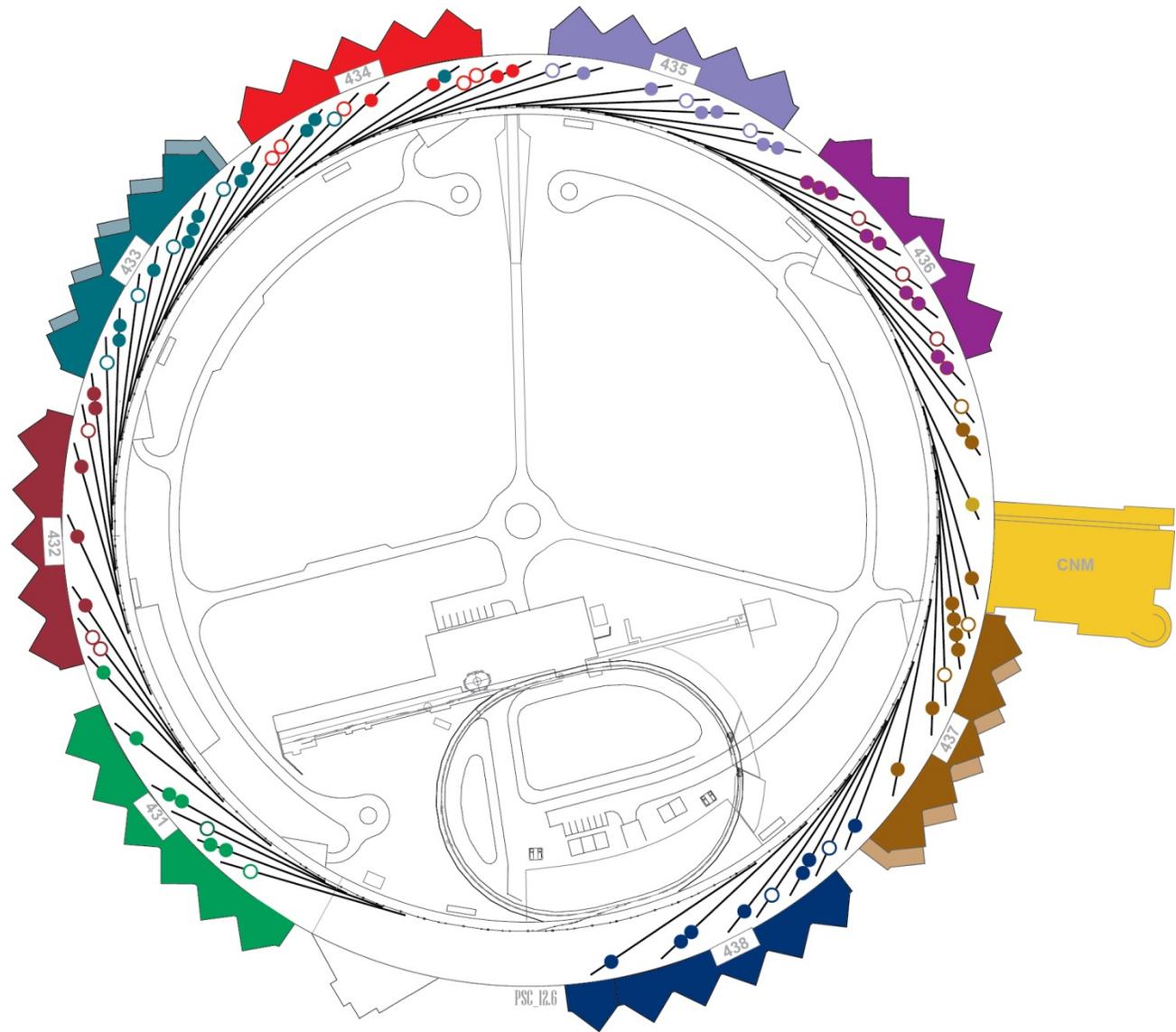
Expand another LOM e.g. 433



APS Operating Beamlines & LOMS - Beyond Upgrade

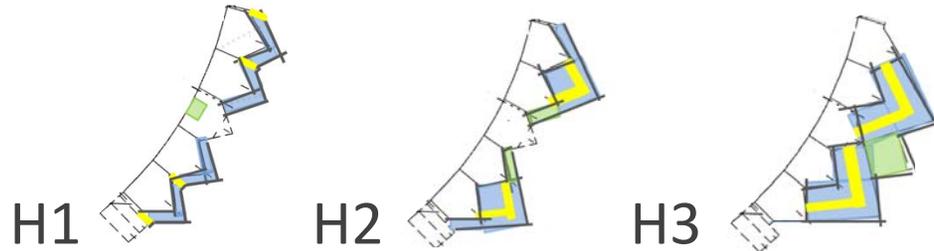
- 84 beamlines
- 479 occupants
- 420 capacity

Could continue to expand LOMs as needed

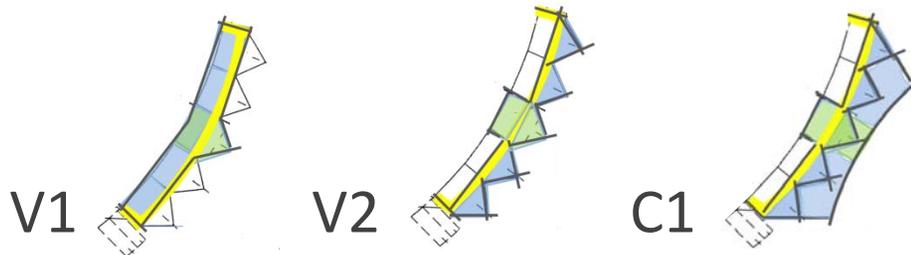


APS Beamline Office Expansion Concepts

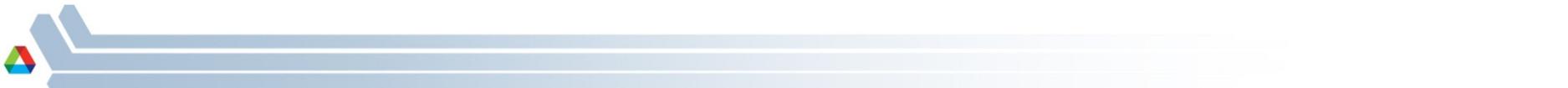
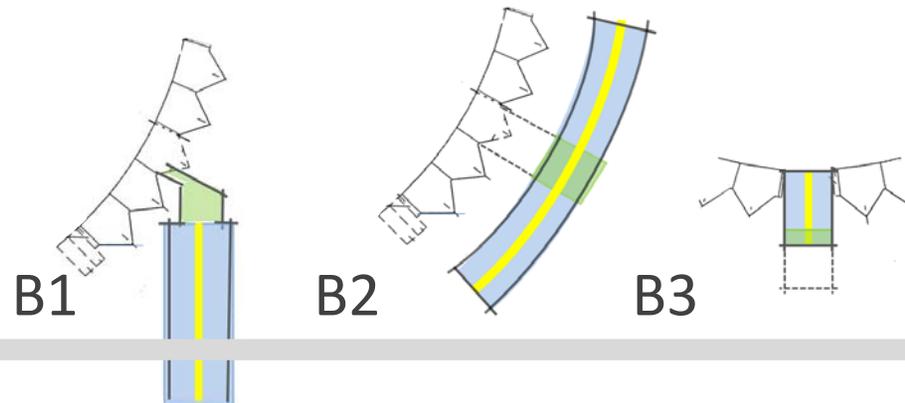
Horizontal Expansion



Vertical Expansion



New Building



Alternative Selection - Vertical Expansion of LOMs

- Need is for office spaces directly adjacent to beamlines distributed around ring
- Vertical LOM expansion avoids costs of moving roadways, wetlands
- Creating a design for expanding LOM by LOM gives flexibility for future expansion as and where needed without redesign costs
- APS is a distinctive, recognizable symbol for DOE Office of Science User Facilities and we need to retain the architectural character of the facility
- Concept and cost estimate has been created, request for funding submitted to Argonne, expect decision for FY13 design start

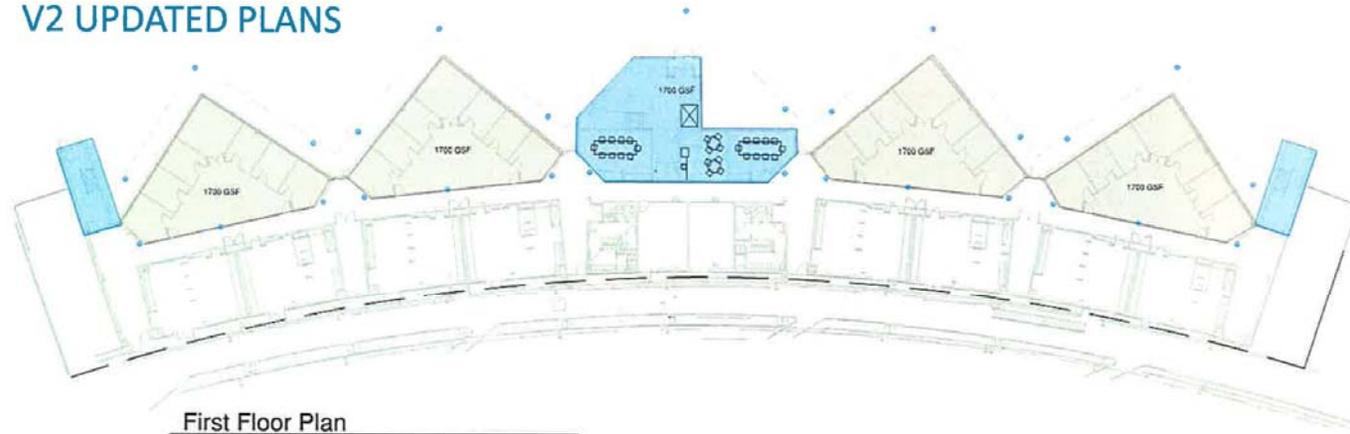


The Advanced Photon Source is an Office of Science User Facility operated for the U.S. Department of Energy Office of Science by Argonne National Laboratory

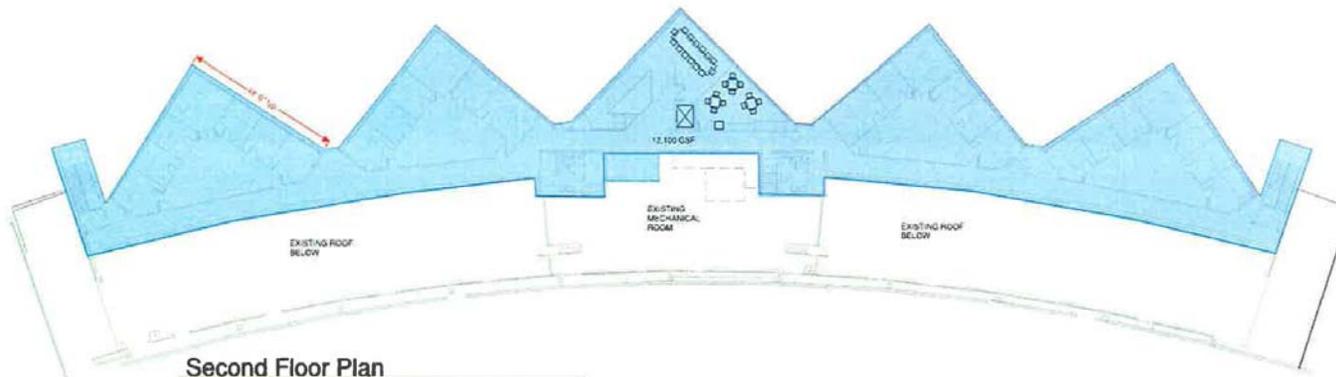


LOM Vertical Expansion Floor Plans

V2 UPDATED PLANS



First Floor Plan



Second Floor Plan

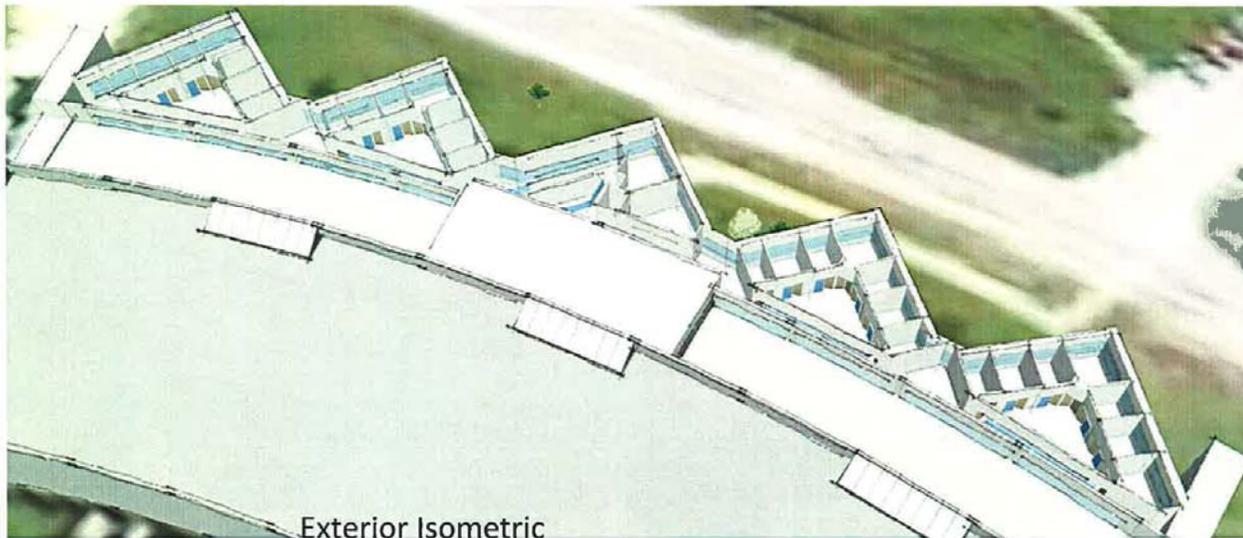
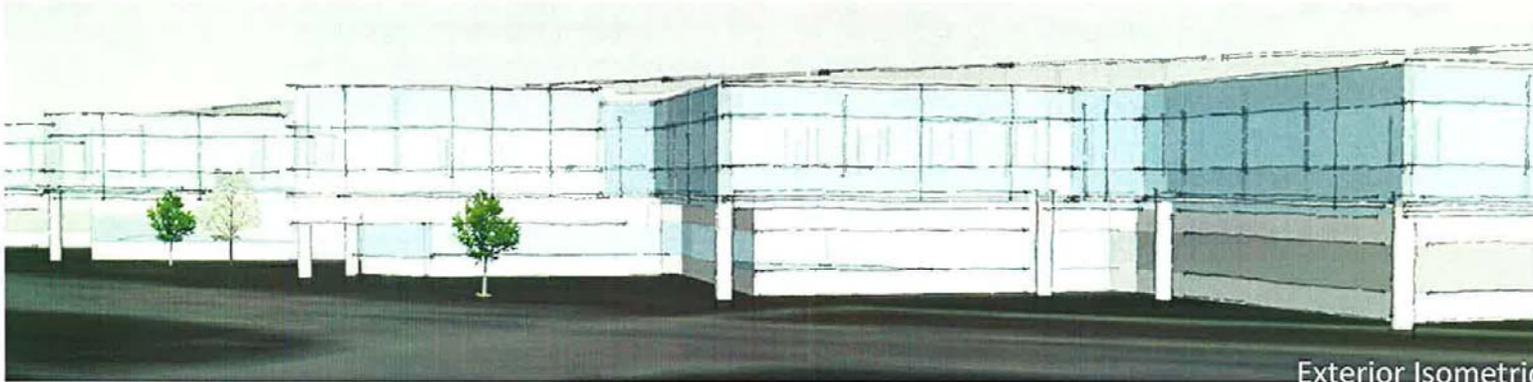
N.T.S.

- DOUBLES AMOUNT OF OFFICE SPACE
- 36 OFFICE/CUBICLES AT 1ST FLOOR = 36 OFFICE/CUBICLES AT 2ND FLOOR
- 72 OFFICE/CUBILCES TOTAL



LOM Vertical Expansion Sketch Views

V2 UPDATED 3D VIEWS



Questions?

