

# APS ENGINEERING SUPPORT (AES) DIVISION



**JOHN CONNOLLY**  
Division Director, AES  
Photon Sciences Directorate

**PSC All-Hands and Priority Meeting**  
October 18, 2017

# OUTLINE

- Overview of the APS Engineering Support (AES) Division
  - Division groups and responsibilities, strategy
- Division activities and highlights
- Division priorities for FY18
- Summary

# OVERVIEW OF THE AES DIVISION

# AES DIVISION – GROUPS AND RESPONSIBILITIES

## Controls

- Responsible for remote monitoring / control for accelerator, insertion devices, personnel safety systems (PSS), and front ends
- Oversight of >1,000 distinct control applications and 400,000 process variables, each representing a machine parameter

## Information Technology

- Responsibility for the APS enterprise network, software, security, servers, backup, and supporting all Laboratory cyber security policies
- Direct technical support to the APS accelerator and beamlines in the planning, acquisition, and operation of IT software and hardware

## Information Solutions

- Business software development group providing a large portion of support directly to the APS User Program
- Directly responsible for all APS business systems (work request or reservation systems, nearly all business databases)

## Design & Drafting

- Supports all of the APS using leading-edge technology to provide design support, 2D prints, 3D models/rendering, reverse engineering
- Responsible for business administration of CAD databases as well as training of CAD users

## Safety Interlocks

- Develops, implements, and supports robust and highly reliable PLC-based engineering safeguards for APS accelerator and beamlines
- Overall authority and responsibility for PSS and equipment protection systems, laser interlocks, ACIS

## Mechanical Operations & Maintenance

- Operates and maintains various mechanical, water, vacuum (all), liquid nitrogen, and pneumatic systems of the APS facility
- Technicians and engineers are on-call providing support for the accelerator, beamlines and users 24/7 throughout the year

## Mechanical Engineering & Design

- Provides highly-specialized mechanical engineering, analysis and design for experimental and accelerator facilities
- Additionally contains a Survey and Alignment Section for precision metrology as well as measurement and alignment services



# DIVISION STRATEGY

- AES Strategic and Development Plan was completed in 2016, as first time for the Division, incorporated into the APS Five-Year Facility Plan.
- Core tenets summarized below:

## Agile Support Role

Achieve safe, cost effective operations in meeting the mission of our sponsor  
Provide divisional resources to the APS Upgrade project to achieve planned milestones  
Promote an adaptive nature, in meeting the changing needs of users and facility operations

## Operational Excellence

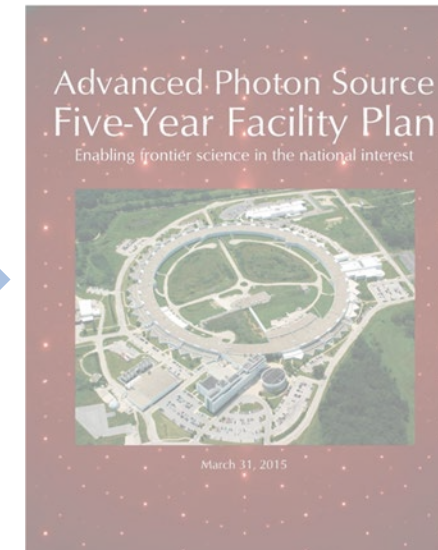
Continue to practice ISM principles with a heightened conviction towards safety and risk  
Manage APS assets in pursuit of highest possible machine reliability  
Adhere to core process fidelity and optimization to operate as one integrated facility

## Engineering Excellence

Endorse a concise and documented governance model with accountability  
Develop innovative and novel designs, questioning the status quo  
Enable engineers, designers, technicians with state-of-the-art toolsets

## Human Capital

Strong partnership with APS Human Resources team to promote continuous workforce development  
Develop a comprehensive and integrated set of talent management strategies  
Maintain an inventory of critical skills with associated actions to close skill gaps



# FY2017 HIGHLIGHTS

# PEOPLE AND RECOGNITION IN FY17

- **Two Group Leader positions staffed:**

- Ned Arnold as CTRLS Group Leader in Nov 2016
- Arvind Ramanathan as IS Group Leader in July 2017



- **Numerous others joining AES groups in FY17:**

- Aleksandar Marcetic in SI group in Nov 2016
- Jason Lerch in MED group in Dec 2016
- Regina Mekler in MOM group in Jan 2017
- Joe Lenner in SI group in Jan 2017
- Fanping Zhu in IT group in Jan 2017
- Ethan Anliker in DD group in Mar 2017
- Jin Fang in IS group in Apr 2017
- Guobao Shen in CTRLS group in Jun 2017
- Joseph Schultz in DD group in July 2017
- Megan Szubert in DD group in July 2017

- **University of Chicago James B. Porter Award for Outstanding Safety Performance** to the “APS Accelerator Materials Recycling Team”

- CJ Sarne (AES/MOM)
- Debby Curry (AES/MOM)
- Ed Theres (AES/MOM)
- Elroy Chang (HSE)
- John Vacca (HSE)
- + 10 others from various Argonne depts.

- **Pacesetter Awards:**

- Oliver Schmidt (AES/MED): Outstanding effort as part of XSD team for 3-ID upgrade of upstream optics
- Giampiero (JP) Sciutto (AES/IT): Extraordinary effort of upgrading Linux beamline and office machines to RHEL 7.3

- **Service Awards:** 33 in total ranging from 5 to 50 years!

- **Patents Awarded or Filings:** Patents awarded to Emil Trakhtenberg and Jie Liu. Patent filings for Jie Liu, Josh Downey, Jeremy Nudell, Mark Erdmann, Scott Izzo



# APS ACTIVE REPAIRS AND LONG-TERM PLANNING

- Currently addressing critical repairs

- Underground low-temperature heating water supply and return piping replacements (\$0.9M)
- Building 450 ice storage system repairs (\$0.3M)
- Area road repaving (\$0.3M)
- Emergent responses to LOM 431Z flooding and CHW Victaulic elbow bolt failure

- Planning for future repairs

- 500,000 ft<sup>2</sup> of roofing replacement (\$8.0M)
- APS cooling tower repairs (\$2.5M)
- Building 450 hardware control repairs (\$1.9M)
- Siemens Advanced Master Motor System (SAMMS) replacement (\$0.3M)

- Taking advantage of APS-U planned outage to upgrade large systems

- Facility modernization package (~\$15M) to replace large installations such as primary cooling system chillers and temperature control network

Project	Type	\$M	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27
B450 Hardware Controls Upgrade	IGPP	\$1.9		▲	—	▲							
APS Area Facility Modernization	SLI	\$15.0					▲	—	—	▲			
Low Temperature Heating Water Repair	OH	\$0.9	—	▲									
400 Area Roof Replacements	OH	\$8.0			▲	—	—	—	▲				
APS Cooling Tower Repairs	OH	\$2.5					▲	—	▲				
Siemens advanced master motor system (SAMMS) switchgear repairs	OH	\$0.3		▲	—	▲							





# RICHARDSON METAL - 800 AREA

- In 2016, the original APS implementation (in 2000) of the policy concerning radiological release of potentially activated material was deemed overly conservative by a DOE review committee.
- A description of the 800 Area activities AES would undertake was provided to DOE Headquarters and the ASO in August 2016; authorization to proceed was granted in September 2016.
- Materials were sorted, separated, and placed into containers, and re-surveying was commenced in very close cooperation with DOE ASO, the DOE Facility Representative, ESH, ESQ (RSO, HP), FMS, and AES Groups, among others.
  - Safe operations reinforced: personnel protective equipment, pre-job briefings, radiological scans
  - Accurate logs kept of material types, weights, survey results for all waste metal
  - **Approximately 58,000 lbs. of material removed and shipped to recycler**
- Final disposal offsite was started in December 2016; last container removed on January 11, 2017.
- **The process continues to be refined in subsequent shutdowns, as this process will be key in facilitating waste minimization/disposition activities for the APS Upgrade Project.**



Above: Prior storage area in Sealand containers in 800-Area

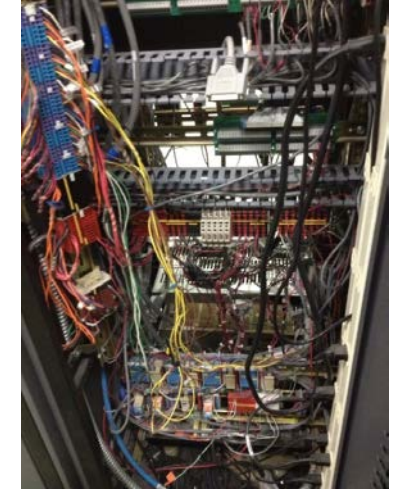
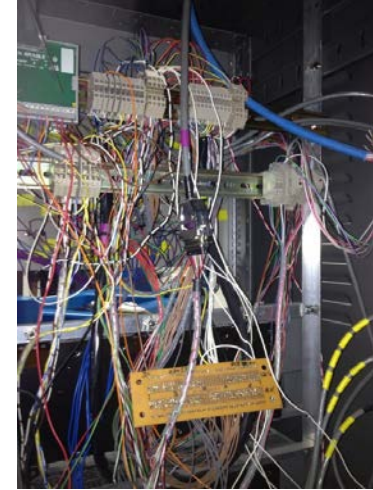
Below: New space in 800-Area for modular containers with roll-up doors



Above: Sorting and separation activity of material removed from accelerator complex

# SAFETY INTERLOCKS: MODERNIZATION AND STANDARDIZATION

- Generation 1 PSS upgrades
  - Completed in 2016 after multi-year project; 44 systems upgraded in total
  - Benefits: 2-3 times shorter validation times, radiation-damaged cables removed, code standardized, intuitive EPICS screens installed, obsolescence addressed
- Designed, built replacement system for beamline 9-BM Beamline Equipment Protection system (BLEPS)
  - Standardized system utilizing latest PLCs, managed obsolescence
  - Process variables (PVs) available for EPICS screens
  - Spares inventory readily available in APS, rather than held by beamline
  - Faster troubleshooting / repair (no reverse engineering)
- Currently updating BLEPS at 4-ID; 9-ID planned for Sept. 2017



*BLEPS control hardware before standardization (above) and after safety interlocks standardization (left)*



# 3D PRINTING APPLICATIONS AND REVERSE ENGINEERING



*Gear box casing for use by XSD*



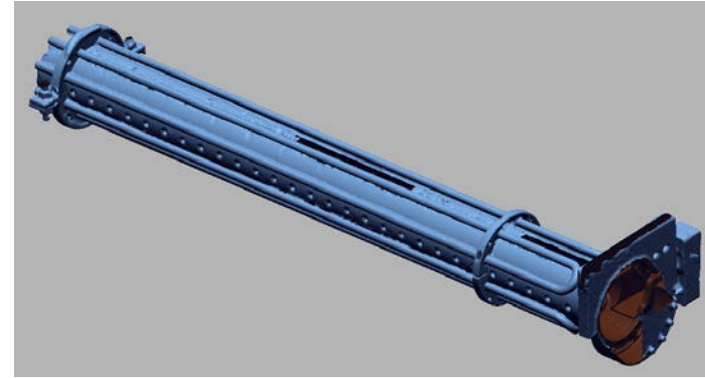
*Window at the end of SAXS chamber (Sector 12), gasket printed integrally to part*



*Collimator piece replacing wire EDM processing with 3D printing*

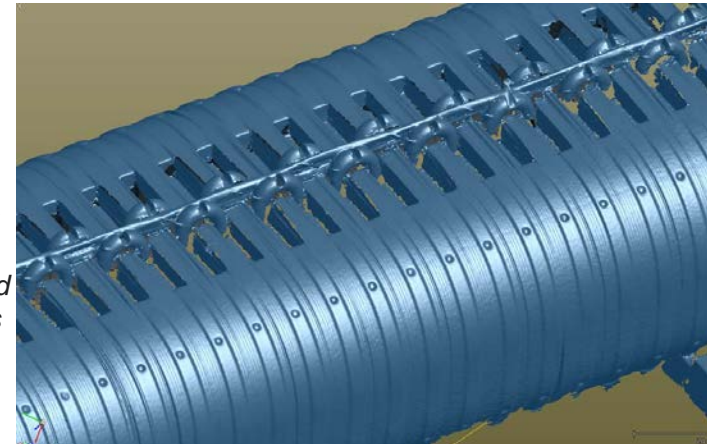


*Sample changer disc for beamlines*



*Accelerating structure scan for ASD*

*SCU coil winding (right), showing variations in winding that could create distortion field (each wire is ~0.5 mm)*



*6-ID hutch*

- AES is providing real-time support to Divisions and users in 3D printing and reverse engineering.



# FY2018 PRIORITIES

# FY2018 PRIORITIES

- **Safety leadership**

- Continue reinforcement of 5 division safety practices
- Impactful observation/conversations

- **Ensuring cost effective operations**

- Addressing obsolescence and reliability, including conventional facilities, standardization where possible
- Continuing robust preventative maintenance cycles
- Group specific objectives

- **Divisional support of APS Upgrade Project**

- AES is majority of matrixed support: FY17 ERA of ~34 FTEs; increase in FY18
- High involvement in milestone activities: FODO plinth move, M4 assembly, Q8 testing, Vacuum sector mock-up, etc.

# FY2018 PRIORITIES

- **Seamless performance on shutdowns as well as larger PSC project efforts**
  - Structured work planning and control through IPECC phases of a project
  - Canting of 4-ID and L1:AS1 structure in Aug/Sept 2017 shutdown (*completed*)
  - Helical SCU installation in Dec 2017/Jan 2018 shutdown
  - FE installation in 28-ID in 2018; Future XTIP (4-ID) and PRISMA support
  - SPP effort for LCLS-II HXR and SXR vacuum chambers
  - APS-U efforts integrated into shutdown plans (e.g. BTX kicker removal in May 2017)



# FY2018 PRIORITIES

## ▪ Continued aspiration towards Centers of Excellence: Operations and Engineering

- Maintain high user availability, downtime ALARA for a large SUF
- Refine obsolescence plans by functional groups
- Promote core process adherence and continuous improvement
  - Transition to common platform in ServiceNow for work request systems, ticketing systems, shutdown planning, project proposal system.
  - Rollover to the Document Management System (DMS); integration of Component Database (CDB)
  - Working group recommendations on the Design Review process and number/type of Safety Committees.

# SUMMARY

- FY17 was an impactful year for AES division in support of accelerator and beamline operations.
- FY18 focuses on priorities around:
  - Safety leadership
  - Cost effective operations
  - Support of the APS Upgrade Project
  - Seamless execution on shutdown tasks and projects
  - Aspiration towards becoming COEs for Operations and Engineering