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The APS Renewal Plan

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Goals of the APS Renewal Plan

- **Improve the stability, maintainability, and performance of the storage ring**
- **Upgrade beamlines with better optics, detectors, control software**
- **Provide more modern infrastructure to support the user science program.**
- **Generate scientific case for a Major Equipment Proposal (MIE)**

Details at: <http://www.aps.anl.gov/Renewal/>

A Rule of Thumb

- The APS has a lifetime of roughly twenty years
- Original cost was of order 1 billion
- Keeping the APS at the cutting edge requires a renewal investment of \$50M/year.

Bringing the APS RF Transmitters into the 21st Century

Present APS RF Transmitter

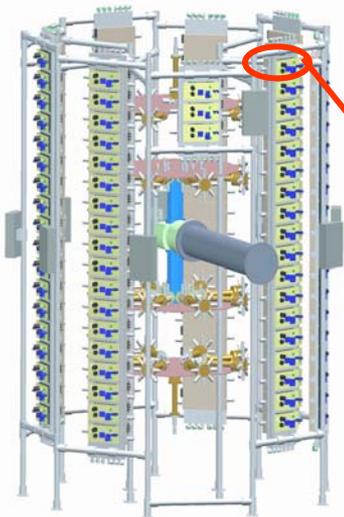


■ Solid-State RF Amplifier Development (R&D)

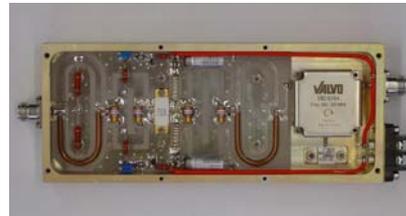
- Present system subject to instabilities
- Not optimized for light sources
- Long-term supply issue and expensive

Proposed APS Renewal/2020 RF Transmitter

200 kW tower



352MHz 330 W Module



352MHz 1 kW Module

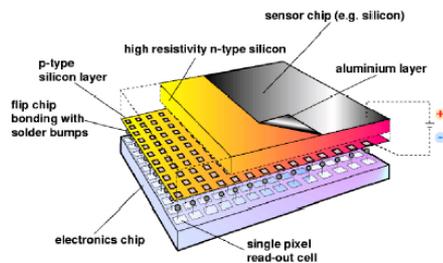
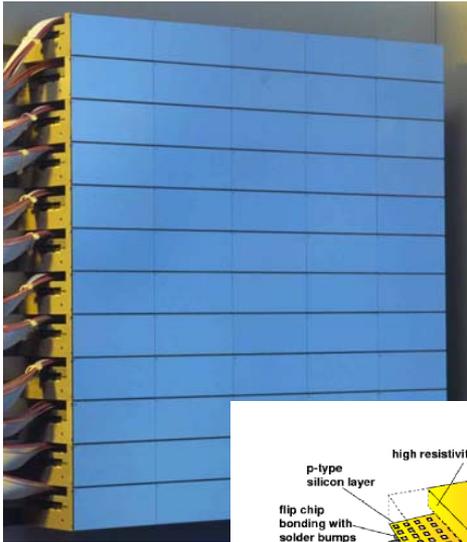


SOLEIL 50 kW tower in operation



Beamline Renewal Proposal Example from the MX CATs

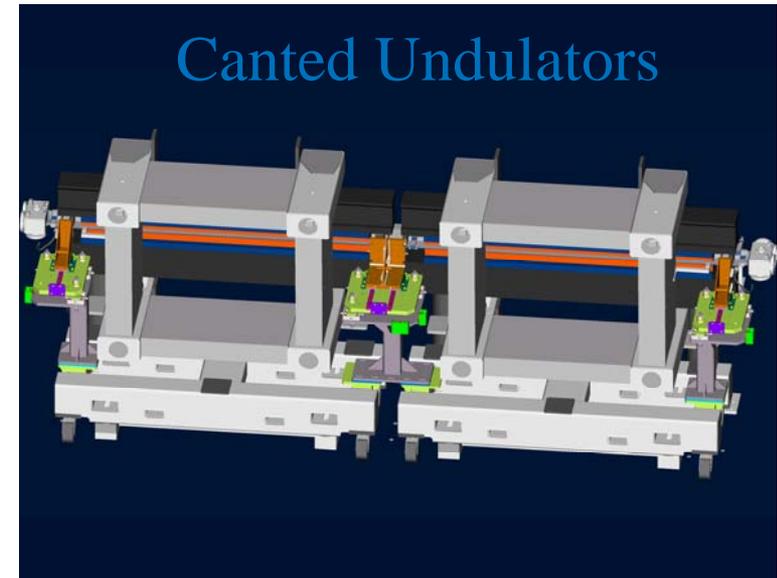
- Beamline renewal proposals covered a wide range of requests, from support of a piece of equipment to an entire beamline.
- Detectors were a frequently mentioned item.



- Support for Pixel Array Detectors (from the MX CATs)
 - Since beamlines at the APS would like to move towards pixel array detectors (PADs), **this proposal requests that the APS define and fund a group to support PAD operations** at the APS
 - APS should **train staff for diagnostics and repair of PADs** and consider the acquisition of a spare PAD modules for enable rapid repair of faulty PAD detectors

Example Renewal Proposal from HP CAT staff

- 10 years experience have revealed clear directions for the future
- At the same time the existing facilities are aging and face steep competition from new facilities in Europe and Asia
- Request:
 - Canted IDs
 - Optimized submicron beam
 - Instrumentation for TR, inelastic, and high resolution diffraction

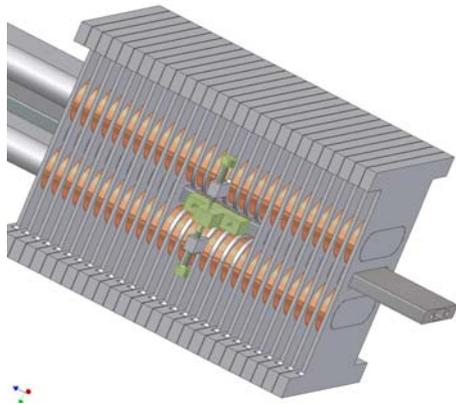


ecompressor are needed to see this picture.

- This proposed upgrade will:
 - Permit advancement to the next generation of HP synchrotron science
 - Optimize the current (mainstream) techniques and develop new ones
 - Help to mitigate the beamtime shortages

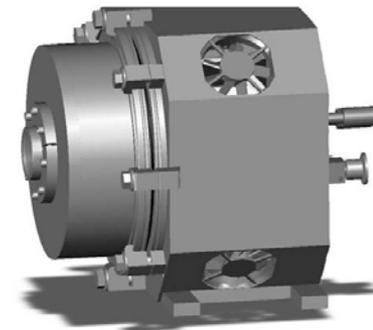
Example of a Beamline Renewal Proposal from XOR Staff

- A dedicated high-energy x-ray beamline for the study of mechanical properties
 - High-energy x-ray scattering techniques can be applied in a variety of ways to study the mechanical properties of materials
 - This proposal will allow us to **explore time scales and spatial resolutions that are currently not possible at the APS - or anywhere else.**
 - Need long straight-section and IDs optimized for 45- 120 keV range
 - Area detectors



Conceptual design for the Nb₃Sn 1.5-cm-period SCU and cryo-system.

QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.



Fast CCD collaboration with LBNL



Current Sector 1 deformation rig

APS Renewal Process

- **Timeline - when does this have to be done?**
- **Organization - who is going to do the work?**
- **Mechanisms for user input - how will user needs and concerns be included?**

Timeline of the APS Renewal Plan

May 28 Solicit science team members, 91 users volunteer

June 16 Select Science Team Chairs

June 20 Organizational meeting of Science Team Chairs

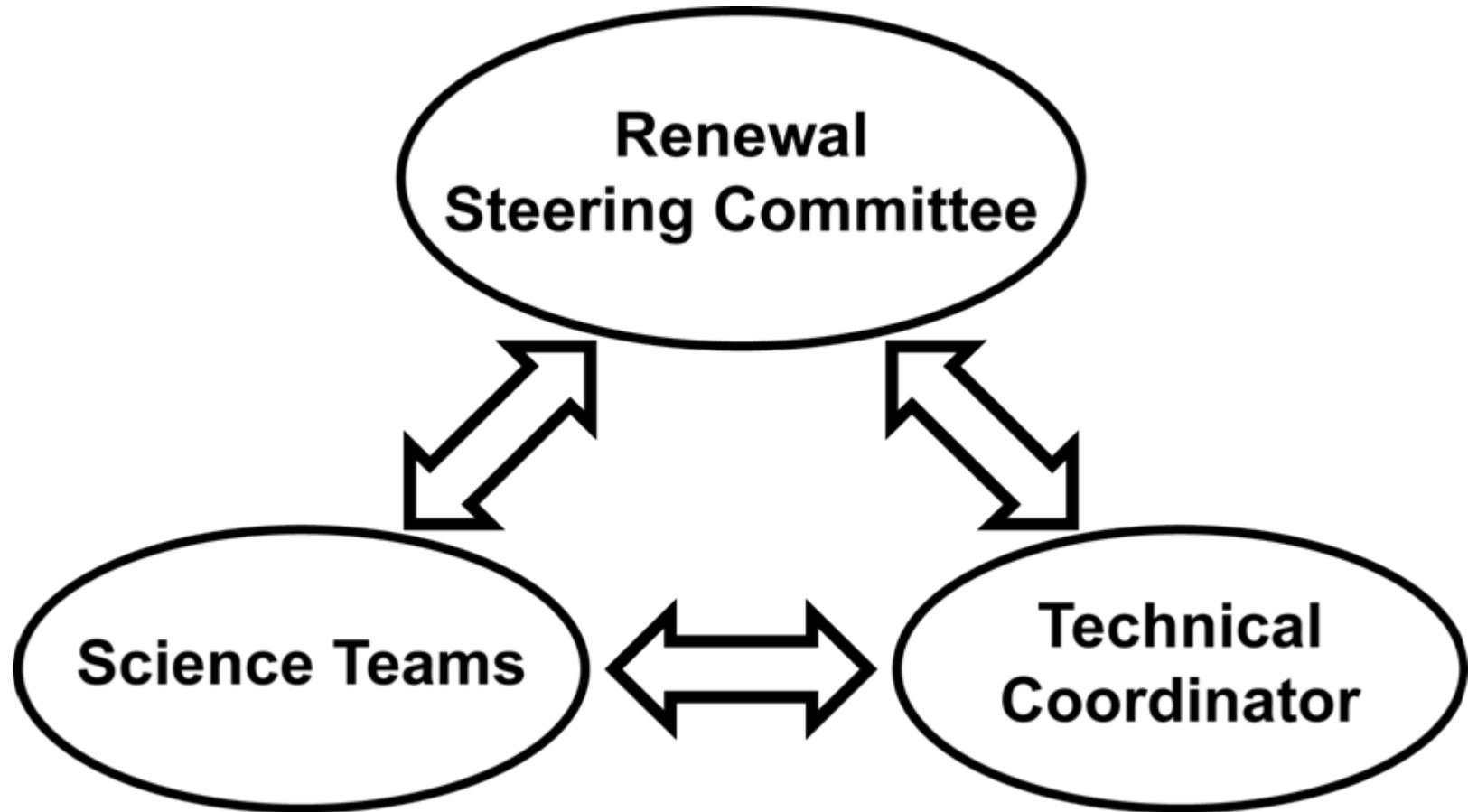
June 27 Announce Science Team Members and Technical Coordinators

Sept. 15 Draft Science Cases due

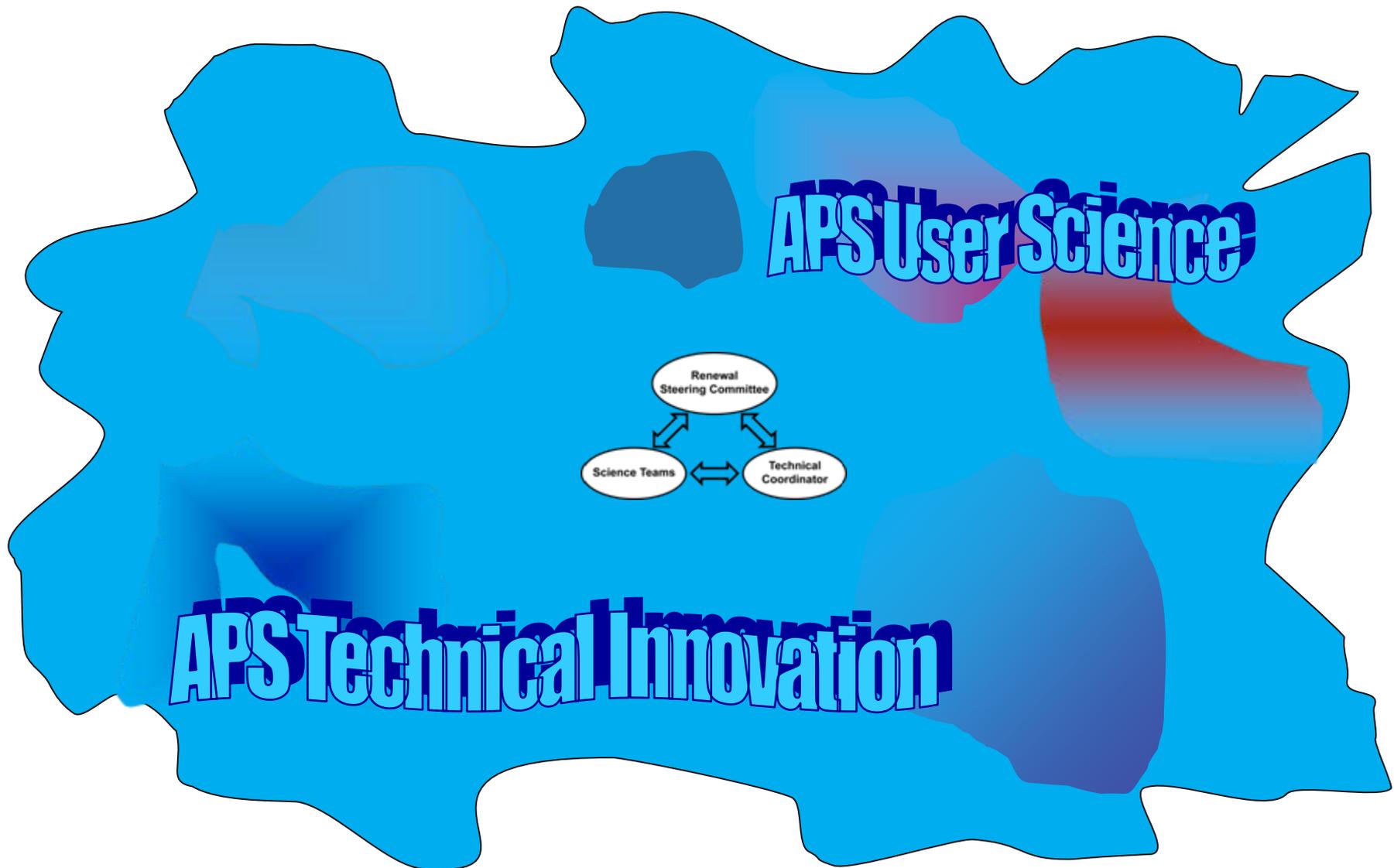
Oct. 21 & 22 APS Renewal Workshop Š discuss draft reports and identify further needs and concerns

Dec. 15 Whitepaper completed

Organization



Capture the Complexity of the APS Community



The APS Renewal Steering Committee

- **Denny Mills** Deputy Director, X-Ray Science
- **Rod Gerig** Deputy Director, Accelerators
- **George Srajer** X-Ray Operation and Research
- **John MacClean** Computer Systems
- **Denis Keane** APS PUC Chair
- **Paul Fuoss** APSUO Representative
- **Bob Fischetti** Life Sciences Council Chair
- **Dan Neumann** APS SAC Representative

APS Renewal Science Teams

Science Area	Chair
■ Atomic, Optical, Molecular, and Chemical Science	— Stuart Rice University of Chicago
■ Biology	— Lee Makowski Argonne National Laboratory
■ Condensed Matter and Materials Physics	— Sam Bader Argonne National Laboratory
■ Engineering Applications/Applied Science	— Gene Ice Oak Ridge National Laboratory
■ Geological, Environmental, and Planetary Sciences	— Neal Sturchio University of Illinois, Chicago
■ Macromolecular Crystallography (MX)	— Anthony Kossiakoff University of Chicago
■ Materials Science and Technology	— Paul Evans University of Wisconsin
■ Polymers and Soft Materials	— Invitation extended
■ Surfaces, Interfaces, and/or Thin Films	— Paul Fenter Argonne National Laboratory

APS Renewal Technical Coordinators

Beamline Techniques

Spectroscopy (EXAFS, XANES)	Matt Newville (GSE CARS)
High Pressure	Guoyin Shen (HP CAT)
High Energy	Dean Haeffner (XSD)
Time-resolved	Eric Dufresne (XSD)
Inelastic	Thomas Gog (XSD)
Nuclear Resonant Scattering	Ercan Alp (XSD)
SAXS	Byeongdu Lee (XSD)
Microprobe	Jorg Maser (XSD)
Full field imaging	Wah-Keat Lee (XSD)
MX	Craig Ogata (Bioscience ANL)
Powder diffraction	Brian Toby (XSD)
Magnetic scattering	Jonathan Lang (XSD)
Coherence	Ian McNulty (XSD)

APS Renewal Technical Coordinators

Technical Support

Optics	Tom Toellner (XSD)
Detectors	Steve Ross (AES)
Beamline controls	Mark Rivers (GSE CARS)
Scientific software	Peter Jemian (AES)
Nanopositioning	Deming Shu (XSD)

Behind the Shield Wall

IDs	Liz Moog (ASD)
Fronts Ends	Patrick den Hartog (AES)
Beam Stability	Glenn Decker (ASD)
Accelerator Operations	Michael Borland (ASD)

Facility

Infrastructure	John Maclean (AES)
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Charge to the Science Teams

Members of the Science Teams are charged with developing the scientific case (for their respective areas) that will be the basis for a five year APS renewal proposal to the DOE. The scientific case should clearly define how upgrades to beamlines (optics, detectors, insertion devices, end-station instrumentation and software) and the facility will enable the science to progress and how that progression will impact the field. The APS management has already called for renewal proposals from beamline scientists that describe how those renewals will enhance the capabilities of various beamlines and/or techniques. The Science Teams should select, consolidate and optimize those proposals (and/or develop/call for new proposals, if necessary) that support their scientific cases and outline how the renewal will position APS to enable high impact science.

The Chair(s) of the Science Teams will organize and lead the development of the scientific case. Members of the Science Teams have accepted responsibility to gather information from the community and prepare the report. The Science Teams will consult with other experts in the field and with the Technique Coordinators.

Charge to the Science Teams (continued)

Technique Coordinators

Technique Coordinators (experts in relevant techniques or instruments) will facilitate the identification of specific techniques that are important to each scientific discipline and, in particular, across disciplines. The Technique Coordinators will work with the Science Teams to develop a strategy for instruments that are required to enable high impact science.

Long-Term Considerations

Although the goal of the Medium Term Renewal is to develop the case for a medium term (5 year) renewal of the beamlines, the Teams should also keep in mind what sort of larger, longer term upgrade of the entire APS facility would further enhance their area of science.

Hearing the Users

- **Send us ideas, the more the better**
- **Talk to the Science Teams**
- **Participate in the Workshop**

Most importantly

- **TELL US WHAT ARE WE MISSING!!**

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