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Science Enabled by the Advanced Photon Source Upgrade[1]

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The Advanced Photon Source (APS) at Argonne National Laboratory is embarking on a major Upgrade that will significantly enhance capabilities for research using high brilliance, high energy synchrotron x-ray beams. The APS is a DOE Office of Science user facility that provides access to x-ray scattering, spectroscopy, and imaging instruments through an open, peer-reviewed proposal process. Currently 64 simultaneously operating beamlines are used by more than 4000 researchers each year across the full range of science and technology fields. The APS Upgrade project will provide major improvements to the x-ray sources as well as more than a dozen new or upgraded beamlines. Key areas of emphasis are using penetrating, high energy x-rays for atomic-scale studies of real materials in real time under real conditions, imaging of hierarchical structures on length scales from millimeters to nanometers, and ultrafast studies of chemical and physical processes on time scales down to picoseconds. I will illustrate the science enabled by the APS Upgrade using examples such as developing synthesis of new materials with outstanding properties and probing picosecond dynamics in energy conversion systems.

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