

## **Lower Monumental U1 Linkage**

The Lower Monumental Dam has six generating units with an installed capacity of 932 MW. The turbine runners are Kaplan (adjustable blade) runners of the Baldwin-Lima-Hamilton (BLH) design. An inherent design flaw in the turbine blade linkages can cause them to shear, resulting in the blade separating from the operating linkage. This happened to U1 in 2005, resulting in discharge ring damage. The short-term repair has been to block the blades in a fixed position and operate the unit in a last-on/first-off manner. Fixing the blades tends to result in more cavitation damage to the unit, a greater hazard for fish passage and less effective fish attraction.

This project will restore the U1 turbine runner to its original design capability by replacing the existing linkage pins with new and correct linkage pins. Since that work involves removal and partial disassembly of the unit, it is prudent to upgrade various mechanical components including bearings, coolers, and servomotors and refurbish the wicket gate mechanism at the same time.

It is also an opportune time to address issues with the generator. A Hydropower Analysis Center study established that original windings should be replaced before failure for economic reasons. This winding is original and has surpassed its design service life. Similar windings of this manufacturer and vintage have experienced sudden failures. A DC ramp test performed on the winding in July of 2013 indicated increased leakage currents. This is consistent with deterioration of the aging insulation system. Given these issues, this project will also replace the generator winding and core.