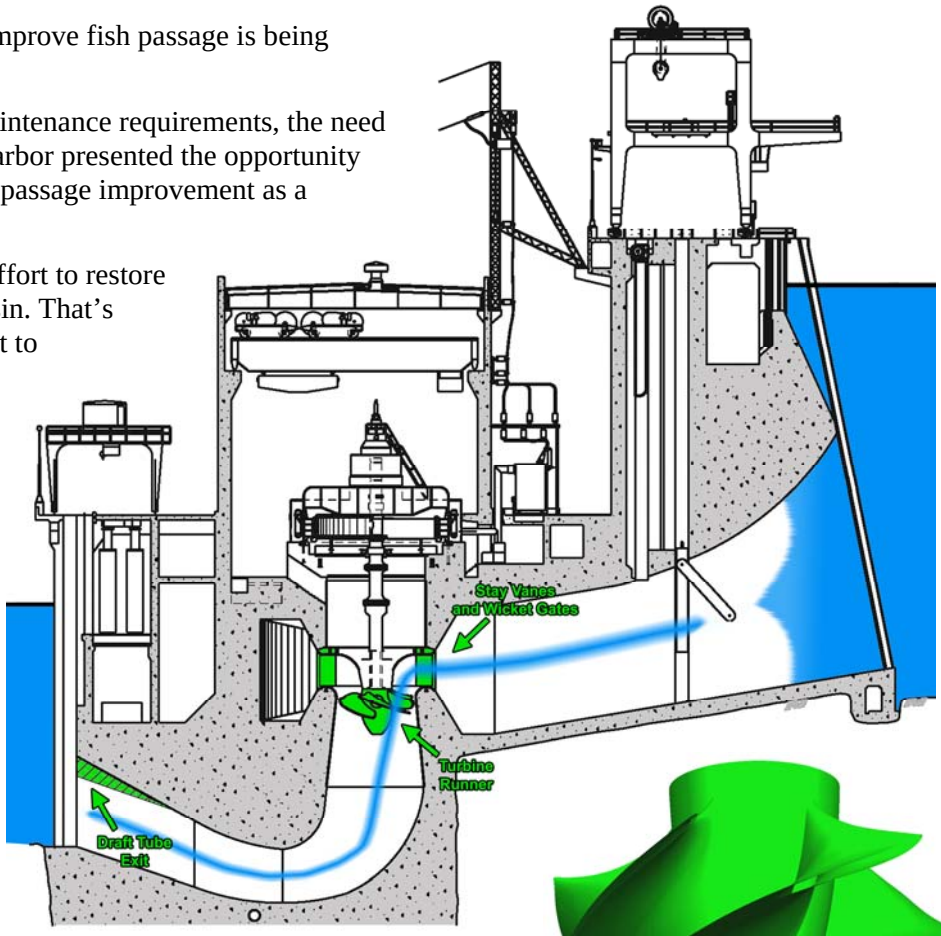
New Turbines Improve Fish Passage

U.S. ARMY CORPS OF ENGINEERS **BUILDING STRONG®**

An advanced-technology turbine designed to improve fish passage is being installed at Ice Harbor Dam.

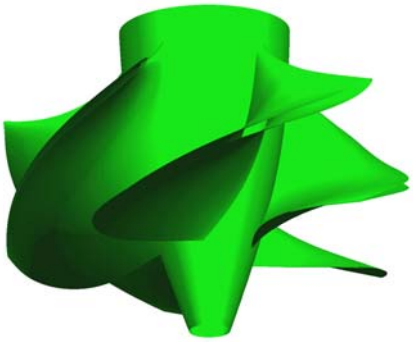
"After 50 years of operation and increasing maintenance requirements, the need to replace the existing turbine runners at Ice Harbor presented the opportunity to pursue new turbine runner designs with fish passage improvement as a priority," said Kevin Crum, project manager.

And every opportunity counts in the regional effort to restore vibrant salmon runs in the Columbia River Basin. That's why three federal agencies are leading a project to improve the design of hydroelectric turbines in Northwest dams to improve survival for future generations of fish.



With a trio of 1961-vintage hydroelectric turbines approaching the end of their useful life at Ice Harbor Lock and Dam, the Bonneville Power Administration and U.S. Army Corps of Engineers recognized a window of opportunity to improve passage conditions for fish. Ice Harbor Lock and Dam, on the Snake River near Pasco, Wash., has proven to be a valuable site for developing technical innovations aimed at raising survival rates of endangered and threatened fish in the region.

The $58 million project, funded by BPA, calls for runner replacements on two turbines -- one fixed-blade, one adjustable --along with fish passageway improvements at Ice Harbor over the next few years.

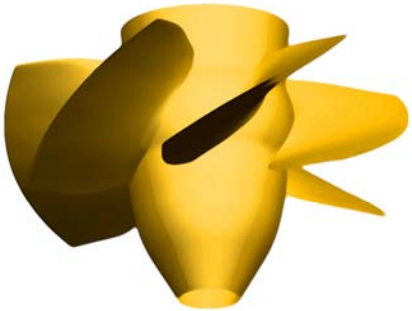


Advanced-design Fixed-blade Runner

Corps project managers anticipate the first turbine will be operational in 2017. The work includes structural modifications to the turbine stay vanes, wicket gates and draft tube exits to improve hydraulic conditions for fish. The contracts also contain options to fabricate and install a third turbine runner.

The turbine design and installation is a collaboration between contractor, Voith Hydro Inc. of York, Pa., the U.S. Army Corps of Engineers, the Bonneville Power Administration and NOAA Fisheries. Small-scale model testing of the new fixed-blade runner design indicates it may also increase power generation by 3 to 4 percent.

The project partners went through multiple design cycles prior to the fabrication stage, using advanced computer modeling as well as tests with physical models to examine water flow and pressures throughout the turbine environment.



Kaplan-style Existing Runner

"The design process combined Corps expertise in physical hydraulic modeling and understanding of fish passage through turbines, BPA's hydropower technical input, NOAA's knowledge regarding anadromous fish biology, with Voith's industry expertise in design of large-scale hydro-turbines to develop a new turbine runner that will reduce risk of injury to juvenile salmon," said Martin Ahmann, Corps hydraulic engineer.

The first of these unique designs – a fixed-blade runner – was assembled at the dam for installation into Unit 2. Installation is a complex process, likely to take about 12 to 14 months. The second style of runner – an adjustable-blade design -- is in development and slated to replace Unit 3 in 2018.

Both types of turbine runners are fabricated with stainless steel blades, which better resists pitting and corrosion caused by water forces than the original, less-resistant steel turbines. Corps operations officials anticipate the better material will help reduce maintenance costs, along with improving conditions for fish that pass through the turbine area.

Post-installation testing is expected to improve understanding of fish passage through the turbine environment. The benefits of exploring new turbine designs could eventually extend beyond Ice Harbor, to replace aging infrastructure at other Columbia and Snake river dams.

The latest monitoring shows that less than 10 percent of all migrating juvenile salmon and steelhead pass through turbines on the Snake river, depending on the dam and the species of fish. At Ice Harbor, that number is between 0.5 to 8.6 percent.

Researchers collect hydraulic data from a scale model of the new Ice Harbor Dam turbine at the U.S. Army Corps of Engineers' Engineering Research and Development Center in Vicksburg, Mississippi. The turbine model is about 1 foot wide; the actual turbine is about 23 feet in diameter.

Most out-migrating fish use surface passage, such as spillway weirs, on their way to the ocean. About 93 to 96 percent of all young salmon and steelhead now survive passage at each dam in the Federal Columbia River Power System.

For more information about the Ice Harbor turbine runner design and other programs to benefit Columbia River salmon and steelhead, please visit the Walla Walla District's website www.nww.usace.army.mil and www.salmonrecovery.gov.

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