

Water Power Technologies

The ORNL Water Power Technologies interdisciplinary research team addresses technical issues related to both developed and emergent hydropower technologies.

Hydropower Advancement Project (HAP)

- Apply systematic assessment to existing hydropower facilities against best practices to lower cost and return on investment uncertainty of operations improvement and equipment upgrades. These activities are aimed at increasing hydropower capacity, efficiency, and environmental performance at existing power plants.

National Asset and Resource Assessment

- Assess the condition and performance of all U.S. federal and non-federal hydropower plants, equipment, dams, diversions, reservoirs, non-powered dams, pumped-storage facilities and connectivity in river basins. Evaluate potential for increased power production facilities to non-powered dams, and adding new pumped storage hydro to the existing US fleet.



Environmental Studies

- *Conventional Hydropower* - investigate stresses that cause fish mortality during downstream passage through dams, reservoirs and turbines, identify environmentally effective and power-efficient instream flow releases, and quantifying the amounts of greenhouse gases (GHG) emitted by hydropower reservoirs in the U.S.
- *Marine and Hydrokinetics Turbine studies* - examine effects of these new dam-free hydropower technologies on aquatic organisms and their habitats. Investigate stress and mortality to fish from turbines and electromagnetic exposure in the marine and estuarine environments.
- *Climate Change* - from projected change in climate and their influences on reservoir inflows, investigate hydrologic variability of rainfall, stream flow and water availability.

Water Optimization

- Develop an integrated set of models and approaches for optimizing the operational efficiency and environmental performance of hydroelectric power plants.

Grid Services

- Evaluating the value of hydropower resources to the grid through examining the power system (market and reliability) needs and the constraint on hydropower resources in providing these services to the grid.

Marine and Hydrokinetic Technologies Research and Development

- Expertise in laboratory and field measurements, post-processing and analysis of bulk and mean flow properties of turbulent flows for machine inflow characterization, computational fluid dynamics (CFD) model boundary conditions, and CFD model validation.
- Development of reference models for hydrokinetic resources, including hydraulic properties of resource, hydrodynamic loads, power density, annual energy production, and morphological and ecosystem properties.

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