

## Water Power Technologies

Oak Ridge National Laboratory (ORNL) supports the Department of Energy's mission to research, test, evaluate, develop, and demonstrate deployment of innovative technologies capable of generating renewable, environmentally responsible, and cost-effective energy from water resources. ORNL supports hydropower research, technology development, deployment, and market acceleration.

## Research, Development and Deployment

The National Hydropower Asset Assessment Program

(<http://nhaap.ornl.gov>) is an integrated research effort to advance sustainable hydroelectricity generation and water management.

- The NHAAP New Stream-reach Development (NSD) project uses an innovative geographic approach to analyze the potential for new hydropower development in U.S. stream segments that do not currently have hydroelectric facilities.
- The NHAAP Environmental Attribution constitutes a geospatial framework that categories GIS data from multiple sources into broad groups representing ecological, geopolitical, socioeconomic and landscape issues. The framework is used to identify environmental concerns related to hydropower construction and operation.

The Annual Hydropower Market and Trends Report (HMR) will provide data on the hydropower fleet, development activity, supply chain, and hydropower performance with a breadth and depth that no other public source currently offers.

Collaborations with other agencies, including the Bureau of Reclamation and US Army Corps of Engineers, are focused on advanced water quality modeling on the Cumberland River in Kentucky and Tennessee for opportunities to maximize energy production while minimizing environmental impacts. Researchers are also working on a tool to predict total dissolved gas concentrations below hydropower dams in the Columbia River Basin to protect aquatic life.

ORNL is providing an assessment of the effects of climate change on water availability for federal hydropower and on marketing of hydropower by the federal Power Marketing Administrations



(PMAs), as required under the SECURE Water Act of 2009 (Public Law 111-11) producing a new understanding of future hydroelectric generation from federal facilities by increased understanding the role of climate variability and change.

Collaborating with the Hydropower Industry, the Hydropower Cost Model is being developed to address current gaps and needs for hydropower cost estimates to provide the DOE Water Power Program with an initial analytical basis for planning R&D strategy by acquiring and compiling cost data and developing cost-related modeling tools.

## Market Acceleration

Market acceleration includes research on hydropower environmental impacts. ORNL is developing tools, methods, and information sets that will assist industry and other stakeholders in the development of environmental flows that can maximize power production to the extent possible while at the same time ensuring acceptable environmental protection.

Fish passage research focuses on refining our understanding of hydropower and hydrokinetic turbine and reservoir passage stresses and predicting the responses of a wide range of fish species to those stresses.

Research is being performed on behavioral responses of aquatic life to electromagnetic fields, potential toxicity of protective coatings, and acoustic disturbance are researched as riverine hydrokinetic devices are considered for permit and launch into US waterways.

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## Contact

**Brennan T. Smith**  
Energy-Water  
Resource Systems  
865-241-5160  
[smithbt@ornl.gov](mailto:smithbt@ornl.gov)