



“Using data synthesis, analysis, and visualization, we create comprehensive resources that detail the trends shaping the hydropower industry.”

Rocio Uria Martinez,  
Hydropower Economist



## Innovations in Water Power Technologies

Hydropower currently accounts for 6% of total electricity generation and is the largest source of renewable energy and utility-scale energy storage in the country. With millions of miles of rivers and lakes across the nation, there is great potential to increase renewable energy production through water power technologies. Oak Ridge National Laboratory (ORNL) research and development activities are focused on lowering the costs of hydropower, enhancing hydropower’s contributions to the resiliency and reliability of the nation’s electric power grid, and studying ways to reduce environmental impacts and improve the regulatory process for hydropower.

### Research and Development

ORNL’s water power technologies research focuses on cost reduction and performance improvement to increase power generation at existing hydropower facilities and accelerate sustainable implementation of new facilities. These research efforts leverage key ORNL strengths in data analytics, high-performance computing, materials science, environmental science, and advanced manufacturing. Focus areas include the following.

**Decision-making tools**—Providing tools and technologies to assist with design and real-time optimization of hydropower generation that reduces costs and increases efficiency.

**Data analytics and modeling**—Generating key data and models that enable new research and development and improve the operations, value, and sustainability of entire fleets of hydropower facilities.

**Early-stage technologies**—Developing new composite turbine designs, floating membrane reservoirs, and pumped-storage technologies to accelerate the growth of US hydropower generation.

*3D printed turbine*



**ASSESSING**  
hydropower resources  
across the nation



**INFORMING**  
with authoritative  
analyses and tools



**DEVELOPING**  
scalable modular  
technologies



**ADVANCING**  
the state of the art  
with industry



**ENABLING**  
new hydropower  
development

## Recent Impacts

**National Hydropower Map**—Showcasing hydropower resources across the country.

**Standard Modular Hydropower**—Advancing ecologically compatible, cost-optimized technology designs for small-footprint hydropower generation.

**Classification Tools**—Providing easy access to key information about national streams and potential new hydropower sites.

**Hydropower Fleet Intelligence**—Enabling hydropower owners to benchmark cost, reliability, and equipment, driving continuous improvement.

**Hydropower Market Report**—Offering a comprehensive picture of trends shaping the industry.

**Additive Manufacturing**—Exploring innovative hydropower technologies with cost reduction potential in collaboration with industry.

**Energy Storage**—Using water to store energy with high efficiency through pumped-storage technologies.

**HydroWise**—Hosting data, tools, and research from across the national laboratory system.



*Low-cost energy storage system powered by water*

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