



## Hydropower Program Overview

**Tim Welch**

Hydropower Program Manager

Timothy.Welch@EE.Doe.Gov | (202)-586-7055

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- Who are we? How can we help?
- Executive Summit for Hydropower R&D
  - What did we hear?
- R&D Projects of Interest
- DOE's Hydropower Vision – The Roadmap
- Request for Information (RFI)

## HYDROPOWER PROGRAM: KEY ROLES

- Invest in **technologies and systems** to reduce costs and unlock new resources
- Develop **tools for industry** to make designs and operations more efficient
- Supply **information and analysis** to identify market opportunities, inform permitting and deployment



- The DOE Hydropower Program develops technological advances, provides information and analyses, and creates tools that help **reduce costs** associated with:
  - **Development of non-powered dams and new pumped storage**
  - **Operations of small hydro**
  - **The FERC licensing process**
  - **Meeting regulatory requirements**
  - **Project operations and maintenance**
  - **New stream reach development**



- Held in Washington, DC in May 2017
- 75 representatives for all aspects of hydropower industry
- 4 topical panels with representatives from industry, DOE, and national laboratories
  - Industry expressed R&D needs
  - National Labs presented capabilities
  - DOE added strategic vision

- Modelling and quantifying inertia and value of flexibility
  - Hydropower Value Study; PSH Techno-Economic Analysis

- Modelling and quantifying inertia and flexibility
- Alternative technologies for fish passage

- **Fish Passage Solutions at Hydropower Dams – Funding Opportunity**
- 29 proposals currently under review
  - Funding for research on **innovative upstream and downstream solutions to provide effective fish passage** through hydropower dams, **while reducing construction and operation costs**
  - Funded research will provide basic information and data on:
    - **New innovative technologies** that can utilize advanced manufacturing technologies;
    - encourage **advances in detection, sorting, and counting** techniques that can be applied to fish passage structures;
    - and support **improvements in fish guidance and attraction** to optimize passage

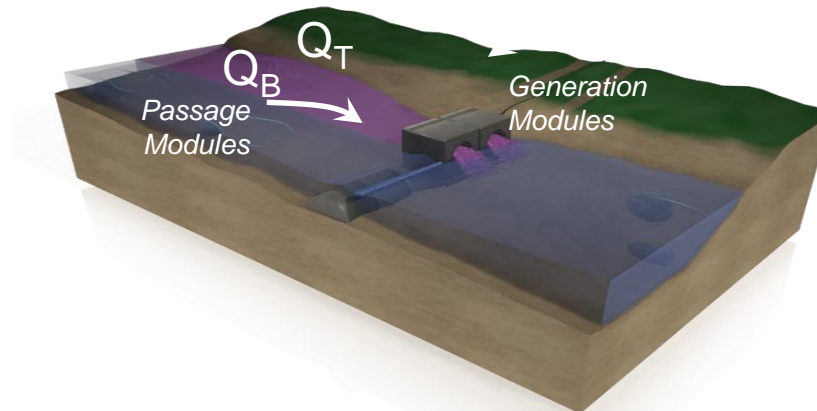




- Modelling and quantifying inertia and flexibility
- Alternative technologies for fish passage
- Development of small hydropower

## Standard Modular Hydropower Technology Acceleration

- Lab: ORNL
  - Create new design criteria to define a new class of standard modular hydropower technology that will deploy at significantly reduced cost, with a smaller physical and environmental footprint
  - Lower cost through **modularity**
  - Ease of permitting from **standardization**
  - **Considers stream functionality** that will increase the **likelihood of greater stakeholder acceptance** than conventional hydropower technology; potentially shortening the regulatory process



- Modelling and quantifying inertia and flexibility
- Alternative technologies for fish passage
- Development of small hydropower
- Integration of small hydropower for grid services

## Integrated Hydropower Storage Systems

- Labs: INL, ANL, NREL
  - Investigate and demonstrate the potential to combine **run-of-river hydropower plants with an energy storage system** to participate in ancillary service markets
  - Developing power systems technology that will **pair a series of small hydro projects with storage systems** such as batteries, flywheels, and supercapacitors
  - **A series of small hydro projects can act as a large hydro project**
  - Added value to grid from additional ancillary services for small projects



- Modelling and quantifying inertia and flexibility
- Alternative technologies for fish passage
- Development of small hydropower
- Integration of small hydropower for grid services
- Machine condition monitoring

## Hydropower Fleet Intelligence

- Labs: ORNL
  - Hydropower Fleet Intelligence (HFI) is an **industry-wide analysis to identify patterns, trends, and relationships** between unit configuration, O&M costs, equipment condition, dispatch history, and other asset data
  - This capability allows hydropower asset managers to use industry data (**machine condition, reliability, and cost**) and predictive models to make better and **more cost effective decisions** with respect to operation and maintenance
  - HFI efforts also include:
    - Research on the **impact of flexible dispatch** of hydropower projects on O&M

- The DOE Hydropower Vision report - July 2016
  - **64 Action Items**
- Now DOE is investigating what **progress the hydropower community has made** against the Vision Roadmap by:
  - **Cataloguing in a database** the efforts of a group of key organizations funding and/or performing R&D.
  - Using that database of hydropower community activities to **assess the gaps and redundancies** against the actions recommended in the Roadmap.
  - **Engaging the hydropower community** to review progress, make recommendations, and help incorporate new information.
- DOE will communicate its findings by the end of the year, but until then look for updates at **Waterpower Week and HydroVision**

## RFI: Expanding Hydropower and Pumped Storage's Contribution to Grid Resiliency and Reliability (DE-FOA-0001886)

Example questions:

- How are **hydropower operations and maintenance (O&M) and capital budgeting practices** informed by changing system conditions?
- Are there **gaps in resource or transmission planning and operational models** that limit effective characterization of hydropower performance and economic optimization? Are these gaps data-driven, computational, or an inherent limitation of the modeling approach?
- Are there **innovative aspects of international pumped storage** or hydropower development – for example, planning approaches, business models, or research programs – that are important to consider for these research efforts?

<https://eere-exchange.energy.gov/default.aspx#Foaldc7e629f0-7127-43df-a13b-6a5da7a38b3a>



# Hydropower Program Project Update

## Ways to Learn More



- **New website for all DOE water power-related resources, all in one location**
- Information is sourced from industry and five national laboratories: Argonne National Laboratory, Idaho National Laboratory, National Renewable Energy Laboratory, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory
- Four main categories for fast data access:
  - Infrastructure
  - Environmental, Sustainability, Regulatory
  - Technology Development
  - Markets and Values
- For More Information: [hydrowise.ornl.gov](http://hydrowise.ornl.gov)



### Data

Review comprehensive facts and statistics for reference and analysis.



### Tools & Maps

Choose from a variety of research tools and maps related to hydropower technology development, hydropower facilities, and other U.S. resources.



### Publications

Locate hydropower research publications from the Energy Department's national laboratories and search by location, theme, and topic.



### Projects

Research hydropower projects to see progress related to infrastructure, technology development, and analytics across the nation.



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