

water

U.S. Department of Energy's Hydropower Program Overview

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Sustainability in Hydropower Conference 2023

June 15, 2023

Outline

- Water Power Technologies Office
 - **Hydropower Program Overview**
 - Environmental R&D for Sustainability
 - US Hydropower trends
- US Clean Energy Priorities and Resources
- Where we are going



About the U.S. Department of Energy (DOE)



The **mission of the U.S. Department of energy** is to ensure America's security and prosperity by addressing its **energy**, **environmental** and **nuclear** challenges through transformative science and technology solutions.



Energy

Catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in energy technologies.



Science and Innovation

Maintain a vibrant U.S. effort in science and engineering as a cornerstone of our economic prosperity with clear leadership in strategic areas.



Nuclear Safety and Security

Enhance nuclear security through defense, nonproliferation, and environmental efforts.

Water Power Technologies Office (WPTO) Overview - Programs



WPTO enables research, development, and testing of emerging technologies to advance **marine energy** and next-generation **hydropower** and **pumped storage** systems for a flexible, reliable grid



Hydropower Program



Marine Energy Program

Water Power Matters at All Scales



Watts:

enable a persistent power source to understand the ocean, by powering observing buoys, monitoring for the environment



Kilowatts:

develop deployable systems to provide clean water, power aquaculture, and powering remote communities



Megawatts:

deploy and demonstrate water powered systems for local grids, remote communities, powering dams and agriculture



Gigawatts:

deploy and demonstrate seasonal storage, enhance hydro grid flexibility, demonstrate new water power systems

All scales require technical and financial assistance, testing infrastructure, user-centric designs, and a robust innovation ecosystem.

Hydropower in the US



The 2020 National Hydropower Map

A Visualization of the Geospatial Distribution and Characteristics of Operational Hydropower Plants in the United States in 2020.

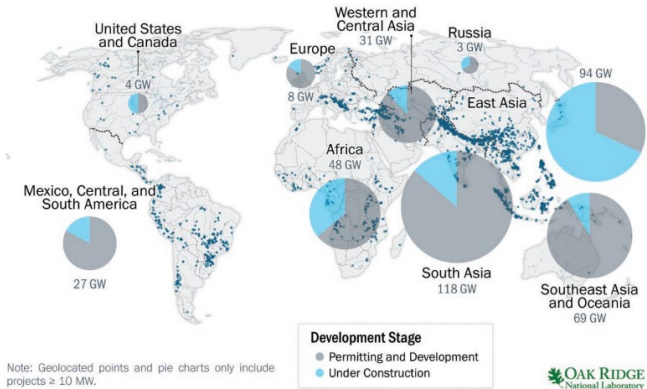
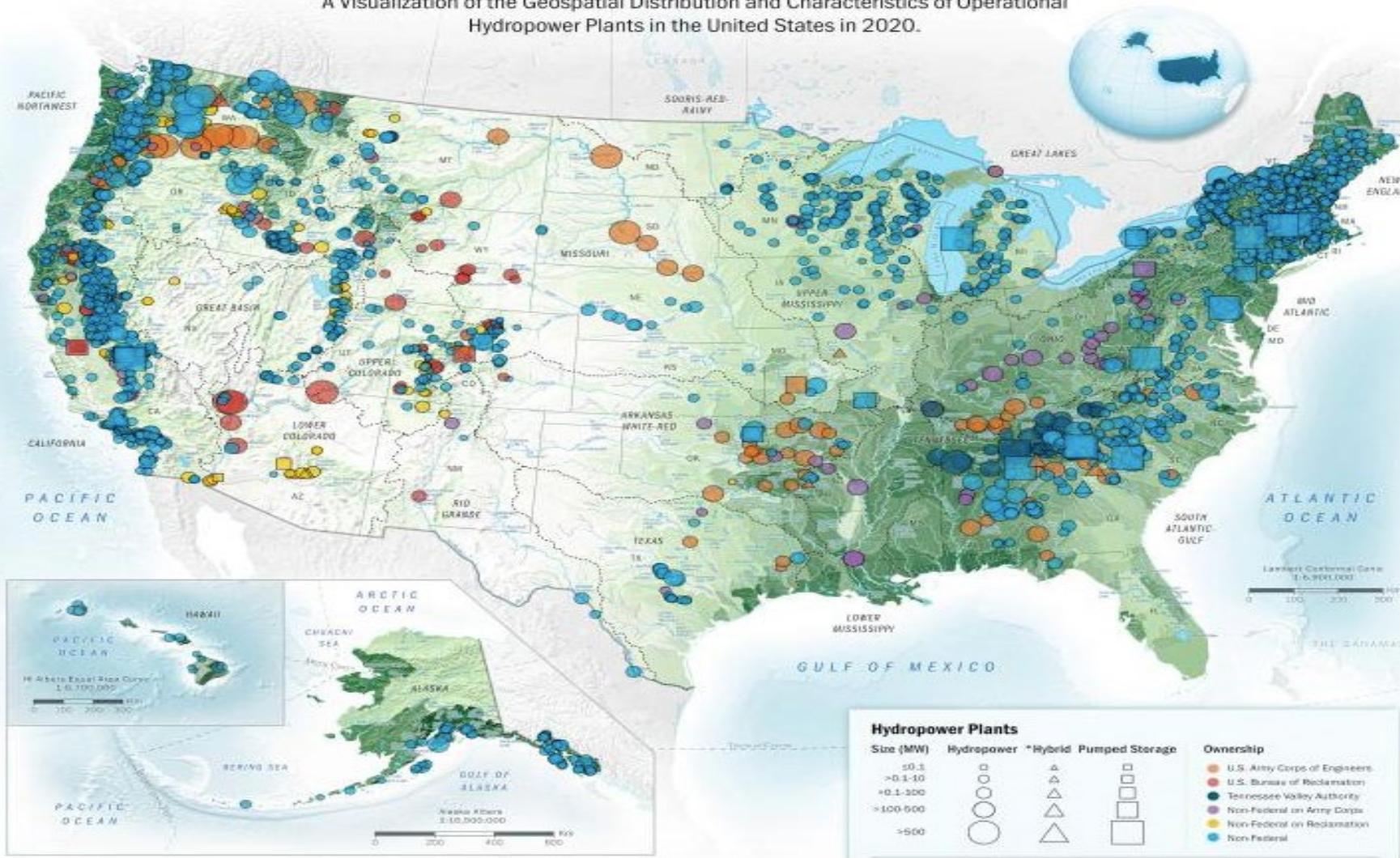


Figure ES-7. Map of hydropower project development pipeline by region and development stage
 Source: IIR, FERC
 Note: Each point represents an individual project. The "under construction" category includes projects that have completed the permitting process and secured financing but have not yet broken ground.

Global: 4,545 projects with a total capacity of 414 GW (2019)

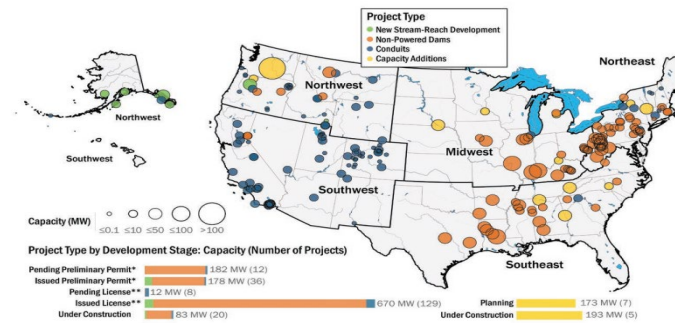


Figure ES-4. Hydropower project development pipeline by project type, region, size, and development stage (as of December 31, 2019)
 Sources: FERC eLibrary, U.S. Bureau of Reclamation (Reclamation) LOPP database, Industrial Info Resources (IIR), web searches

US: Capacity additions, conduits, non-powered dams, & new hydro in Alaska

Hydropower Program R&D Focus Areas

INNOVATIONS FOR LOW-IMPACT HYDROPOWER GROWTH	GRID RELIABILITY, RESILIENCE, AND INTEGRATION (HYDROWIRES)	FLEET MODERNIZATION, MAINTENANCE, AND CYBERSECURITY
Develop, test, and validate cost-effective, sustainable technologies for non-conventional hydropower applications in new-stream reaches, NPDs, and conduits.	Understand, enable, and improve hydropower and PSH's contributions to reliability, resilience, and integration in a rapidly evolving electricity system.	Develop digitalization, maintenance, and cybersecurity tools and capabilities to enable data-driven decision making, improve system reliability and reduce costs; and enhance infrastructure security.
ENVIRONMENTAL AND HYDROLOGIC SYSTEMS SCIENCE		
Research and develop new technologies to better characterize river systems and evaluate potential impacts; avoid, minimize, or mitigate environmental impacts; and improve understanding of various hydrologic risks and uncertainty.		
DATA ACCESS, ANALYTICS, AND WORKFORCE DEVELOPMENT		
Improve access to relevant hydropower, river, and water information—including hydropower educational and training materials—and develop analytical tools to explore opportunities and weigh potential trade-offs across multiple objectives at basin-scales.		

Research Area Themes

Environmental R&D

Monitoring Technologies

Avoid, Minimize, Mitigate
Environmental Impacts

Environmental Metrics

Hydrologic Systems Science

Climate Change and
Hydrologic Science

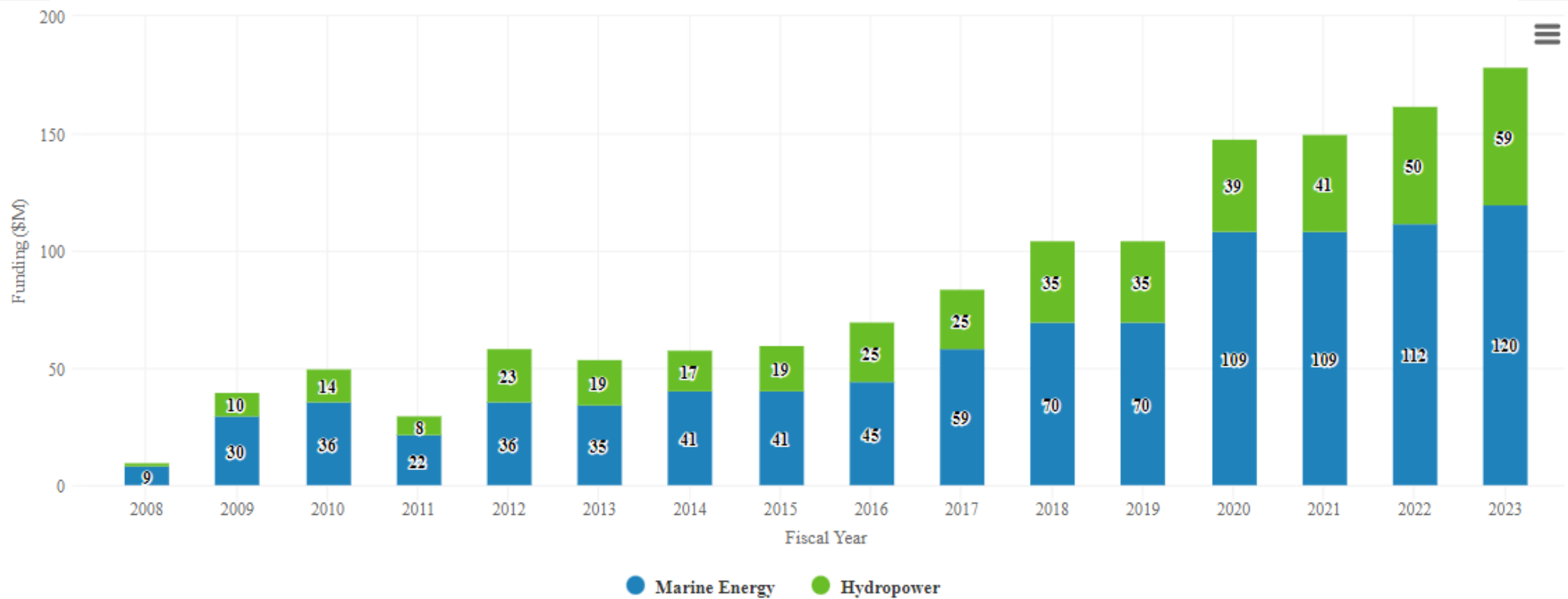
Methane Emissions
from Reservoirs

DOE Project Maps:

<https://www.energy.gov/eere/water/water-power-technologies-office-projects-map>

WPTO Budget – Congressional Appropriated R&D funds

WPTO Budget Over Time



Highcharts.com

Note: This graph shows annual appropriations and enacted funding only. This graph does not reflect the nearly \$1B of BIL funding for hydropower and marine energy.

Biden-Harris Priorities – Day 1

- Building a clean energy economy to address the climate emergency
- Workforce to address climate emergency
 - Millions of high paying union jobs, with targeted efforts to address historic environmental injustices
- 100% clean energy economy with net zero emissions no later than 2050
- Covid-19
- Environmental justice central to all federal climate action

Once in a Generation/ Lifetime Funding for Clean Energy

The Bipartisan Infrastructure Law is
THE LARGEST INVESTMENT IN:



Clean water infrastructure



Public transit



Passenger rail in 50 years



Upgrading the power grid



Tackling legacy pollution



Clean, electric buses



Roads and bridges since the Interstate Highway System



Increasing our infrastructure's resilience

Search...

Affordable, high-speed internet

Inflation Reduction Act Summary

ENERGY AND CLIMATE PROVISIONS

Bipartisan Infrastructure Law:

- **Hydroelectric Incentives program:** more than \$750 million to support the U.S. hydropower fleet to meet the nation's clean energy goals
 - \$125M USD – Production incentives
 - \$75 M USD – Efficiency incentives
 - **\$553.6 M USD – Enhancement incentives**
- **Inflation Reduction Act:**
 - Suite of Tax credits for clean energy
 - Expansion of Renewable Electricity Production Credit
 - Extends build dates for hydropower
 - Provides full value of credit for hydropower and marine energy

Biden-Harris Administration Priorities Climate – 2 years in

Energy Policy Examples:

- **Transmission:**
 - Facilitate timely, responsible, and equitable permitting of electric transmission lines
- **Renewable Energy on Public Land:**
 - Goal of permitting at least 25 gigawatts (GW) of renewable energy on public lands by 2025
- **Modernizing and Accelerating Environmental Reviews:**
 - Clarified and restored basic safeguards in NEPA for environmental reviews (e.g., to consider direct, indirect, cumulative, and climate impacts)
 - Issued guidance to agencies on how to account for climate change and greenhouse gas emissions
- **Offshore Wind:**
 - Goal to deploy 30 gigawatts by 2030
 - on track to complete reviews of at least 16 project plans by 2025, representing more than 27 GW of clean energy

Nature Protection Examples:

- America the Beautiful Act 30% of land and water conservation by 2030
- Memos from the White House to Agencies to prioritize corridors/connectivity for fish and wildlife

This year New National Lab R&D Awarded from the Infrastructure Law

The Bipartisan Infrastructure Law is
THE LARGEST INVESTMENT IN:

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Office of ENERGY EFFICIENCY & RENEWABLE ENERGY ABOUT EERE RESOURCES BUILDINGS & INDUSTRY RENEWABLE ENERGY SUSTAINABLE TRANSPORTATION

WATER POWER TECHNOLOGIES OFFICE

Water Power Technologies Office

WPTO Announces over \$16 Million in New National Lab-Led Hydropower and Marine Projects

DECEMBER 9, 2022

Water Power Technologies Office » WPTO Announces over \$16 Million in New National Lab-Led Hydropower and Marine Projects

The U.S. Department of Energy's (DOE) [Water Power Technologies Office \(WPTO\)](#) today announced over \$16 million in new projects to further hydropower and marine energy research and development. These awards encompass \$5.6 million for hydropower projects and \$10.5 million for marine energy projects across six national laboratories.



Hello June!



Congressional Language/ Appropriations For Fish Passage and Protection R&D:

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Office of ENERGY EFFICIENCY & RENEWABLE ENERGY ABOUT EERE RESOURCES BUILDINGS & INDUSTRY RENEWABLE ENERGY SUSTAINABLE TRANSPORTATION

WATER POWER TECHNOLOGIES OFFICE

Water Power Technologies Office

WPTO Releases \$4 Million Funding Opportunity to Advance Fish Passage and Protection Technologies

OCTOBER 31, 2022

Water Power Technologies Office »
WPTO Releases \$4 Million Funding Opportunity to Advance Fish Passage and Protection Technologies

Office: [Water Power Technologies Office](#)
FOA number: [DE-FOA-0002801](#)
Link to apply: [Apply on EERE Exchange](#)
FOA Amount: \$4 million

The U.S. Department of Energy's (DOE) [Water Power Technologies Office \(WPTO\)](#) today released a [\\$4 million funding opportunity](#) to reduce the environmental impacts of hydropower with research to enhance innovative fish passage and protection technologies.

ENERGY.GOV

GRID DEPLOYMENT OFFICE ABOUT US ENHANCED TRANSMISSION PLANNING FEDERAL FINANCING TOOLS FEDERAL COLLABORATION GENERATION CREDITS JOIN OUR TEAM

Hydroelectric Incentives Guide

Grid Deployment Office

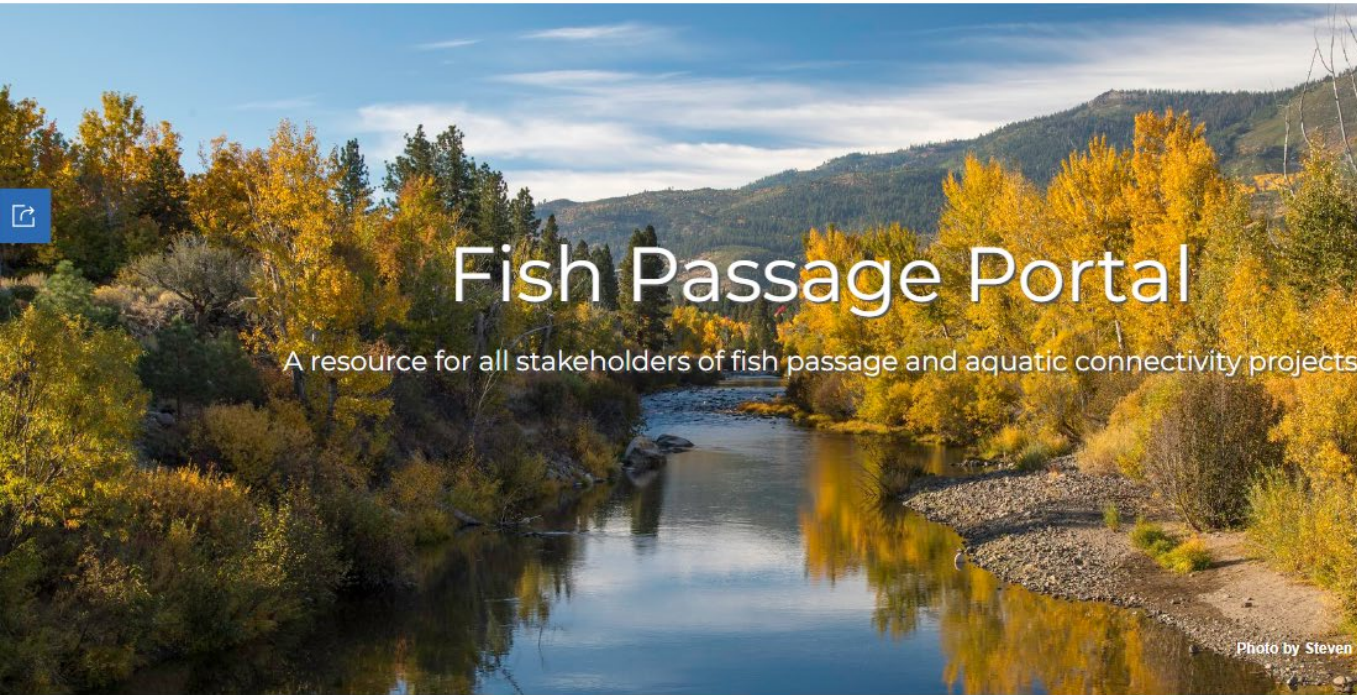
Grid Deployment Office » Hydroelectric Incentives Guide

The Hydroelectric Incentives program oversees an investment of more than \$750 million to support the continued operation of the U.S. hydropower fleet to meet the nation's clean energy goals and ensure a more reliable and resilient electric grid system. The Bipartisan Infrastructure Law (BIL) funded three distinct hydroelectric incentive programs aimed to add hydroelectric capacity to non-powered dams and construct small hydroelectric projects in areas of inadequate electric service, as well as incentivize hydropower investment in capital improvements related to efficiency, grid resilience, dam safety, and environmental conditions.

US Interagency Coordination – Fish Passage

← ↻ 🏠 🔒 https://interagency-bil-fish-passage-project-1-fws.hub.arcgis.com 🔍 ⭐ 📄 ⚙️

Fish Passage Portal Find Funding Resources View Projects



Fish Passage Portal

A resource for all stakeholders of fish passage and aquatic connectivity projects

Welcome to the Fish Passage Portal

The portal is a “one-stop shop” for anyone who needs information, funding, or resources to improve fish passage and aquatic connectivity projects. We provide landowners and public lands managers the tools to find funding across the federal government, as well as access to data, planning, and geospatial information.

RECEIVED BIL FUNDING FOR FISH PASSAGE AND BARRIER REMOVAL	PARTNER AGENCIES ALSO ENGAGED IN SUPPORTING FISH PASSAGE AND BARRIER REMOVAL
<ul style="list-style-type: none"> US Fish and Wildlife Service (USFWS) National Oceanic and Atmospheric Association (NOAA) US Forest Service (USFS) Bureau of Reclamation (USBOR) Federal Highway Administration (FHWA) US Army Corps of Engineers (USACE) Federal Emergency Management Agency (FEMA) 	<ul style="list-style-type: none"> Environmental Protection Agency (EPA) US Geological Survey (USGS) Department of Energy (DOE) Natural Resources Conservation Service (NRCS) Bureau of Indian Affairs (BIA) Bureau of Land Management (BLM) National Park Service (NPS)

by agency (top right), or select a point on the map to explore projects and each agency's investment into fish passage restoration.

Please note that projects are in varying stages of implementation.

Interagency Bipartisan Infrastructure Law Fish Passage Project Dashboard

Filter by Agency: No agency selected

Fish Passage Projects	Federal Agencies
223	5

Fish Passage Funding: **293.7M**
* Funding amount subject to change.

Number of Barriers by Project

Type	Count
Low Water Crossing	2
Dam	48
Various	19

Interagency Bipartisan Infrastructure Law Fish Passage Projects




- Bureau of Reclamation
- National Oceanic and Atmospheric Administration
- US Army Corps of Engineers

Fish Passage Projects

Search...

- 0816 Rio Pitahaya AOP Need #1
- Addressing priority barriers in the watersheds of the Great Marsh, MA
- ALARKA project with Trout Unlimited

Reimagining the Hydropower Vision Roadmap

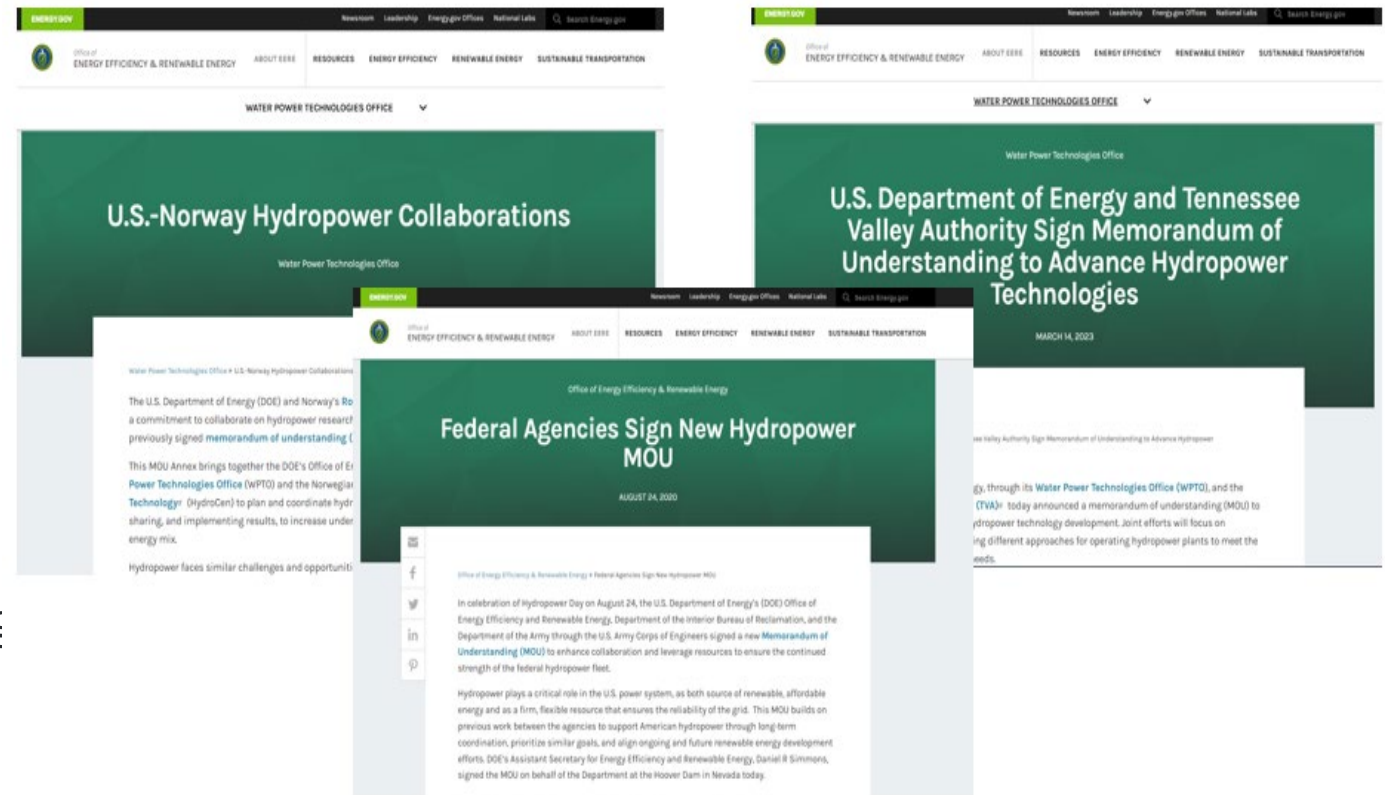
HYDROPOWER'S FUTURE	
	Flexible Operations
	Safe Dams
	Sustainable Approaches



ACTION AREAS	
	Technology Advancement
	Sustainable Development & Operations
	Enhanced Revenue & Markets
	Optimized Regulatory Processes
	Enhanced Collaboration, Education & Outreach

Collaborations

- Federal Hydropower Memorandum of Understanding (MOU)
 - US Bureau of Reclamation and the Army Corps of Engineers
- DOE-Tennessee Valley Authority MOU
- IEA Tasks
 - Hydropower and Fish
- DOE-Norway MOU
 - Norwegian Research Institutes
- Multiple US hydropower community working groups
 - Example: Uncommon Dialogue with Industry, agencies, NGOs

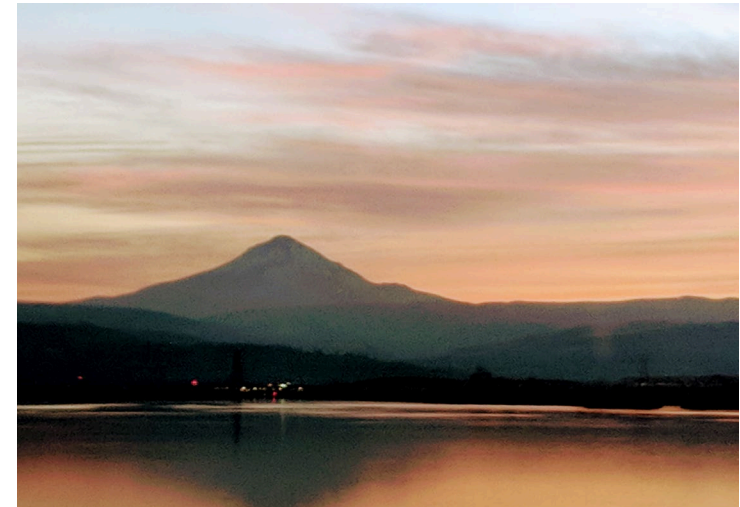
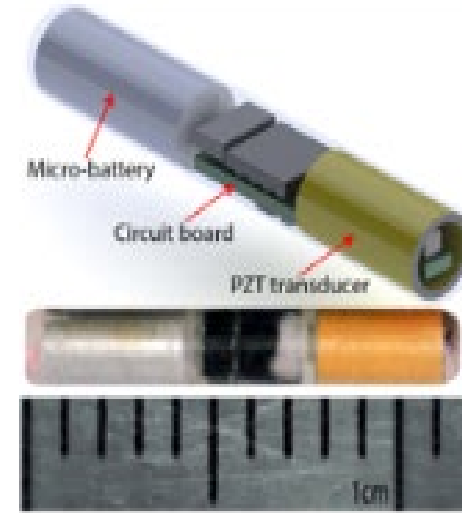


Industry Innovation

A few examples:

- Kodiak Alaska, a community of ~5600
 - 100% renewable grid
 - Hydro dam with storage
 - Six 1.5 MW wind turbines
 - Flywheels
- Douglas County PUD in Washington State
 - Pairing existing hydropower with a modular hydrogen
 - Increasing storage and flexibility
- Natel Energy
 - Began in 2009 with a DOE award
 - Designed a fish-safe Restoration Hydro Turbine
 - Deployments and commissioning are ongoing

STEM: Giving kids and teachers tools and data to understand their fish and hydropower systems



Thank you!

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Subscribe to [Hydro Headlines](#) for a monthly snapshot of hydropower news and happenings and to the [Water Wire](#) for a bimonthly update of all things water power including funding opportunities, events, publications, and news sent directly to your inbox.

Learn more about WPTO at water.energy.gov.