U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

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WATER POWER TECHNOLOGIES OFFICE

Semiannual Stakeholder Webinar

November 9, 2022

Welcome

- All listeners have been muted as this webinar will be recorded, transcribed, and shared on the WPTO website and in future editions of the Water Wire, Hydro Headlines, and Water Column newsletters.
- If you have issues with the webinar, please send us a note using the chat box on the right side of your screen.
- The webinar will conclude with a Q&A session. Please send questions by 2:30 p.m. ET to WaterPowerTechnologiesOffice@EE.DOE.GOV *or* use the chat box in Zoom.
  - *Names of individuals submitting questions will remain anonymous to our listeners.*
  - *If we do not get to your question, we will follow up via email.*

Speakers

Maxine Hillman
Communications Analyst

Jennifer Garson
Director

Corey Vezina
Acting Hydropower Program Manager

Samuel Bockenhauer
HydroWIRES Lead

Tim Ramsey
Marine Energy Program Manager

Ashley Brooks
Diversity, Equity, and Inclusion Lead

New Funding Topics Announced for Small Businesses

On November 7, DOE announced the topics for the next round of funding under the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) program (Phase I Release 2 for Fiscal Year 2023). **DOE expects to release the full funding opportunity on December 12.**

WPTO is fundings five subtopics in C56-14. WATER POWER TECHNOLOGIES

a) Innovations in Water Data (*Hydropower and Marine Energy*)
b) Advanced Coatings and Geomembrane Liners (*Hydropower*)
c) Identification of Cybersecurity Threats and Research and Development of Mitigation Strategies for Hydropower and Dams' Operations (*Hydropower*)
d) Co-Development of Marine Energy Technologies (*Marine Energy*)
e) Marine Energy Supply Chain Development (*Marine Energy*)

Want to learn more about these water power topics/sub-topics? **Join WPTO for a webinar on Thursday, December 1 from 2 PM – 3 PM ET.** Register now and submit questions ahead of time to water.sbir@ee.doe.gov

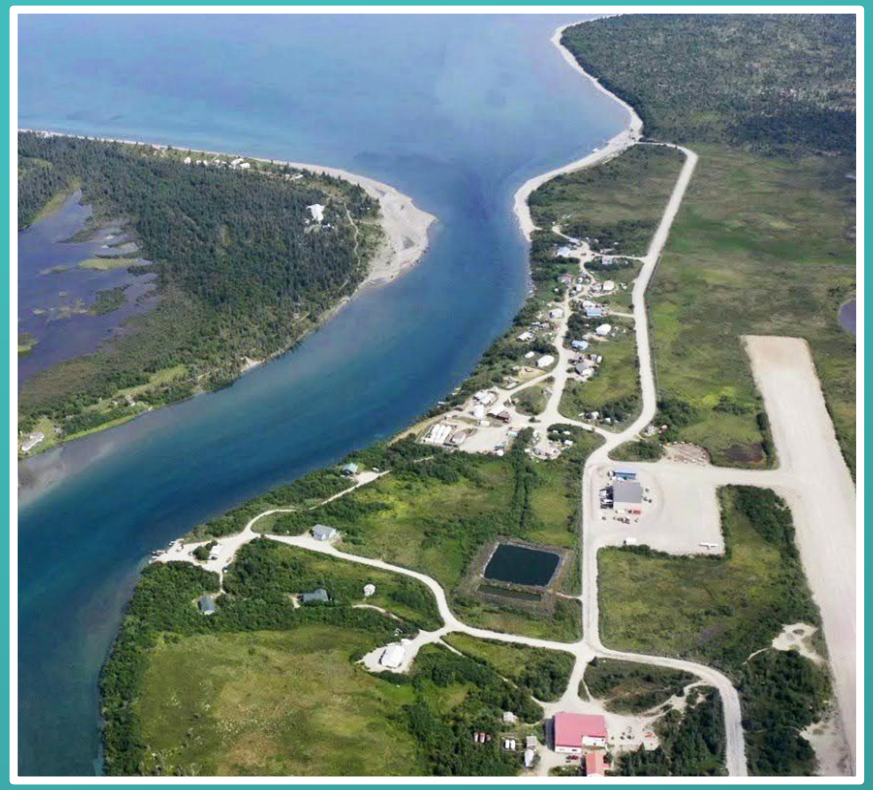
WPTO also works with the American Made Network's Power Connectors who provide mentorship and guidance to all SBIR applicants; more details can be found here: cebn.org/media_resources/sbir-events

Communities Selected for ETIPP Technical Assistance

The Energy Transitions Initiative Partnership Project (ETIPP) provides direct technical assistance to remote, island, and islanded communities across the United States to increase their energy resilience. WPTO is one of the co-funders of this program.

In June, DOE announced 12 competitively selected communities that will receive technical assistance.

- Aquinah and Chilmark, MA
- Bainbridge Island, WA
- Beaver Island, MI
- Guam Power Authority, Guam
- Hui o Hau'ula, HI
- Igiugig, AK
- Makah Tribe, Neah Bay, WA
- McGrath, AK
- Microgrid of the Mountain, Puerto Rico
- Mount Desert Island, ME
- Nikolski and St. George, AK
- University of Hawaii, HI



EERE's Inclusive Energy Innovation Prize Fall Summit

- More than 200 teams applied to this EERE prize which WPTO co-funded.
- 18 teams advanced to Phase 2 and will begin to work on their impact plans and prepare for the pitch competition in May 2023.
- To honor their achievements thus far, build a community of peers, and share knowledge about available resources, teams gathered in Washington, D.C., on November 2 and 3 for the Inclusive Energy Innovation Prize Fall Summit.

Peer Review 2022

WPTO's 2022 Peer Review

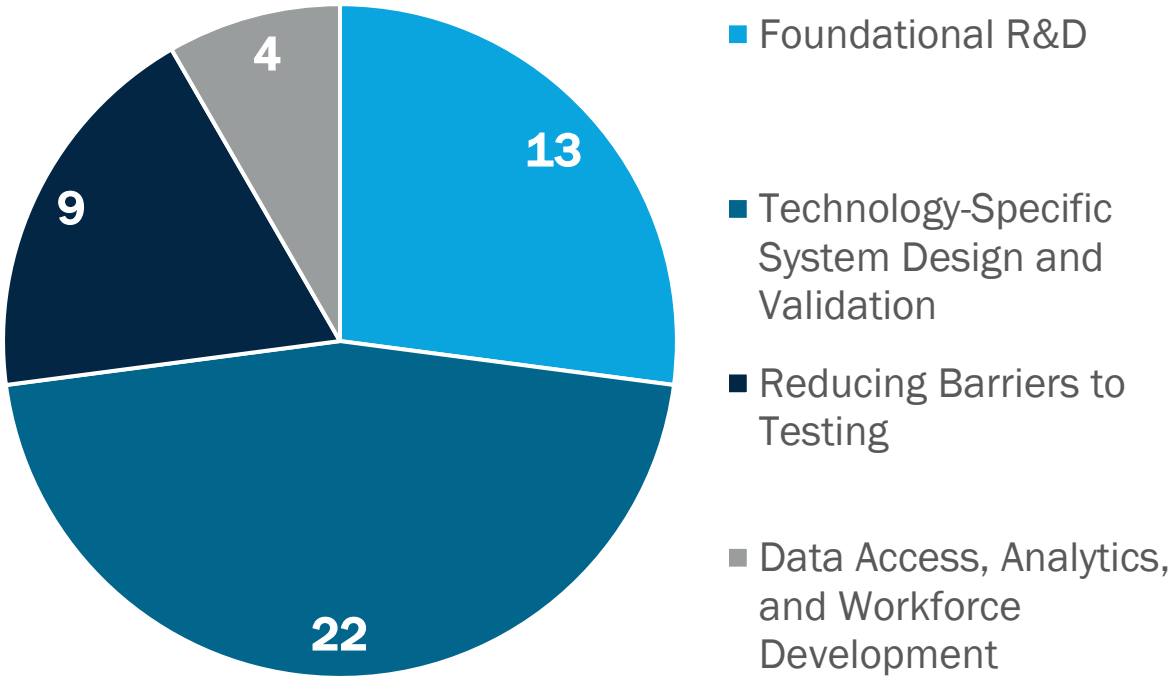
WPTO's Peer Review process **enables external stakeholders** to **provide feedback** on the **most impactful use of taxpayer funding** and **develop recommendations** for the most efficient and effective ways to accelerate industry development in water power technologies.

- The review was held virtually in July 2022:
  - July 18–22: Marine Energy Peer Review
  - July 25–29: Hydropower Peer Review
- Presentations available now, and report coming soon!

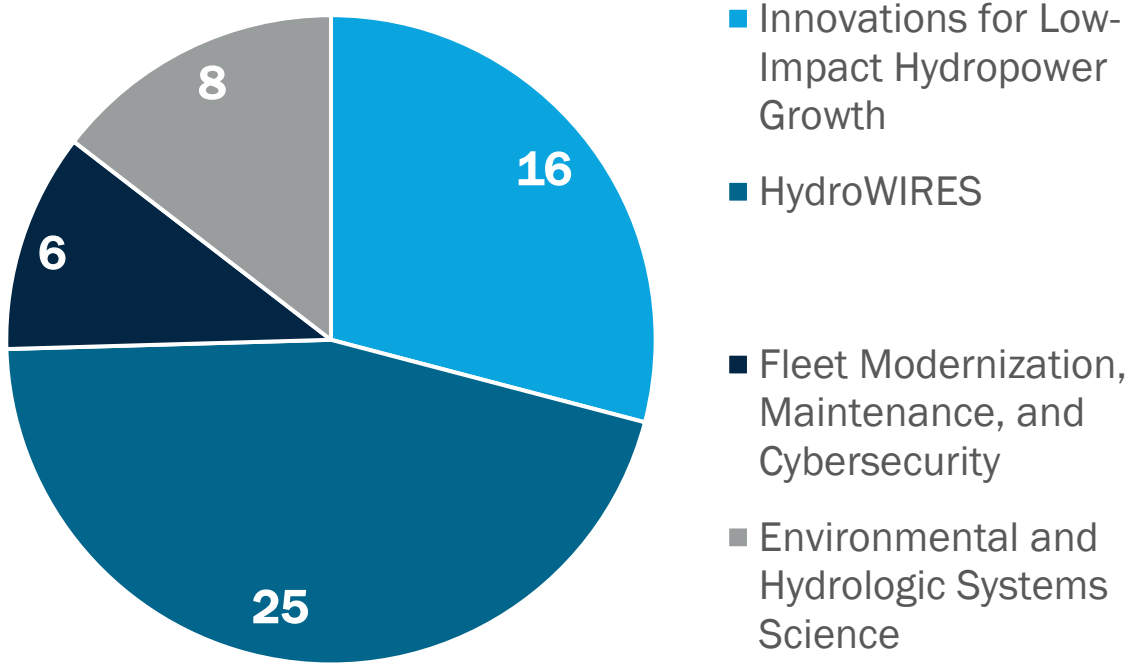
Peer Review by the Numbers

31 reviewers evaluated **more than 100 projects** active in Fiscal Years 2019–2021.

of Marine Energy Projects Reviewed by Activity Area

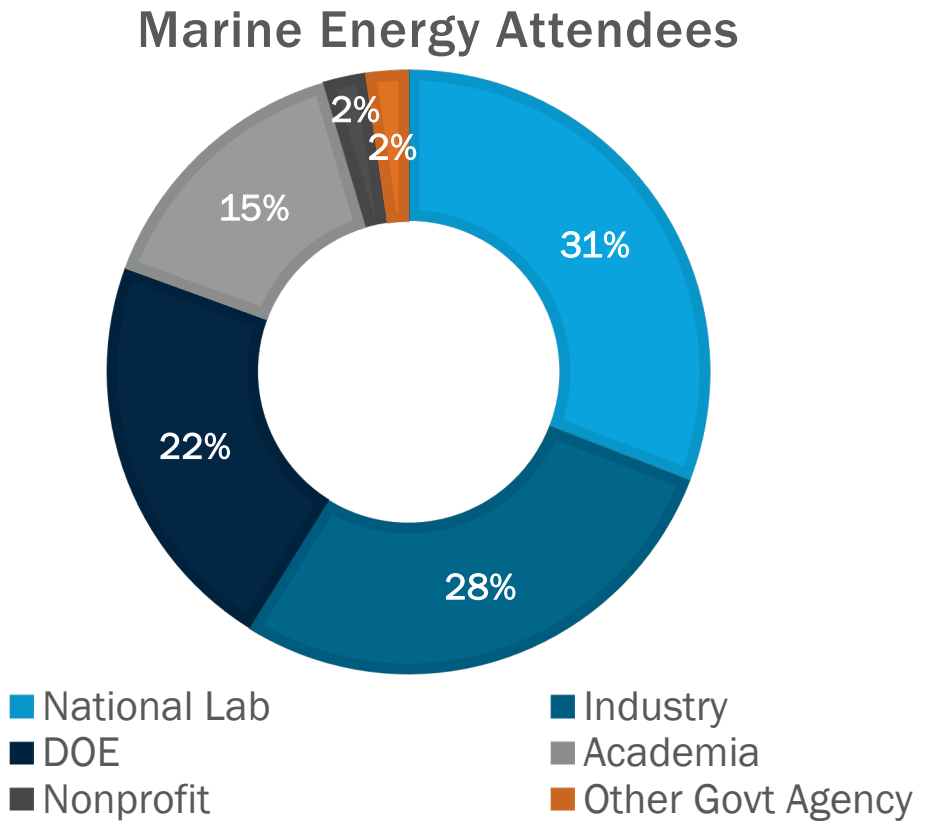


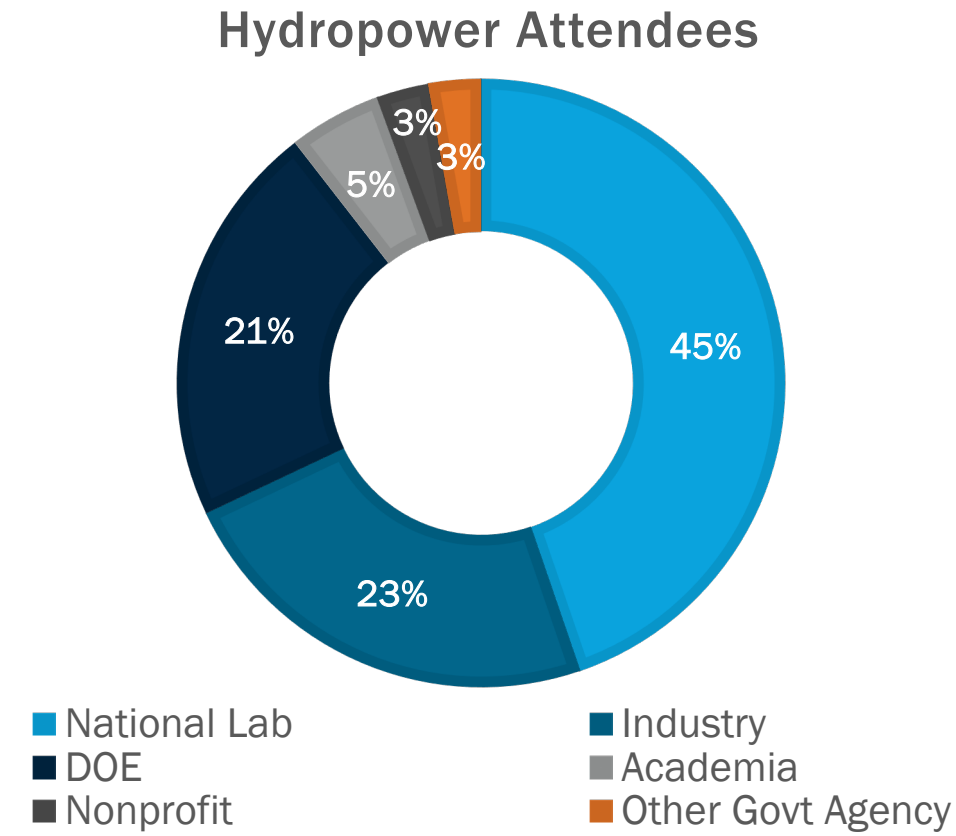
of Hydropower Projects Reviewed by Activity Area



Peer Review by the Numbers

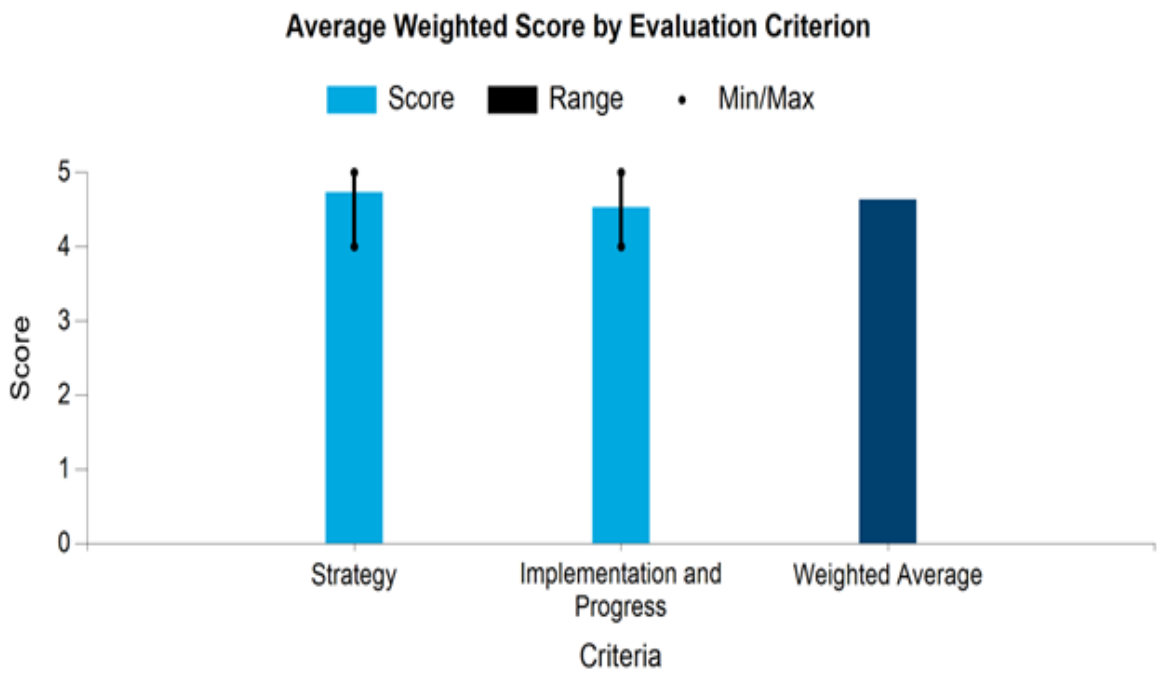
More than 350 people attended, including many international participants and a broad representation of water power stakeholders.



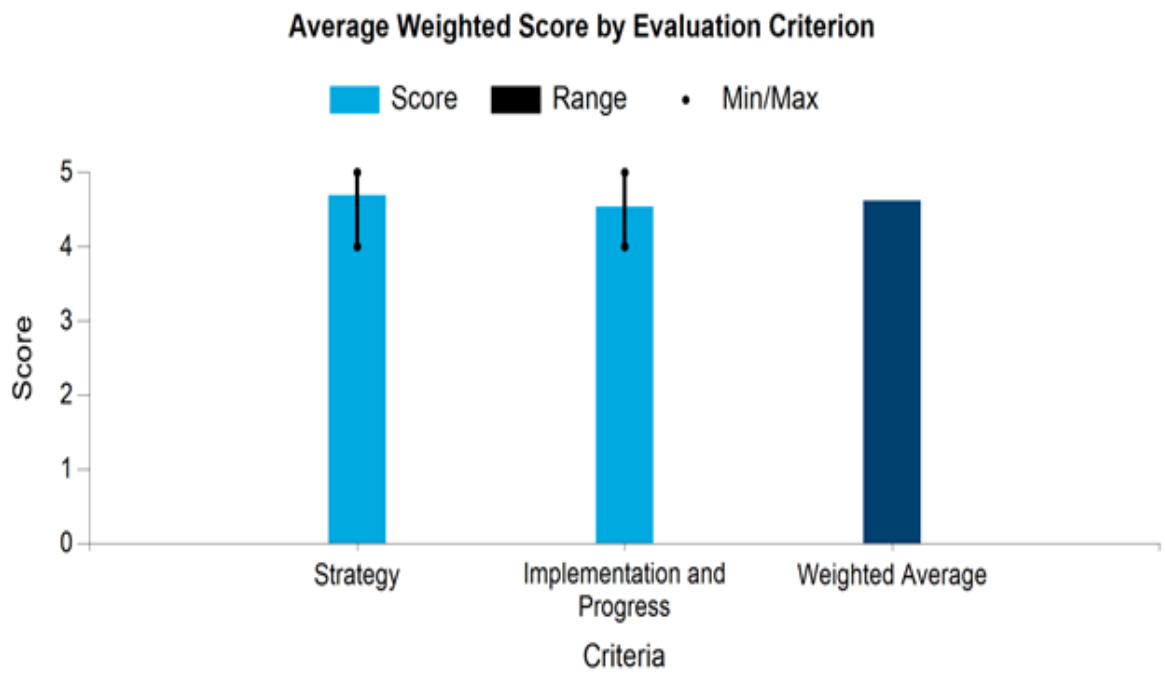


Peer Review by the Numbers

Marine Energy Program Strategy

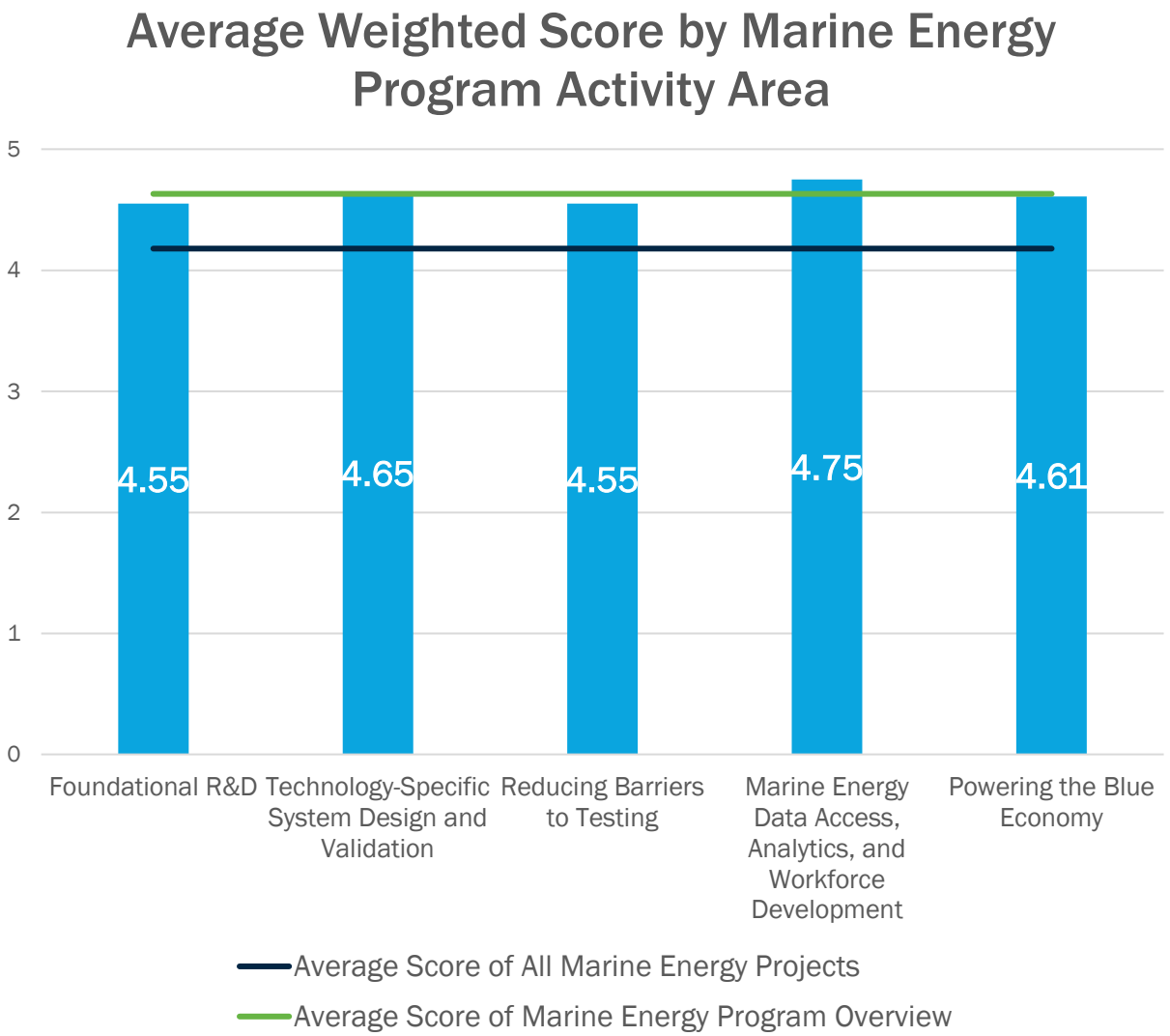


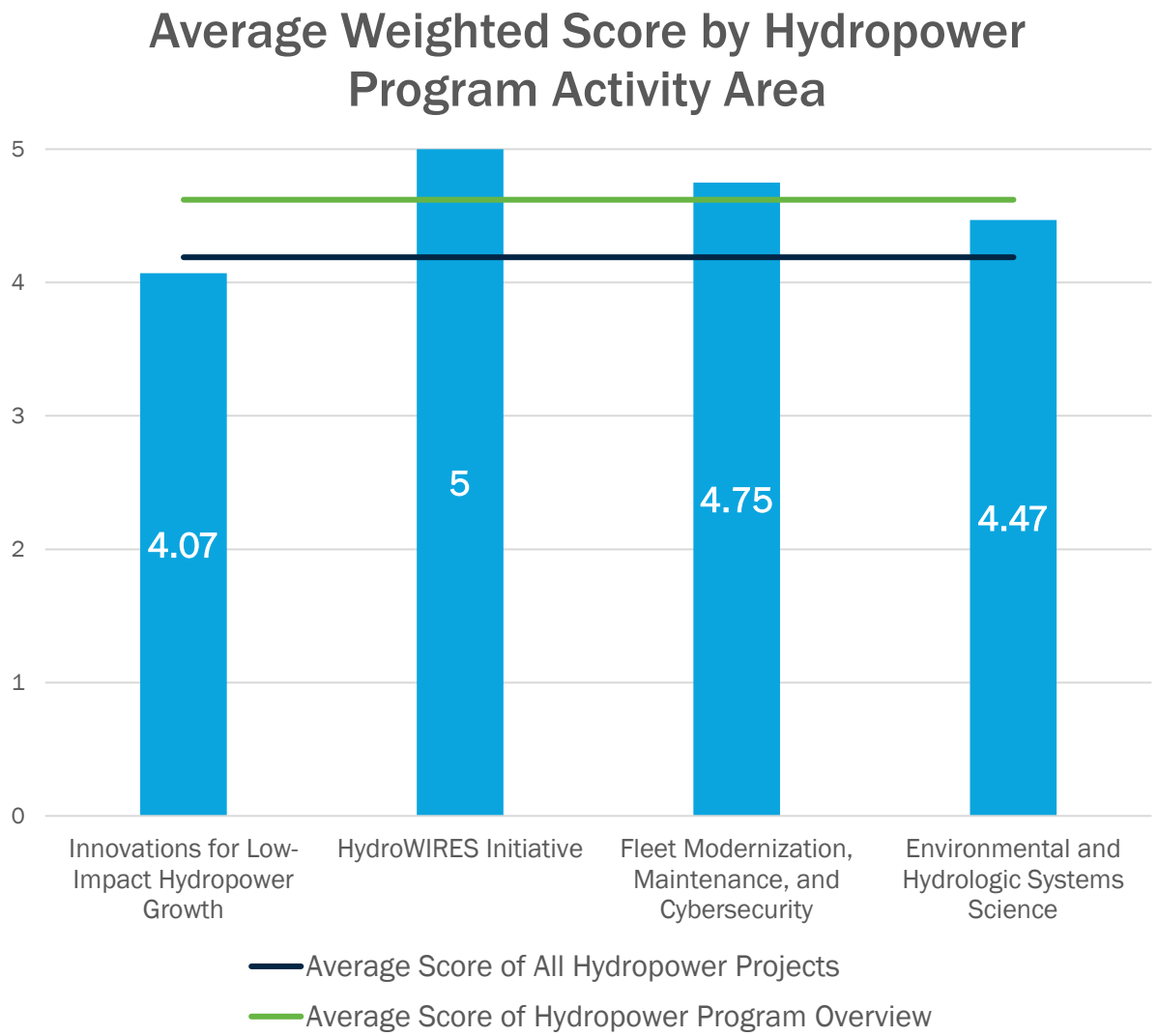
Hydropower Program Strategy



Reviewers agreed that each program has a defined strategy, as outlined in the Multi-Year Program Plan, that considers challenges facing industry and other stakeholders and leverages appropriate funding mechanisms to achieve intended outcomes.

Peer Review by the Numbers





Reviewers' Program Recommendations

Marine Energy Recommendations

- Focus funding and maximize impact in later stages.
- Improve fundamental research and technology transfer.
- Mitigate possible negative environmental impacts.
- Strengthen supply chain and end-user engagement for the Powering the Blue Economy Initiative.

Hydropower Recommendations

- Ensure broad and inclusive engagement across the hydropower community.
- Create comprehensive communications plans.
- Better disseminate results and share plans for commercialization.
- Expand and supplement existing workforce development efforts.
- Focus peer review presentations on results and convey broader context within portfolio.

Hydropower Program Updates

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WATER POWER TECHNOLOGIES OFFICE

Hydropower Funding and Technical Assistance Opportunities

More than $28 million across three Bipartisan Infrastructure Law-funded opportunities

- FOA 2731: Innovative Technologies to Enable Low-Impact Hydropower and Pumped Storage Hydropower Growth
  - Concept papers due December 1, 2022.
  - Full applications due March 5, 2023.
- FOA 2800: Stakeholder Insight into Hydropower R&D Issues
  - Full applications due November 18, 2022.
- FOA 2802: Pumped Storage Hydropower Wind and Solar Integration and System Reliability Initiative
  - Letters of intent due November 17, 2022.
  - Full applications due December 15, 2022.

Hydropower Funding and Technical Assistance Opportunities

FOA 2801: Advancing Fish Passage and Protection Technologies

- Concept papers due December 5, 2022.
- Full applications due March 27, 2023.

HydroWIRES Technical Assistance Program

- Apply by December 16, 2022.

New Small Business Innovation Research (SBIR) Funding (FY 2023 Phase I Release 2)

- Hydropower topics include:
  - Innovations in Water Data (*Hydropower and Marine Energy*)
  - Advanced Coatings and Geomembrane Liners (*Hydropower*)
  - Identification of Cybersecurity Threats and Research and Development of Mitigation Strategies for Hydropower and Dams' Operations (*Hydropower*)
- DOE expects to release the full funding opportunity on December 12. Join WPTO on December 1 to learn more.

Hydropower Incentives Program Update

- The Hydropower Incentives Programs (Sections 242, 243, and 247), previously managed by WPTO, have moved to DOE's new Grid Deployment Office.
- DOE created the Grid Deployment Office and several other new offices as a result of the Bipartisan Infrastructure Law.

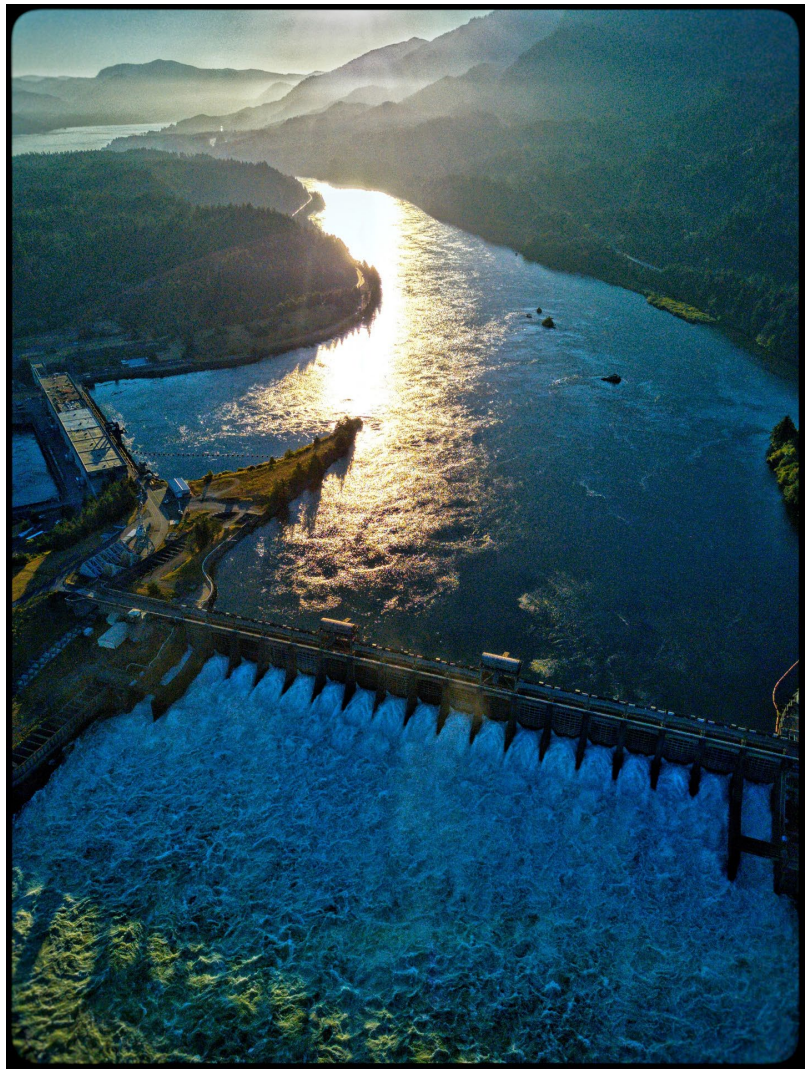
- Tim Welch, WPTO's previous Hydropower Program Manager, has moved to the Grid Deployment Office full time to oversee these programs.
- Corey Vezina is now serving as WPTO's Acting Hydropower Program Manager.

Tentative Hydropower Incentives Program Schedule

- Released RFI for 243 and 247 Program Development (June 2022) and held public webinar (August 2022).
- Incorporating RFI responses into guidance documents for each program.
- Section 247: Maintaining and Enhancing Hydroelectricity Incentives
  - Release draft guidance for public comment: early January 2023
  - Issue guidance and open solicitation: early May 2023
- Section 243: Hydroelectric Efficiency Improvement Incentives Program
  - Release draft guidance for public comment: mid-March 2023
  - Issue guidance and open solicitation: mid-June 2023

Fiscal Year 2021 242 Payments

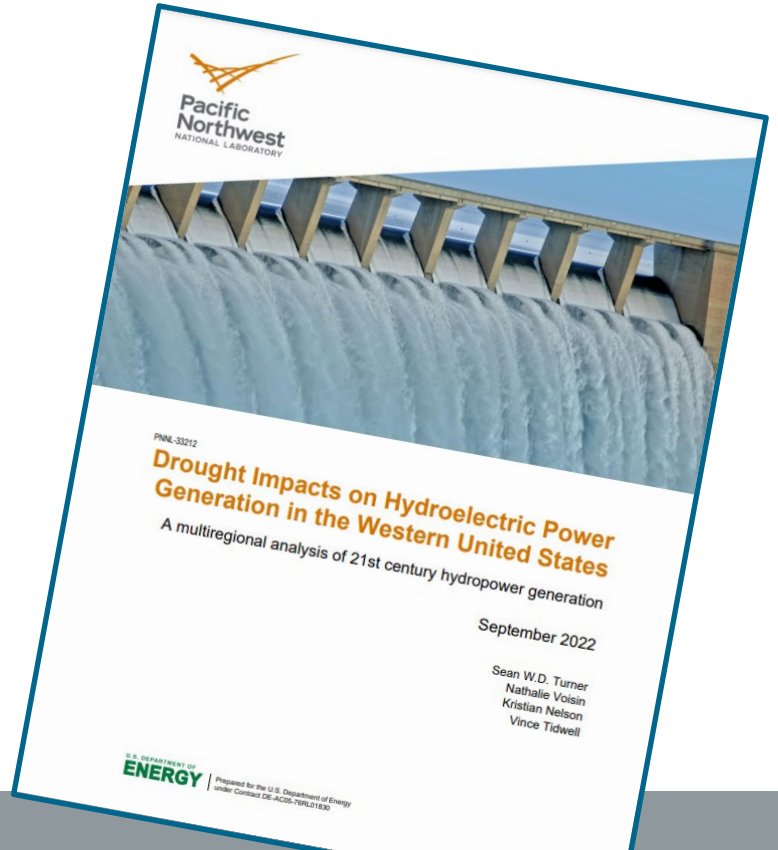
- Paid $13.5 million in incentives.
- 55 Recipients—a record!
  - 18 new applicants
- First year with expanded eligibility criteria to include facilities located in communities with inadequate electric service.
  - Led to five newly eligible facilities receiving payments.



Drought's Impact on Hydropower in the Western United States

New DOE Study Finds Western Hydropower Provides Reliable Electricity Even During Historic Droughts

- Looked at eight climate sub-regions across 11 western states, including Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.
- Found that though drought does raise concerns for hydropower generation, the overall fleet sustained 80% of its average generation for the years 2001–2021.
- Even during drier times, hydropower facilities can often still be relied upon to supply power when needed most.



Hydropower and Climate Change

Technical Report: The Third Assessment of the Effects of Climate Change on Federal Hydropower

- Multimodel assessment framework to better reveal uncertainties in future hydrologic and hydropower projections from federal hydropower facilities.
- Climate change creates contrasting conditions that include increasing temperatures and both intensifying rainfall and drought, all of which affect hydropower operations.

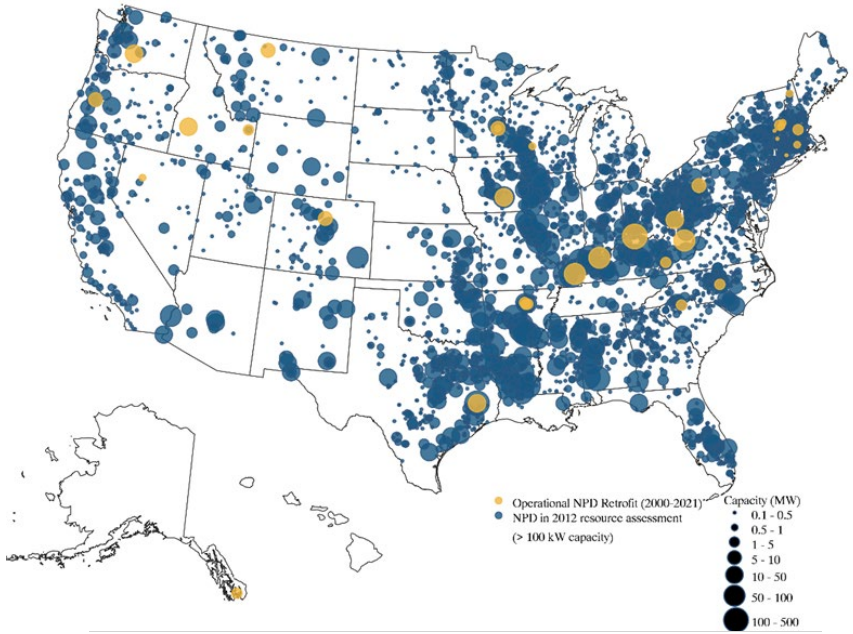
Climate Data and Research Needs to Support Nonfederal Hydropower

- Released Request for Information in April 2022.
- Hosted workshop in conjunction with Clean Currents in October 2022.
- Plans to release RFI and workshop report in 2023.

Hydropower Assessments

An Assessment of Non-Powered Dam Hydropower Development Opportunities in the United States

- Most retrofits go through existing intake/conveyance systems rather than adding generation via a bypass or siphon.
- Dam ownership plays a major role in differentiating NPDs.
- Federally owned NPDs are the most common type of retrofit.



An Assessment of Hydropower Potential at National Conduits

- Assessment of the potential to generate electricity from new hydropower operations along existing U.S. water conduits.
- New conduit hydropower could potentially add a total of 1.41 gigawatts to the U.S. power grid.

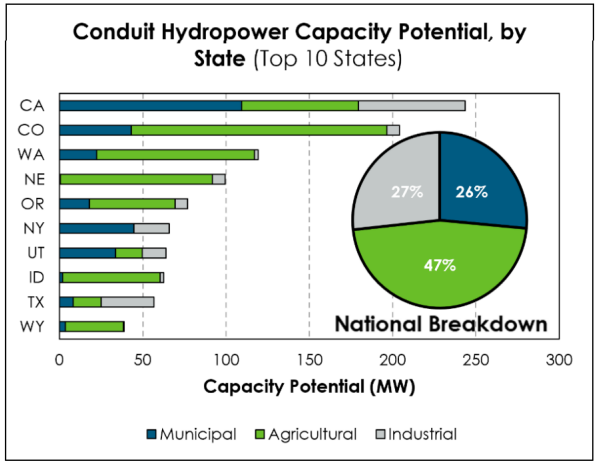
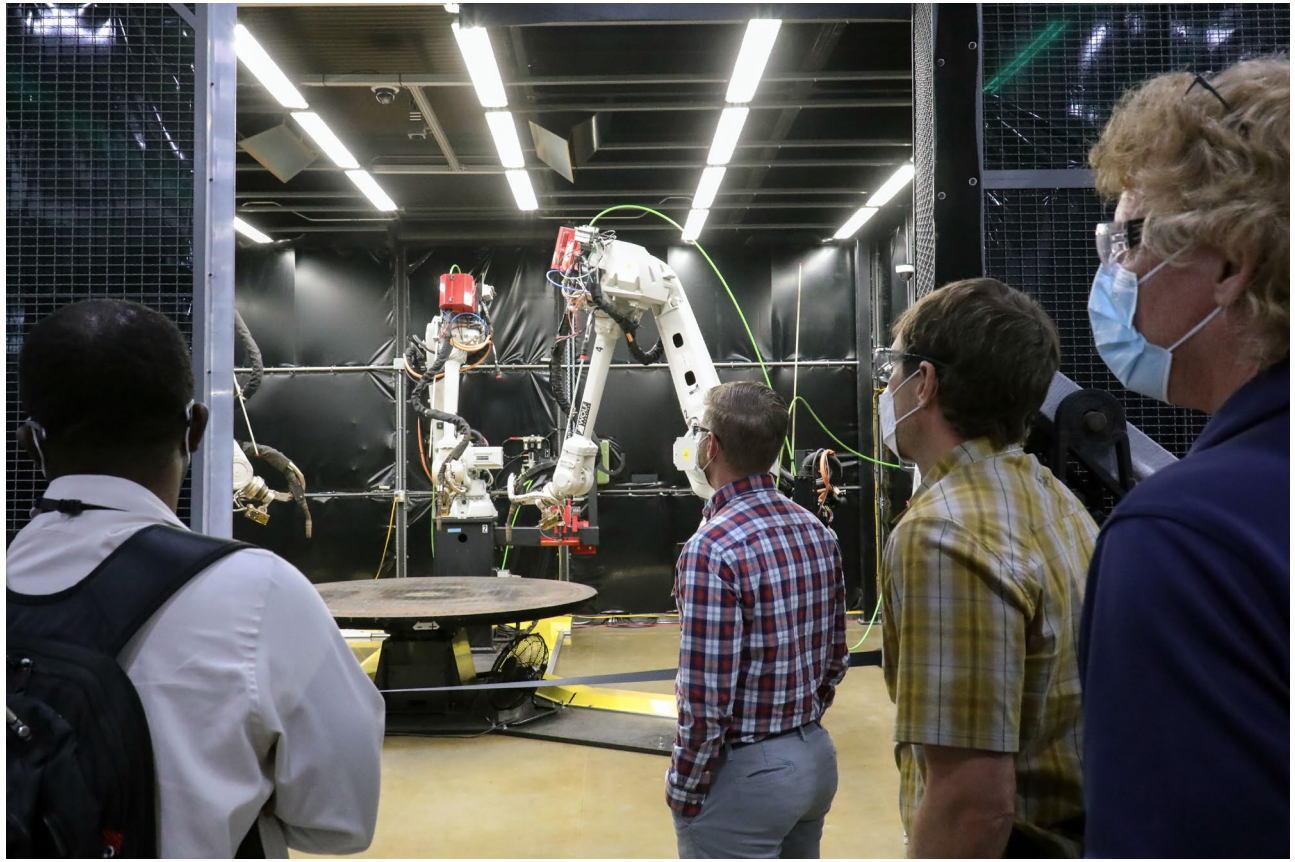


Figure ES.2. Top 10 states with the highest conduit hydropower capacity potential.

Advanced Manufacturing for Hydropower Workshop

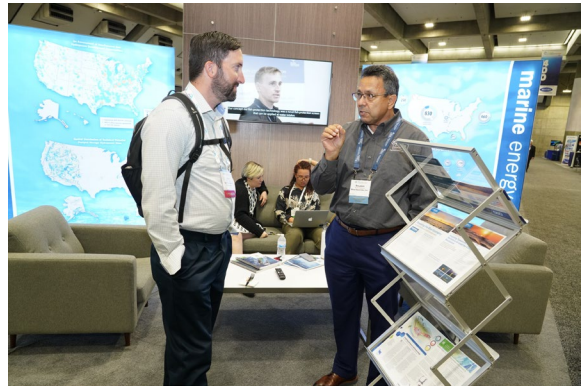


Participants in the Hydropower Advanced Manufacturing Workshop toured the Manufacturing Demonstration Facility, a DOE user facility, on ORNL's Hardin Valley campus. Credit: Kelley Smith/ORNL, U.S. Department of Energy

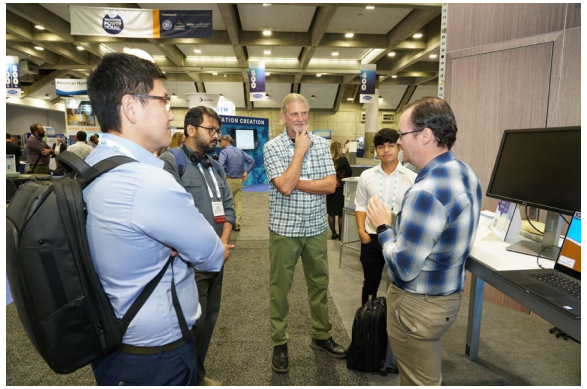
- Two-day workshop in August hosted jointly by WPTO and Oak Ridge National Laboratory at the lab's Manufacturing Demonstration Facility.
- Brought together stakeholders across the hydropower industry, academia, and government sectors.
- Focused on challenges in conventional hydropower manufacturing and began to prioritize opportunities to leverage advanced manufacturing capabilities to address current manufacturing and materials challenges.

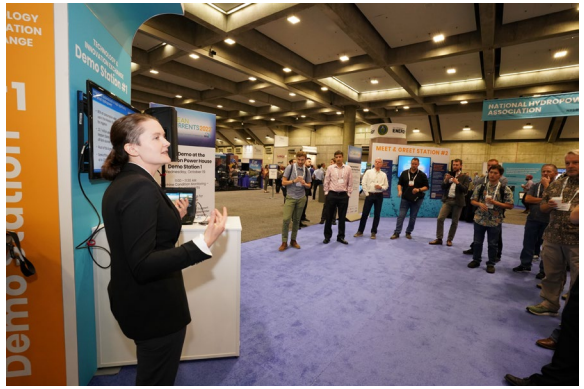
Clean Currents 2022

- 62 DOE representatives (15 WPTO staff and 47 national lab staff).
- 24 presentations, panels, workshops, and posters from DOE and national lab representatives.



Top row from left: Sam Bockenhauer (WPTO) speaks on a panel about PSH development; Charles Scaife (WPTO) speaks on a panel on environmental justice; visitors use the WPTO booth.





Bottom row from left: Jayson Martinez (PNNL) and Aljon Salalila (PNNL) demonstrate fish monitoring tools at the WPTO booth; Shiloh Elliott (INL) demonstrates IrrigationViz at the Innovation Power House; Vladimir Koritarov (ANL) speaks on a panel on PSH with Scott DeNeale (ORNL)

IEA Hydro TCP: 41st Executive Committee Meeting in Helsinki, Finland

Energy systems worldwide are in transition. The IEA Hydropower Technology Collaboration Program addresses key issues related to hydropower through joint work across 10 countries.

- Net Zero by 2050: A Roadmap for the Global Energy Sector
  - Global generation from hydropower must be doubled by 2050.
- Hydropower Special Market Report: Analysis and Forecast to 2030
  - The present and expected growth rate is far too slow.
  - Seven priority areas identified for hydropower.

https://ieahydro.org

New $4 Million HydroWIRES Technical Assistance Program

- Provide PSH developers and other stakeholders with national lab expertise and capabilities to address valuation hurdles in PSH project development.
- Provide the broader hydropower community with assistance for specific challenges they face related to the HydroWIRES Initiative mission.

Topics	Anticipated award amount	Anticipated # of awards	Anticipated Total Funding
1.1 PSH Valuation Tool - Baseline Analyses, Interpretation, and Applications	$100-250k	2-5	$500k
1.2 Additional Custom Analyses, Interpretation, and Applications	$500k-$1M	1-3	$1.5M
2. Open Topic	$500k-$1M	1-3	$2M
		Total	$4M

Apply with a simple webform by December 16, 2022!

HydroWIRES Flexibility FOA Selections

Announced $8 million in funding to support projects that will improve the flexibility of the U.S. hydropower fleet and enhance electric grid reliability.

- **General Electric Research's** "Increasing Operational Flexibility of Existing Hydropower through Non-Intrusive Feedback Control and Hybridization."
- **Littoral Power Systems, Inc's** "Turbine/Generator Upgrade System with Control Suite for Increasing Hydropower Plant Flexibility."
- **Oregon State University's** "Hybrid Hydropower-Storage Units for Greater Operational Flexibility."

Pumped Storage Research Updates

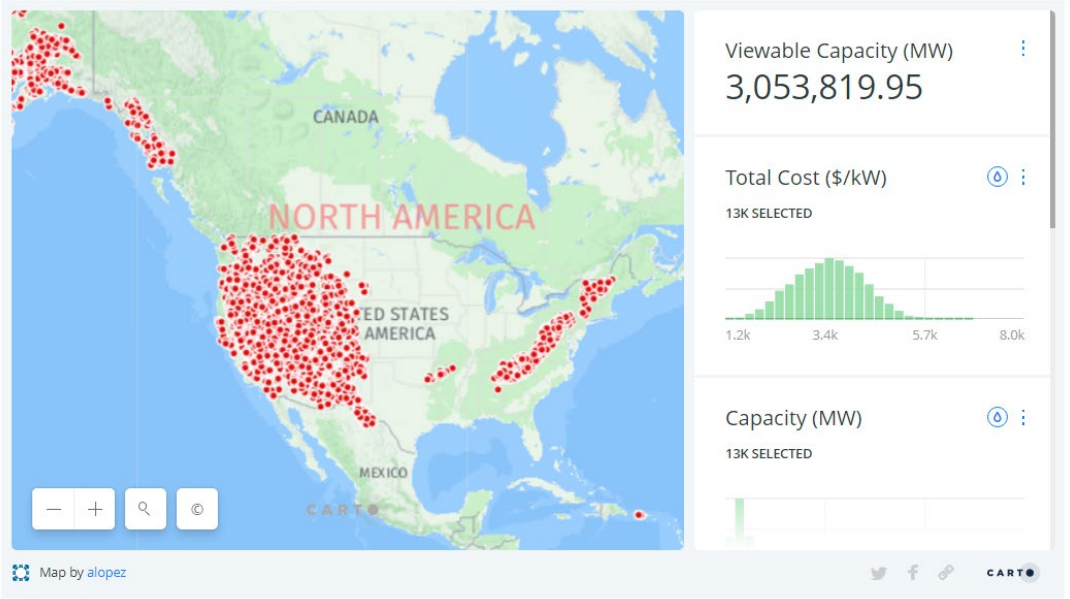
Pumped Storage Hydropower Resource Assessment (published by NREL)

- Using spatial mapping, identified nearly 15,000 sites in the United States where closed-loop PSH technology could be deployed in the future.

Innovative Pumped Storage Hydropower Report (published by Argonne)

- Highlights 12 promising PSH technologies that could significantly reduce cost, time, and risk, including:
  - Submersible pump-turbine and motor-generators
  - Geomechanical PSH
  - Open pit mine PSH

Interactive Map



[Closed-Loop Pumped Storage Hydropower Resource Assessment for the United States]

[A Review of Technology Innovations for Pumped Storage Hydropower]

Hydropower Operations Optimization (H2Os) Prize

- Data-driven competition designed to encourage the development of new operational solutions that can help advance hydropower's contribution to the grid.
- Competitors write code to schedule simulated hydropower operations that respect water management operations and constraints with revenue objectives.
- Three phases of successive difficulty and prize pool of up to **$75,000**.

Phase Three closes on November 11!

americanmadechallenges.org/challenges/h2os/index.html

Phase One Winners

- Team HydroFlex – **1st Prize!**
- Hydrophile
- Littoral Power Systems
- Maroon 3
- MST Power
- Vassar Labs Inc.
- Wenyuan Tang
- Yul Young Park

Phase Two Winners

- Team HydroFlex – **1st Prize!**
- Vassar Labs Inc.
- Wenyuan Tang
- Maroon 3
- MST Power
- Rick Matter

Hydro Hybrids Demonstration Report and Market White Papers

Report: Small hydropower hybrid demonstration with Idaho Falls Power

- Small hydropower with energy storage can provide distribution grid black start.
- Use of the ultracapacitor system increased operational stability.

White paper: Long-duration energy storage compensation mechanisms

- New PPA structures include multi-part payment schemes.
- These help off-takers hedge against market and generation risks, while providing revenue guarantees to developers.

White paper: Zero-carbon market designs and hydropower

- Ongoing market design initiatives include replacing fixed operating reserve requirements with demand curves, accommodating state policies, and implementing new market products.
- Hydropower can support system flexibility and take advantage of new price dynamics.

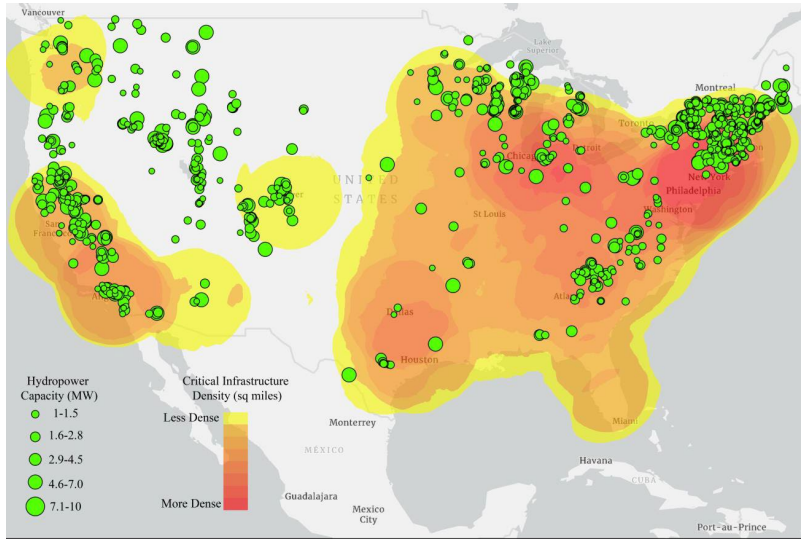


Figure: small hydropower overlaid with density of critical infrastructure

https://www.energy.gov/eere/water/hydrowires-publications

Marine Energy Program Updates

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WATER POWER TECHNOLOGIES OFFICE

Marine Energy Funding and Technical Assistance Opportunities

- $10.3 million funding opportunity to support marine energy innovation
  - December 2, 2022: deadline for concept papers.
  - February 24, 2023: deadline for full applications.
- Marine Energy Graduate Student Research Program
  - December 2, 2022: deadline for applications for the 2023 cohort.
- Testing Expertise and Access for Marine Energy Research (TEAMER) program
  - TEAMER reviews requests for technical support on a quarterly basis.
  - January 13, 2023, is the next deadline.
- New Small Business Innovation Research (SBIR) Funding (FY 2023 Phase I Release 2)
  - Marine energy topics include:
    - Innovations in Water Data (*Hydropower and Marine Energy*)
    - Co-Development of Marine Energy Technologies (*Marine Energy*)
    - Marine Energy Supply Chain Development (*Marine Energy*)
  - December 1, 2022: Join WPTO's webinar to learn more about the water power topics.
  - December 12, 2022: DOE expects to release the full funding opportunity.

Coming Soon: $35 Million for Tidal and Current Energy Systems

WPTO plans to provide $35 million to advance tidal and current energy systems. Funding is from the Bipartisan Infrastructure Law, and WPTO intends to release the funding opportunity announcement in early 2023.

Funding Opportunity Objectives and Goals

- Build upon state clean energy strategies with local partners.
- Attract competitive tidal and current energy developers for technology site integration.
- Improve tidal and current energy research and development.
- Build site infrastructure and supply chains with increased participation at the state level, including local agency, tribal, and university research involvement.
- Establish a working business model covering site development to commercial scale.

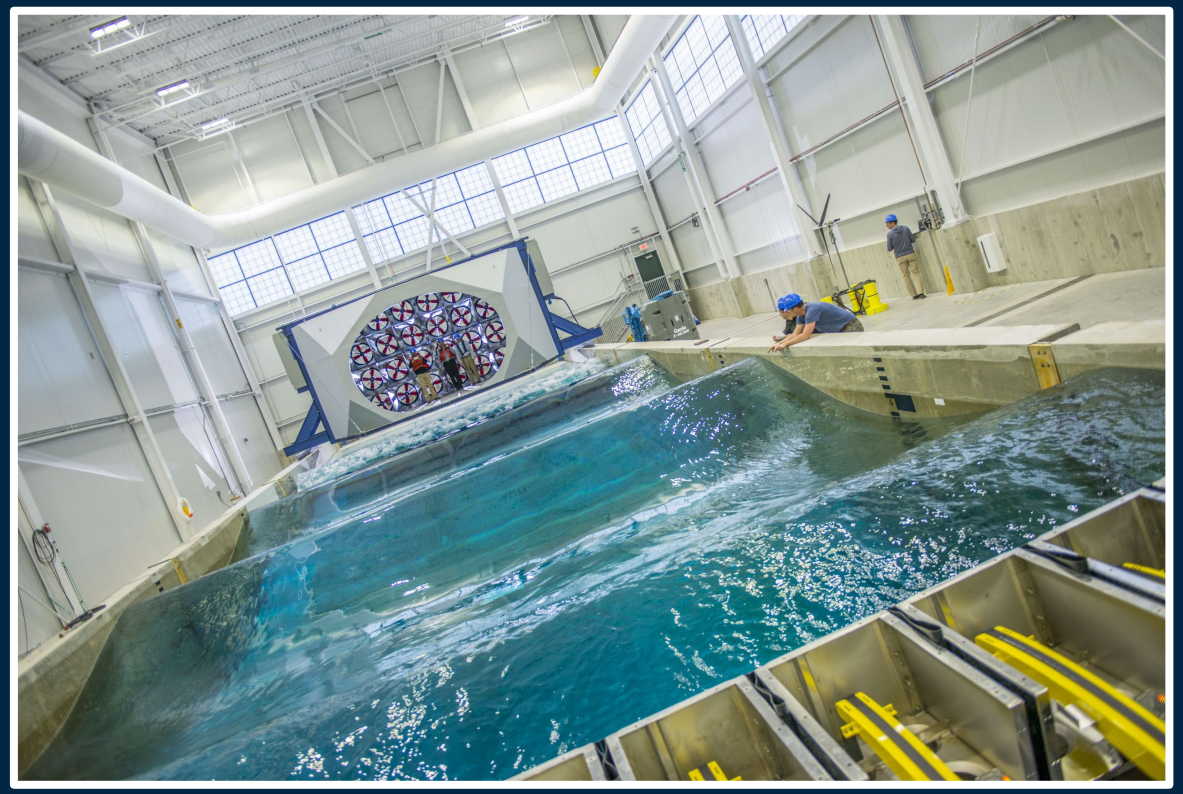
2022 International Conference On Ocean Energy (ICOE) and Ocean Energy Europe (OEE)

- ICOE and OEE were collocated on October 18-20 in San Sebastian, Spain.
- The U.S. was well represented throughout the program. U.S. speakers included WPTO Director Jennifer Garson, Marine Energy Program Manager Tim Ramsey, and partners from industry, academia, and the national labs.
- Energy security was a big topic as a result of the war in Ukraine.
- Attendees were interested in opportunities in the U.S. as a result of new research, development, and demonstration funding from the Bipartisan Infrastructure Law and tax incentives from the Inflation Reduction Act.

Above: WPTO Director Jennifer Garson joins thought leaders from across Europe for a plenary panel on challenges and opportunities for marine energy.

Left: POET, NHA's Marine Energy Council, and WPTO exhibited at ICOE/OEE.

TEAMER Updates



- Since last WPTO Semiannual Stakeholder Webinar
  - RFTS6 selections announced (10 projects).
  - RFTS7 selections announced (seven projects).
  - RFTS8 closed Nov. 4.
  - Webinar held on updated application and evaluation criteria.
- Now
  - Accepting applications for open water support on a rolling basis.
  - Open water activities have begun.
  - Onboarding new facilities.
  - Project results are available on the Portal and Repository for Information on Marine Renewable Energy and the Marine and Hydrokinetic Data Repository.

WPTO-Funded Selections for SBIR Fiscal Year 2022 Phase II

Topic: Development of Environmentally Acceptable Lubricants for Hydropower Applications

- Tetramer Technologies, LLC.

Topic: Co-Development of Marine Energy Technology at Smaller Scales

- Aquaharmonics Inc.
- Ocean Power Technologies, Inc.
- Oscilla Power, Inc.
- Saht Energy, LLC
- Triton Systems, Inc.

Topic: Low-Cost, User-Friendly Monitoring Tools for Marine Hydrokinetic Sites

- Hydronalix
- Integral Consulting Inc.
- Marinesitu, Inc.
- Subseasal LLC

Joint Topic: Compact Power Conditioning Systems for High-Torque, Low-Speed Machines

- RCT Systems, Inc.

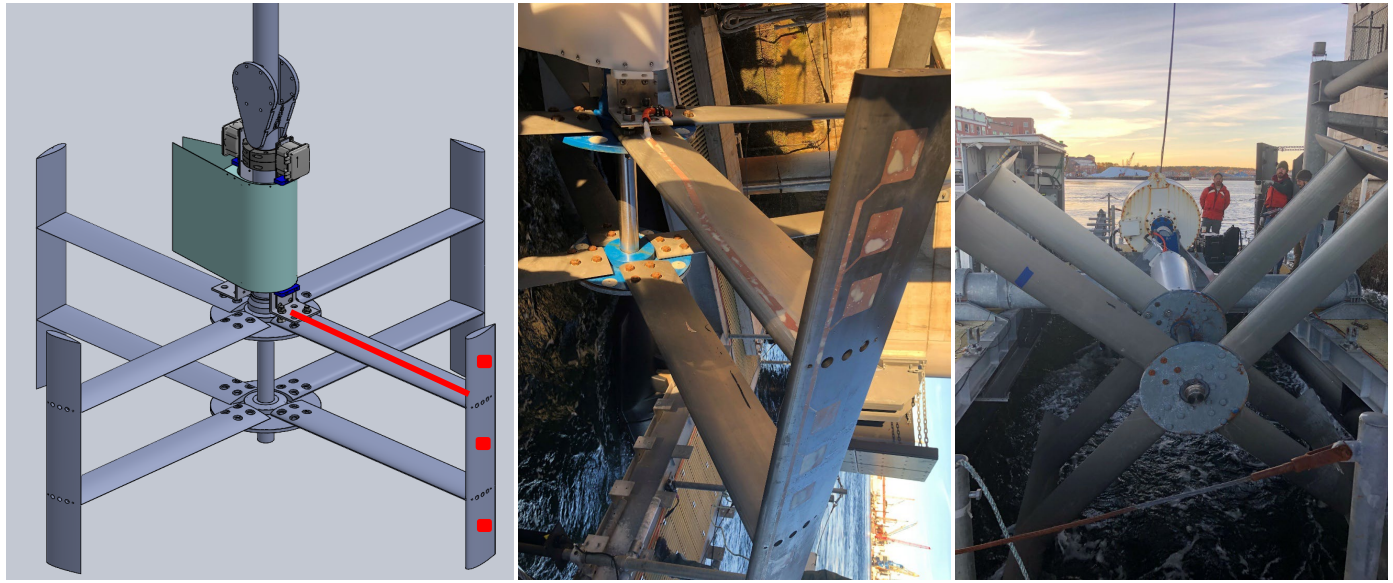
Topic: Technology Transfer Opportunity: Electrochemical Recycling Electronic Constituents of Value (E-RECOV)

- Quantum Ventura Inc.

NREL/UNH Crossflow Tidal Energy Converter

Goal

Retrofit an existing, commercially available crossflow tidal turbine deployed on Memorial "Living" Bridge in Portsmouth, New Hampshire, to further expand the data available for numerical model improvements and advance the understanding of operational loading characteristics.



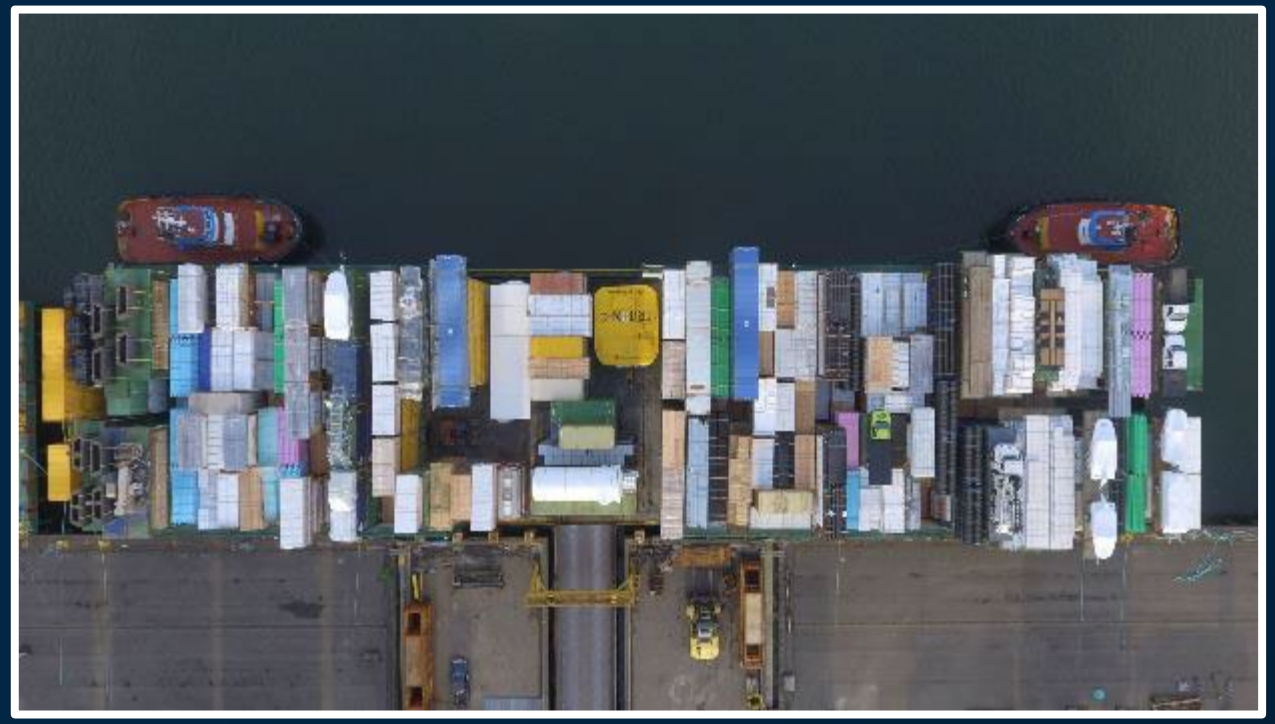
Project Timeline

- **Nov. 2020**: Project kick off.
- **Jan.-Dec. 2021**: Modernize and recommission the Memorial "Living" Bridge's MODAQ system and perform an initial measurement campaign with the existing system.
- **Jan.-Sept. 2022**: Design, review, build, and complete lab calibration and system verification of the blade sensing system.
- **Oct.-Dec. 2022**: Instrumented blade and data acquisition system re-installed at Memorial "Living" Bridge and tidal energy converter testing.
- **Jan.-Sept. 2023**: Complete data analysis and publish results.

https://www.nrel.gov/news/program/2022/living-bridge-to-clean-energy.html

Oscilla Power

- Triton-C has been transported to Hawaii in preparation for ocean testing.
- The system will deploy at the U.S. Navy's Wave Energy Test Site (WETS).
- Deployment is expected in December!



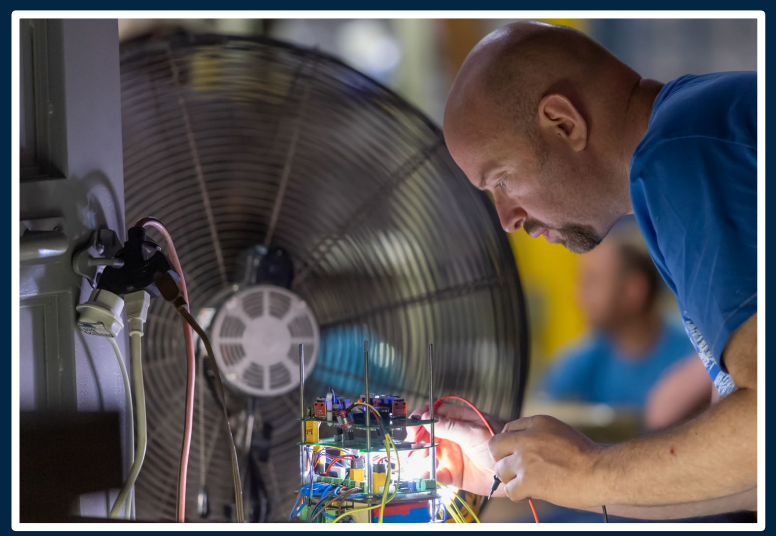
Waves to Water Concludes with Testing in North Carolina

DRINK Finale

- Competitors demonstrated their wave energy-powered desalination systems.
  - 1st Prize Winner: Oneka Snowflake
  - Finalists MarkZero Prototypes, WATER BROS, and Project 816 also received cash prizes for placing in categories for most water produced, lowest weight, simplest assembly, and simplest deployment.
- Finalists competed for up to $1 million in cash prizes.
- Testing took place off Jennette's Pier in North Carolina and was supported by the Coastal Studies Institute.
- Unexpected weather conditions shortened testing window significantly.

Ocean Observing Prize

- BUILD Contest participants tested their devices in state-of-the-art wave tank at the U.S. Navy's Maneuvering and Seakeeping Basin in Carderock, Maryland, in June 2022.
- Winners:
  1. Maiden Wave Energy Rover (Philadelphia, PA)
  2. Wave Powered Oceanographic Gliders (Tallahassee, FL)
  3. EEL Drone (Los Angeles, CA)

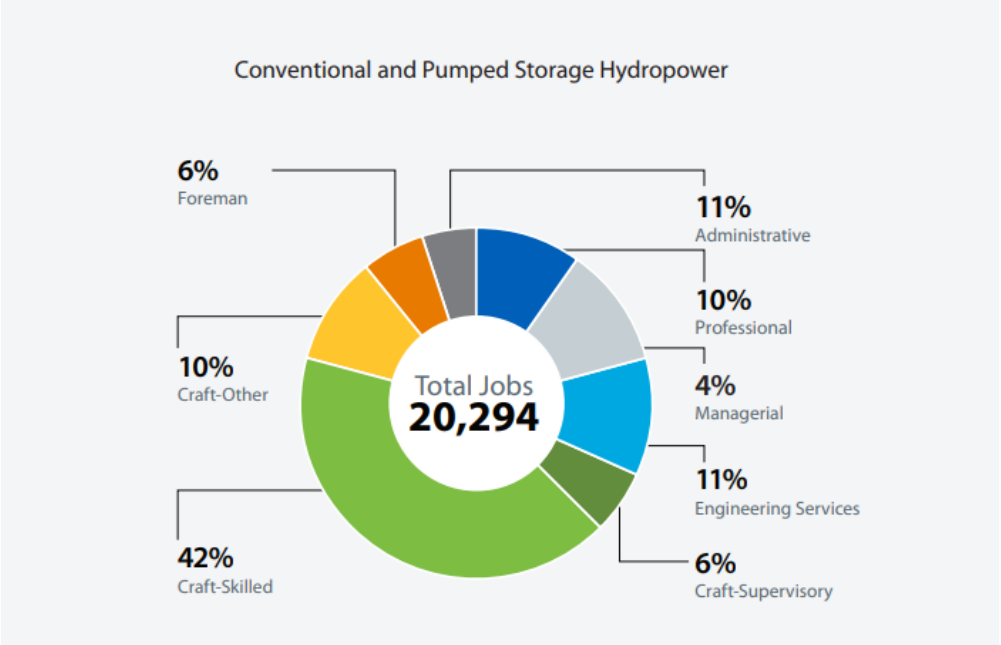


STEM/Workforce Updates

Hydropower Workforce Report

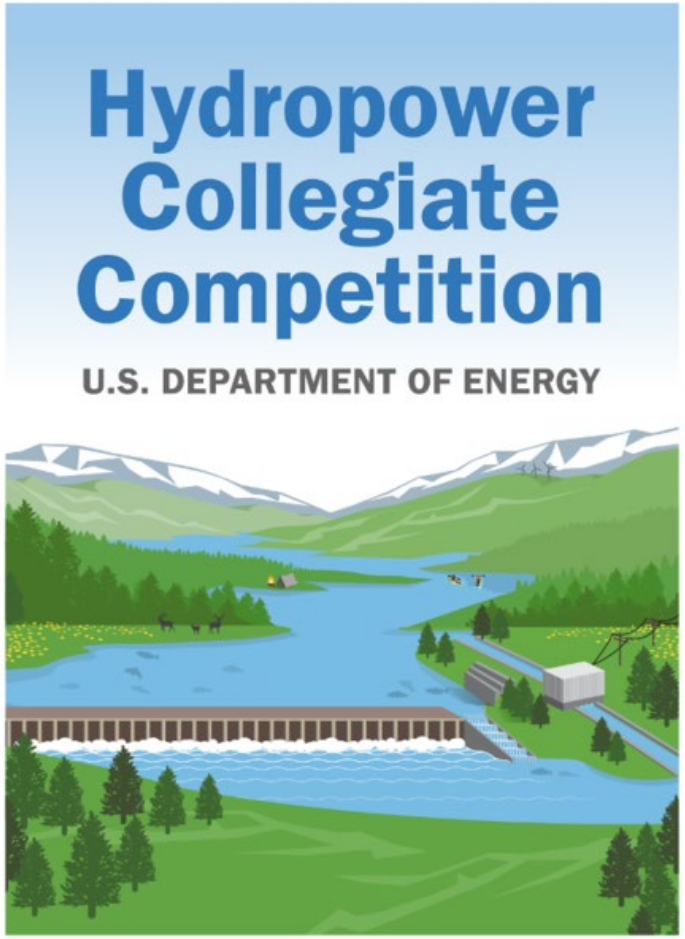
- A new, diverse workforce is critical to the industry's ability to sustain current operations and grow.
- More hydropower-focused educational and training opportunities are needed to address recruitment and hiring challenges.
- The workforce pipeline could be strengthened by providing more hydropower coursework, expanding hands-on learning opportunities for students through efforts such as collegiate competitions, and creating new programs like fellowships that provide relevant work experience.
- Challenges with recruiting and new hydropower workers' job readiness could be overcome by expanding technical training, apprenticeships, and educational outreach.

Hydropower relies heavily on crafts and tradespeople and these jobs are in high competition in the U.S. workforce.



Hydropower Collegiate Competition

- First year of the competition with 11 teams of students participating.
- Administrated by the National Renewable Energy Laboratory and the Hydropower Foundation.
- Incentivizes interdisciplinary teams of undergraduate and graduate students from a variety of academic programs to propose unique solutions to address the challenge of how hydropower can play a critical role in enabling 100% clean energy.



Marine Energy Collegiate Competition (MECC)

- 17 student-led teams competed in May 2022.
  - First Place: Webb Institute
  - Second Place: Oregon State University
  - Third Place: University of New Hampshire

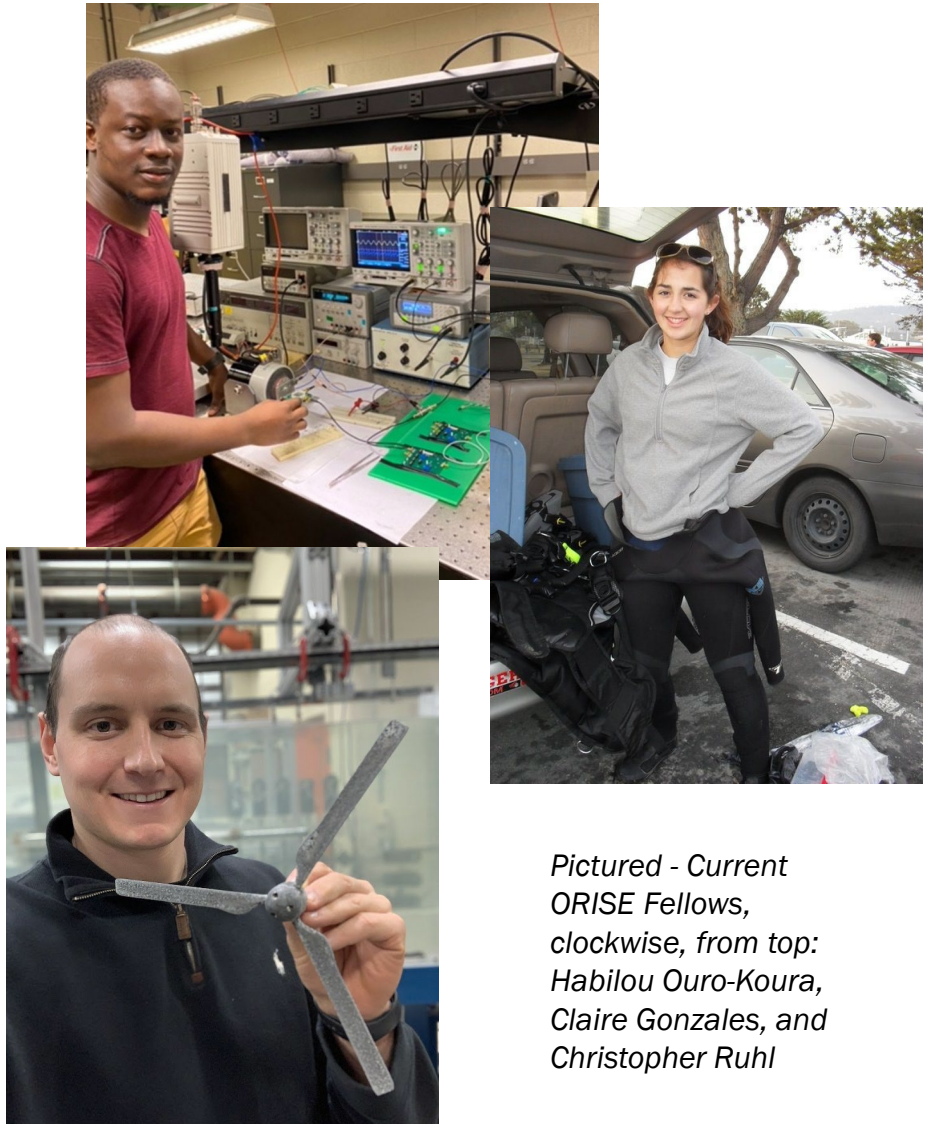
- Individual Categories
  - Best Community Outreach: Webb Institute
  - Best Build and Test: Virginia Tech, partnering with University of Maine
  - Best Business Plan: University of Washington
  - Best Pitch: Michigan Technological University
  - Best Poster: Federal University of Rio de Janeiro
  - Best Technical Report: University of Massachusetts – Dartmouth
  - Out-of-the-Tank Award: Virginia Tech, partnering with Stevens Institute of Technology

- 19 teams will compete in MECC 2023!

Marine Energy Graduate Student Research Program

- Now in its fifth cohort and administered by Oak Ridge Institute for Science and Education (ORISE).
- Previously open only to doctoral candidates but now open to master's students as well.
- Fellows conduct research at their academic institution and at an external host facility carrying out research in marine energy. Host facilities can be a government research facility, industry site, or other WPTO-approved facility.
- **Applications are due on December 2.**
  - Research plan
  - Copy of transcripts
  - Letter of support from host facility
  - One letter of recommendation
  - Resume

https://orise.orau.gov/marine-energy-research-program



Pictured - Current ORISE Fellows, clockwise, from top: Habilou Ouro-Koura, Claire Gonzales, and Christopher Ruhl

WPTO Funding and Technical Assistance Opportunities

Hydropower opportunities

- Innovative Technologies to Enable Low-Impact Hydropower and Pumped Storage Hydropower Growth
- Stakeholder Insight Into Hydropower R&D Issues
- Pumped Storage Hydropower Wind and Solar Integration and System Reliability Initiative
- Advancing Fish Passage and Protection Technologies
- HydroWIRES technical assistance program

Marine energy opportunities

- Marine Energy Systems Innovation at Sea
- TEAMER
- Tidal and River Current Energy Advancement *(funding opportunity to be released in early 2023)*

Crosscutting opportunities

- SBIR *(funding opportunity to be released on December 12, 2022)*

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Q&A

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