WPTO Semiannual Stakeholder Webinar

March 1, 2021

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

WATER POWER TECHNOLOGIES OFFICE

Webinar Logistics

- **All listeners have been muted as this webinar will be recorded, transcribed, and shared on our website and in a future edition of the Water Wire.**
- **If you have issues with the webinar, please send us a note using the chat box on the right-hand side of your screen.**
- **The webinar will conclude with a Q&A session. Please send questions by 4:00PM ET to WaterPowerTechnologiesOffice@EE.DOE.GOV.**
  - 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.

Agenda (in Eastern Time)

3:30-3:35 Introduction

3:35-4:20 2020 Recap

- Legislative & Staffing Update
- 2019-2020 Accomplishments Report
- Hydropower Program Updates
- Marine Energy Program Updates

4:20-4:35 Water Power & the Biden Agenda

- Remarks and Q&A with Kelly Speakes-Backman and Alejandro Moreno

4:35-4:45 Looking Ahead: WPTO Priorities & Events

4:45-4:55 Q&A with WPTO Staff

4:55-5:00 Closing

Today's Speakers

Allison Johnson
Engagement and Outreach Lead

Matt Grosso
Operations Supervisor

Jenn Garson
Senior Advisor

Kelly Speakes-Backman
Acting Assistant Secretary for Energy Efficiency and Renewable Energy

Tim Ramsey
Marine Energy Program Manager

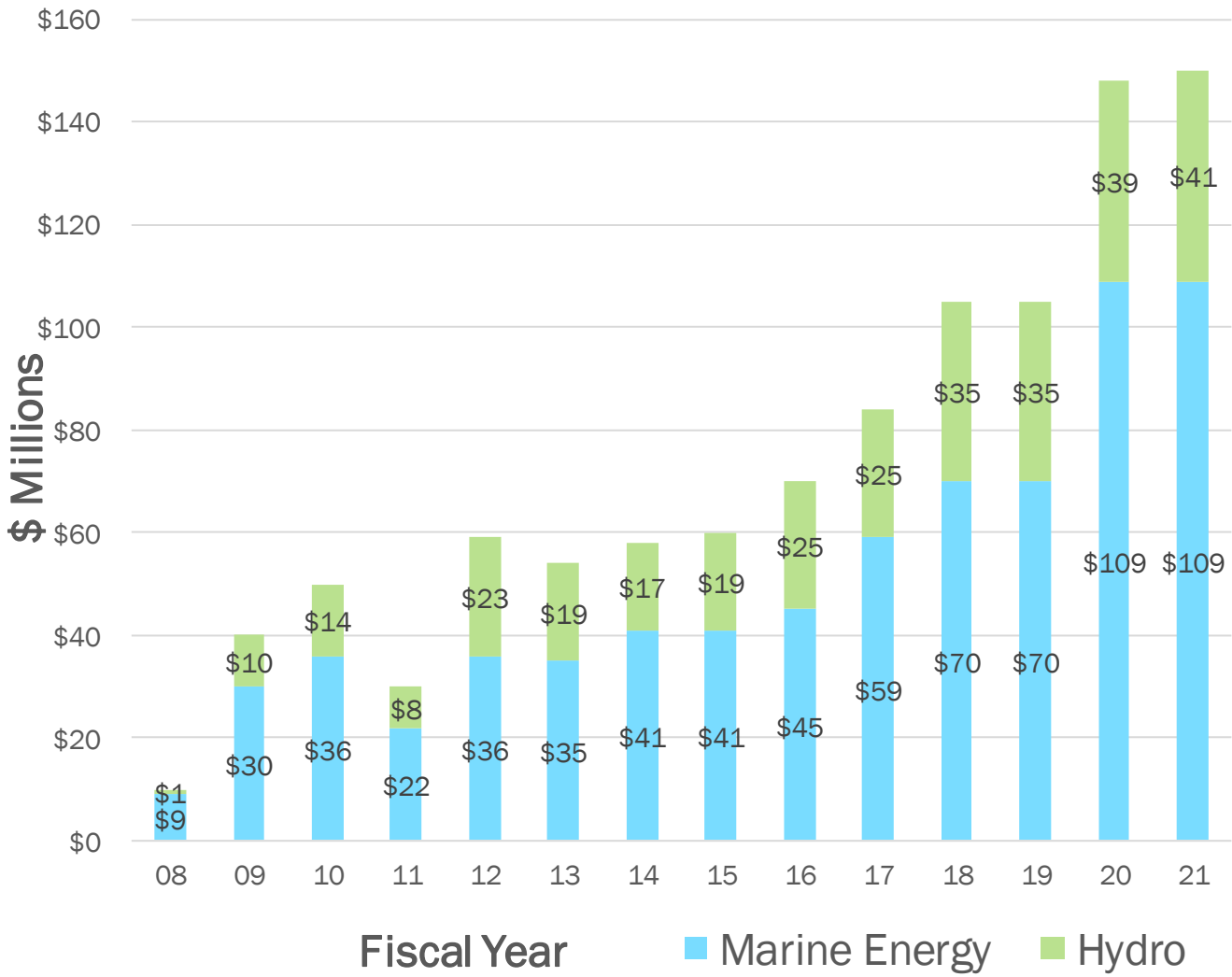
Tim Welch
Hydropower Program Manager

Sam Bockenhauer
HydroWIRES Lead

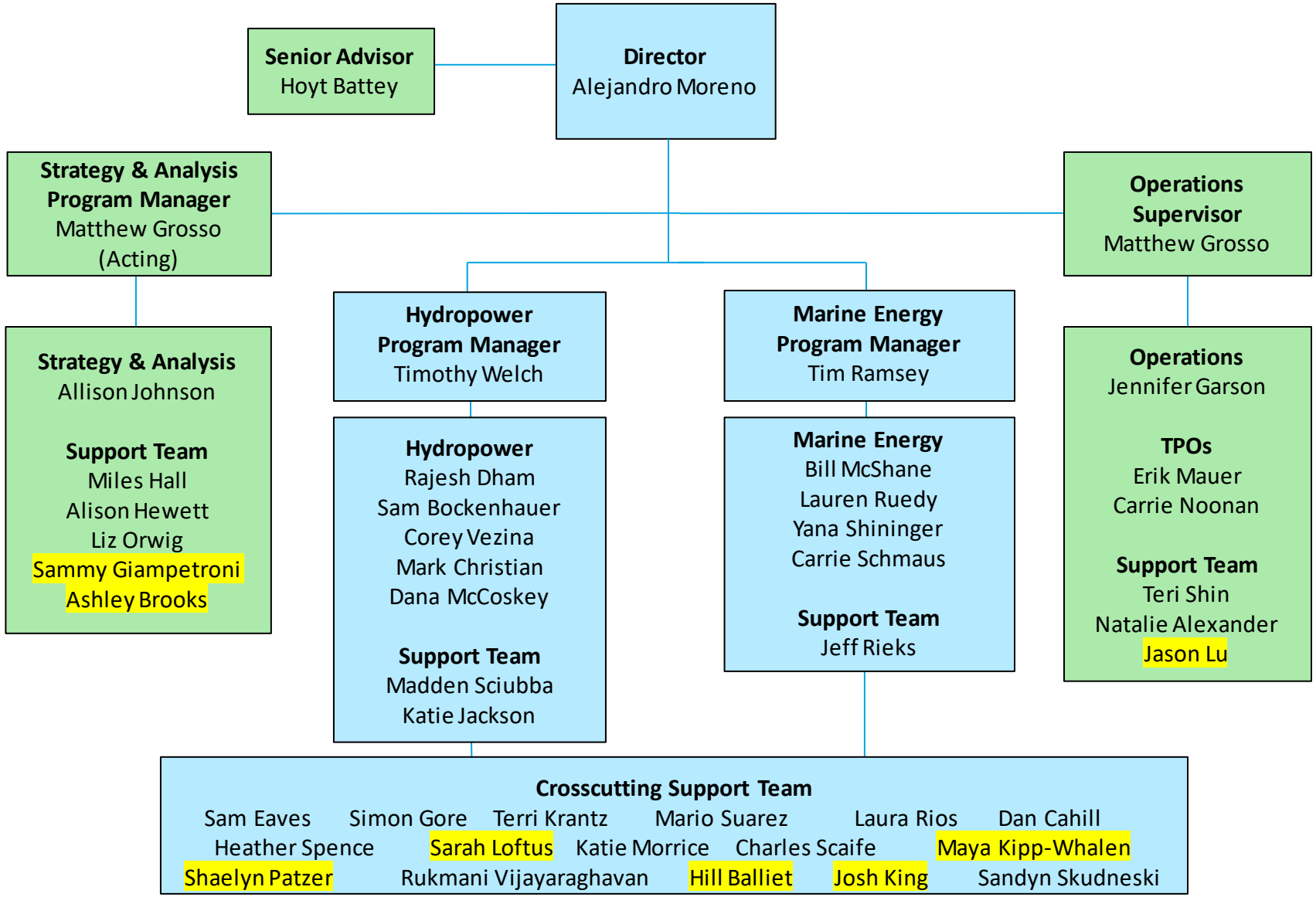
Alejandro Moreno
WPTO Director & Acting Deputy Assistant Secretary for Renewable Power

WPTO Budget & New Congressional Direction

- WPTO is currently funded at the high level since its establishment at $150M, with $109M for marine energy and $41M for hydropower.
- The MHK Program is now named the Marine Energy Program due to new authorization language.
- Congress directed an expansion of EPACT 242 to include small hydro facilities in areas with inadequate electric service.



New Individuals Have Joined Our Team in the Last Year



WPTO's Released its 2019-2020 Accomplishments Report

WPTO's 2019-2020 Accomplishments report provides a compilation of some important successes within WPTO's research and development efforts for both the hydropower and marine energy industries, including:

- accomplishments from 16 hydropower projects active during 2019-2020,
- accomplishments from 16 marine energy projects acting during 2019-2020,
- and discussion of 16 projects across both programs with significant milestones planned in 2021.

Going forward, we intend to publish these reports annually.

Visit the WPTO website to dive into the report.

Hydropower Program Updates

Tim Welch & Sam Bockenhauer

Federal Agencies Establish New Hydropower MOU

- DOE, the Bureau of Reclamation, and the U.S. Army Corps of Engineers signed a new Memorandum of Understanding (MOU) on August 24.
- This MOU builds on previous work between the agencies to strengthen long-term coordination, prioritize similar goals, and align ongoing and future renewable energy development efforts.
- A detailed action plan, developed with the support and input from all three agencies including the Power Marketing Administrations, is forthcoming which outlines new projects the agencies proposed across five topic areas:
  1. Asset Management
  2. Value of Hydropower
  3. Workforce
  4. Water Supply Reliability
  5. Environmental Outcomes

Latest Congressional Direction for the Hydro Incentive Program

Updated Eligibility

(1) Qualified hydroelectric facility.--The term `qualified hydroelectric facility' means a turbine or other generating device owned or solely operated by a non-Federal entity--

(A) that generates hydroelectric energy for sale; and

(B)(i) that is added to an existing dam or conduit; or

(ii)(I) that has a generating capacity of not more than 20 megawatts;

(II) for which the non-Federal entity has received a construction authorization from the Federal Energy Regulatory Commission, if applicable; and

(III) that is constructed in an area in which there is inadequate electric service, as determined by the Secretary, including by taking into consideration:

(aa) access to the electric grid;

(bb) the frequency of electric outages; or

(cc) the affordability of electricity.

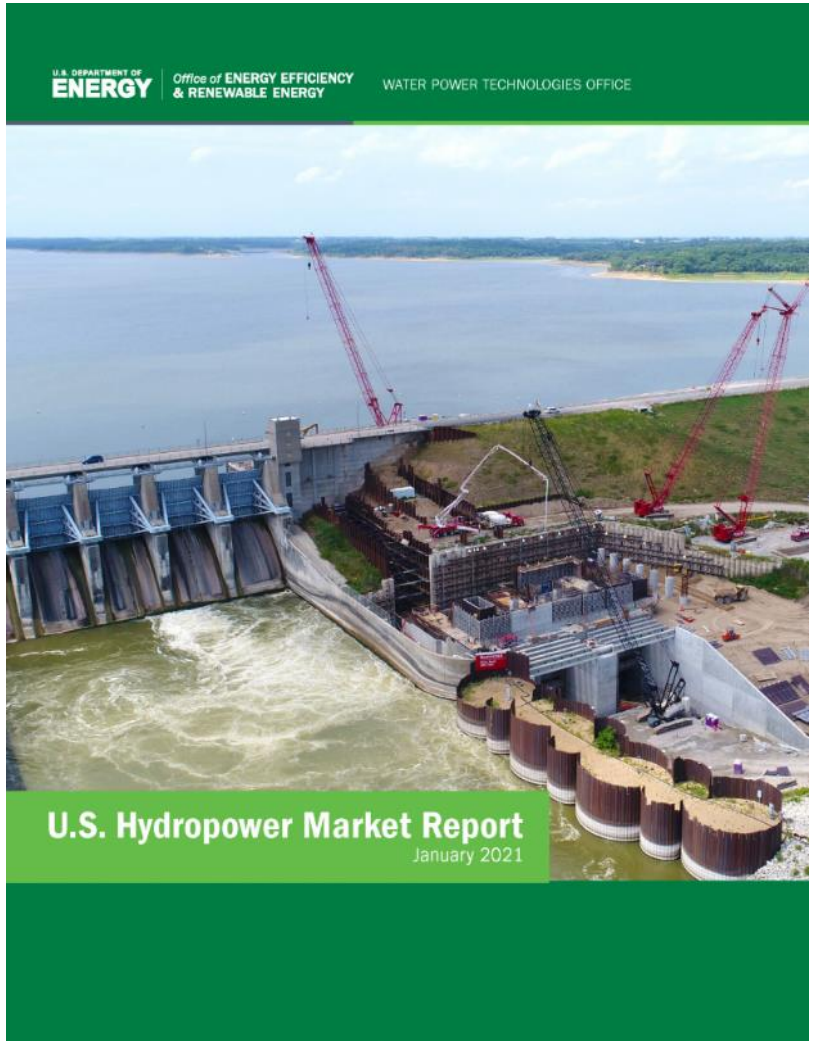
Program Extension

Congress reauthorized appropriation for fiscal years 2021-2036.

Next Steps:

- Clearly define new language
- Seek public input through a Request for Information (RFI)

Hot Off the Press: a New Hydropower Market Report

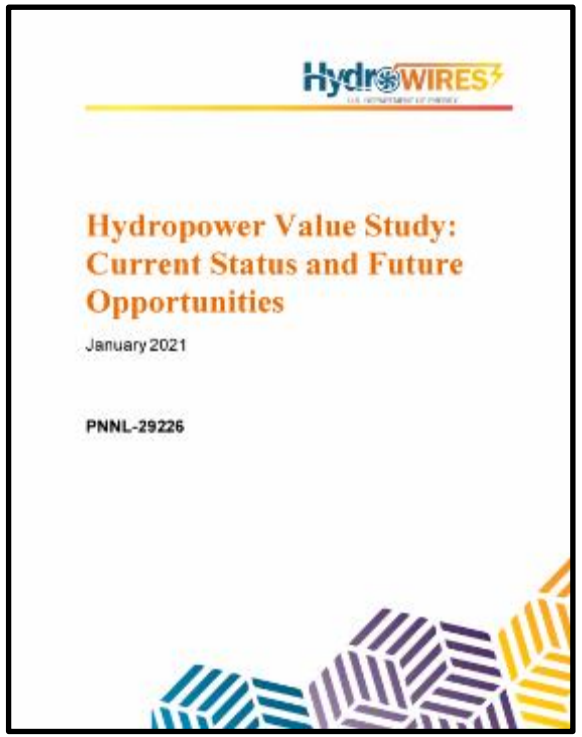


A few key messages:

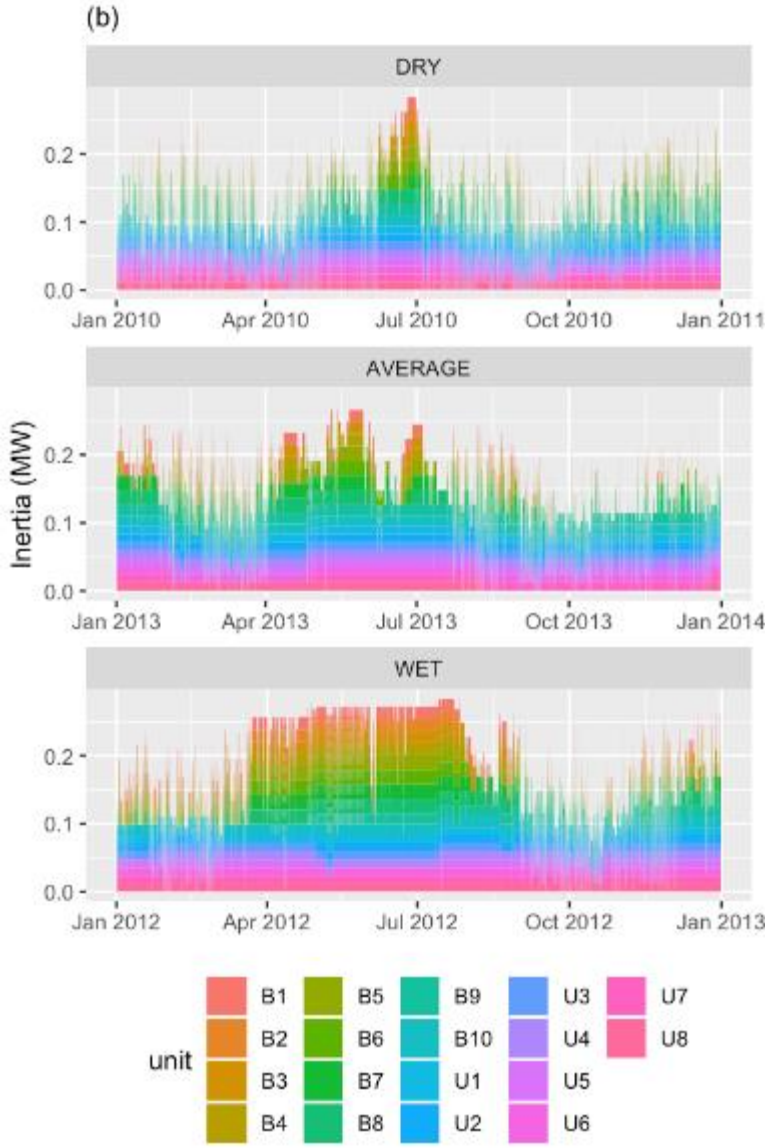
1. In the U.S. over the past decade, **pumped storage capacity grew by almost as much as all other types of energy storage combined.**
2. **Hydropower "punches above its weight" regarding provision of various ancillary services** (compared to % of installed capacity, in nearly every region and metric analyzed, including black start, 1-hour ramps, frequency regulation and reserves)
3. Most U.S. hydropower capacity increases are not from new developments, but rather **increases at existing facilities, new hydropower in conduits and canals, and by powering non-powered dams.**
4. **FERC relicensing activity is set to more than double in the coming decade** (almost half of the PSH fleet).

Join our webinar on March 31 to learn more about the report's key findings. bit.ly/WPTOWebinarHydroMarketReport

Hydropower Value Study: Changing Roles for Hydro



Example result: Rock Island plant inertia provision varies greatly across wet and dry years.



1. **Hydropower operations are evolving** in many parts of the country because of changing grid conditions.
2. Hydropower generators are **important contributors to grid reliability.**
3. There is **wide variation** in hydropower plant conditions and capabilities to provide grid services.
4. Traditional economics for hydropower plants **may not provide stable revenue** into the future.
5. Although not all services that hydropower provides are currently monetized, **new markets for grid services are emerging** that can offer alternative revenue streams.

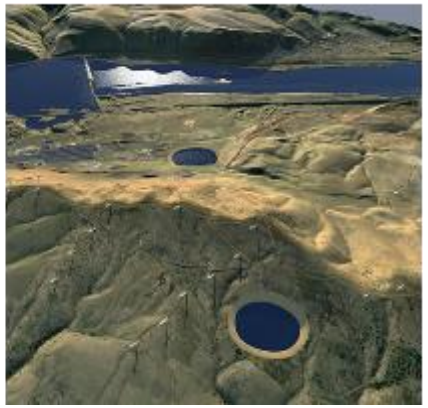
See energy.gov/hydrowires for the report!

Coming This Month: PSH Valuation Guidebook

- Comprehensive guidebook for determining the value of pumped storage hydropower (PSH) plants and their many services and contributions to the power system.
- Nearing completion of case studies that apply the guidebook to two proposed PSH projects.
- Also developing an online PSH valuation tool to "bring the guidebook to life" and connect with state-of-the-art power system models.

Banner Mountain PSH
- 400 MW, quarternary technology
- Closed loop
- Located near Caspter, WY

Goldendale Energy Storage Project
- 1,200 MW, adjustable speed technology
- Closed loop
- Located on WA/OR border



01 Prepare Input Data

02 Develop Two IRP Cases
Case 1: without the PSH plant
Case 2: with the PSH plant

03 Select IRP Simulation Models
Select IRP simulation models based on the key features and availabiliy

04 Conduct IRP Simulations
Run simulations for two cases using capacity expansion planning tools

05 Assess the Avoided Costs
Determine the differences in capital investment and fixed O&M costs between two cases

International Forum on Pumped Storage Hydro

HydroWIRES U.S. DEPARTMENT OF ENERGY

IFPSH

- Kicked off in November 2020, the IFPSH is a government-led multi-stakeholder platform to shape and enhance the role of the 'world's water batteries' in future power systems.
- Working groups and chairs include:
  - Sustainability (EDF Hydro)
  - Policy and Market Frameworks (GE Renewables)
  - Capabilities, Costs, and Innovation (Voith Hydro)

Pumped Storage Hydropower International Forum

EDF GE VOITH

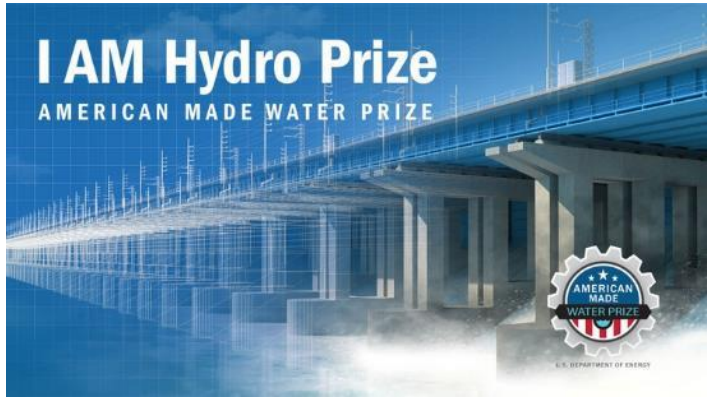
Other international efforts:

- Deputy Chair of the IEA Hydropower Technical Collaboration Programme
- US-Norway MOU on Hydropower R&D in areas of:
  - Optimization and modeling
  - Technology R&D
  - Environmental performance
- Collaboration with Canada and Mexico on the North American Renewable Integration Study (coming soon!)

iea

HydroCen
NORWEGIAN RESEARCH CENTRE FOR HYDROPOWER TECHNOLOGY

Four Prizes Crowdsourced Hydropower Innovation



I Am Hydro Prize

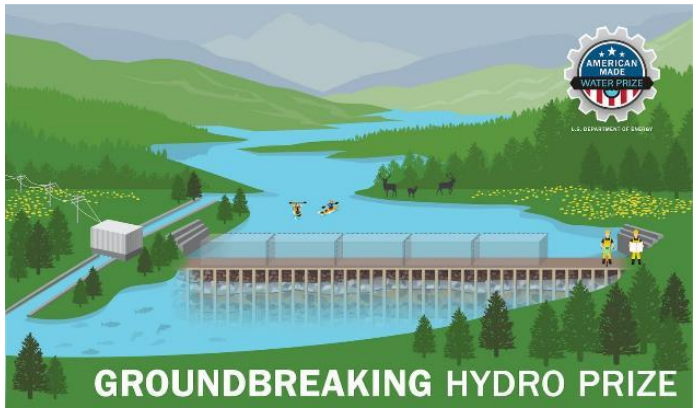
- Lower the costs of hydropower components and facilities by leveraging advanced manufacturing technologies
- Single stage ideation prize, $175K in cash prizes for 11 winning teams

Fish Protection Prize

- Catalyzing new solutions, designs, and strategies to prevent fish from swimming into water infrastructure.
- In partnership with the Bureau of Reclamation
- 9 finalists worked with PNNL to develop solutions and present at PITCH contest at the American Fisheries Society.
- $700,000 of combined cash prizes and voucher support 3 winning teams.

FAST Commissioning for Pumped-Storage Hydropower Prize

- Next-generation pumped-storage hydropower development and the encouragement of exploration for new use cases of PSH.
- $550k of combined cash prizes & voucher support
- 9 finalists, 4 grand prize winners.



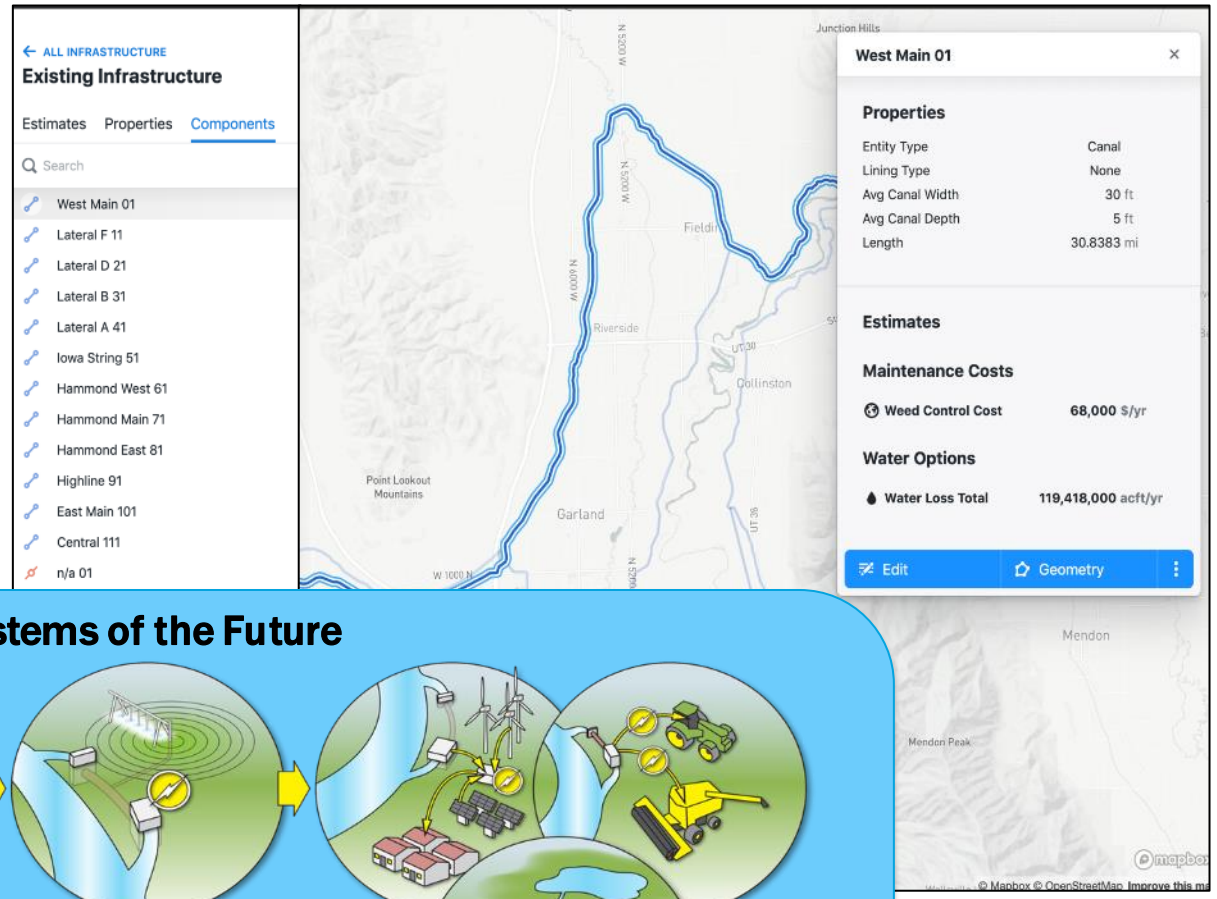
Geotechnical Foundations Prize *(winners to be announced soon!)*

- Lower the costs of foundations in standard modular hydropower
- Single-stage ideation prize with up to $300,000 in prizes

In Development: Irrigation Modernization Tool

Benefits of Modernization

- Increase agricultural revenues
- Decrease operations and maintenance costs
- Reduce herbicides in canal system
- Improve water availability and quality for fish
- Increase hydropower potential



In Development: Hydropower Digital Twins

- A digital twin is a tool which, if appropriately tailored, can be applied to a wide variety of hydroplant applications
- As with all investments, scale and specificity must be commensurate with the value provided
- Ease of site customization is also key to industry impact

Applications Include:

Cybersecurity
Detecting network intrusion, enabling AI based Red/Blue Teams

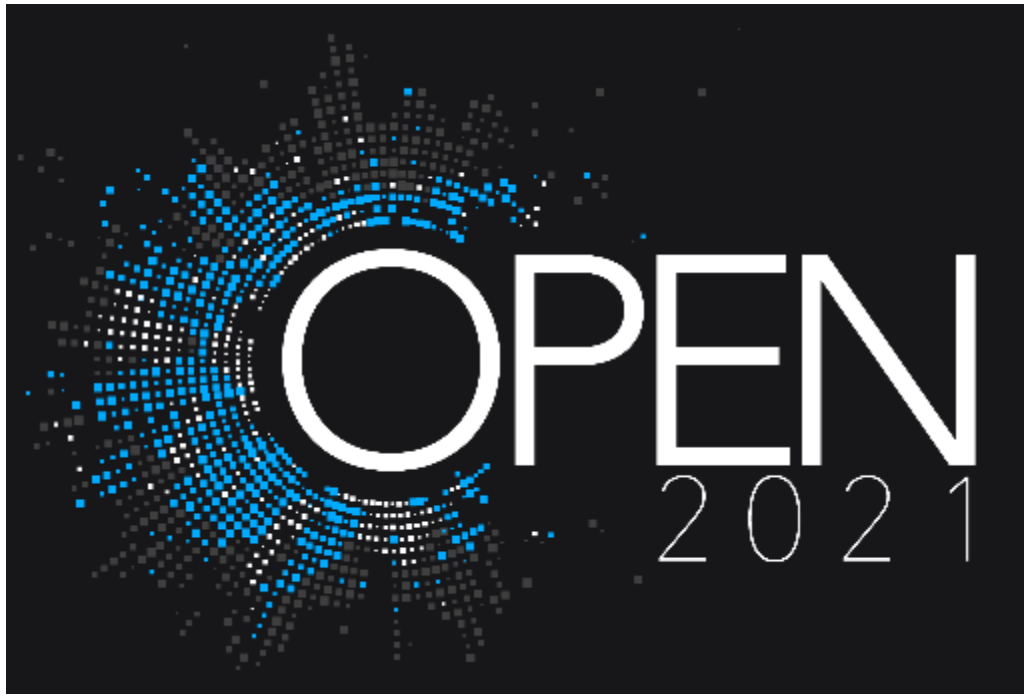
Operations and Maintenance
Improved maintenance timing and reduced system downtime

Investment and Market Planning
"What If" analysis of market scenarios and component impacts

Marine Energy Program Updates

Tim Ramsey & Jenn Garson

$100M Open Funding Opportunity from ARPA-E



Concept papers are due April 6!

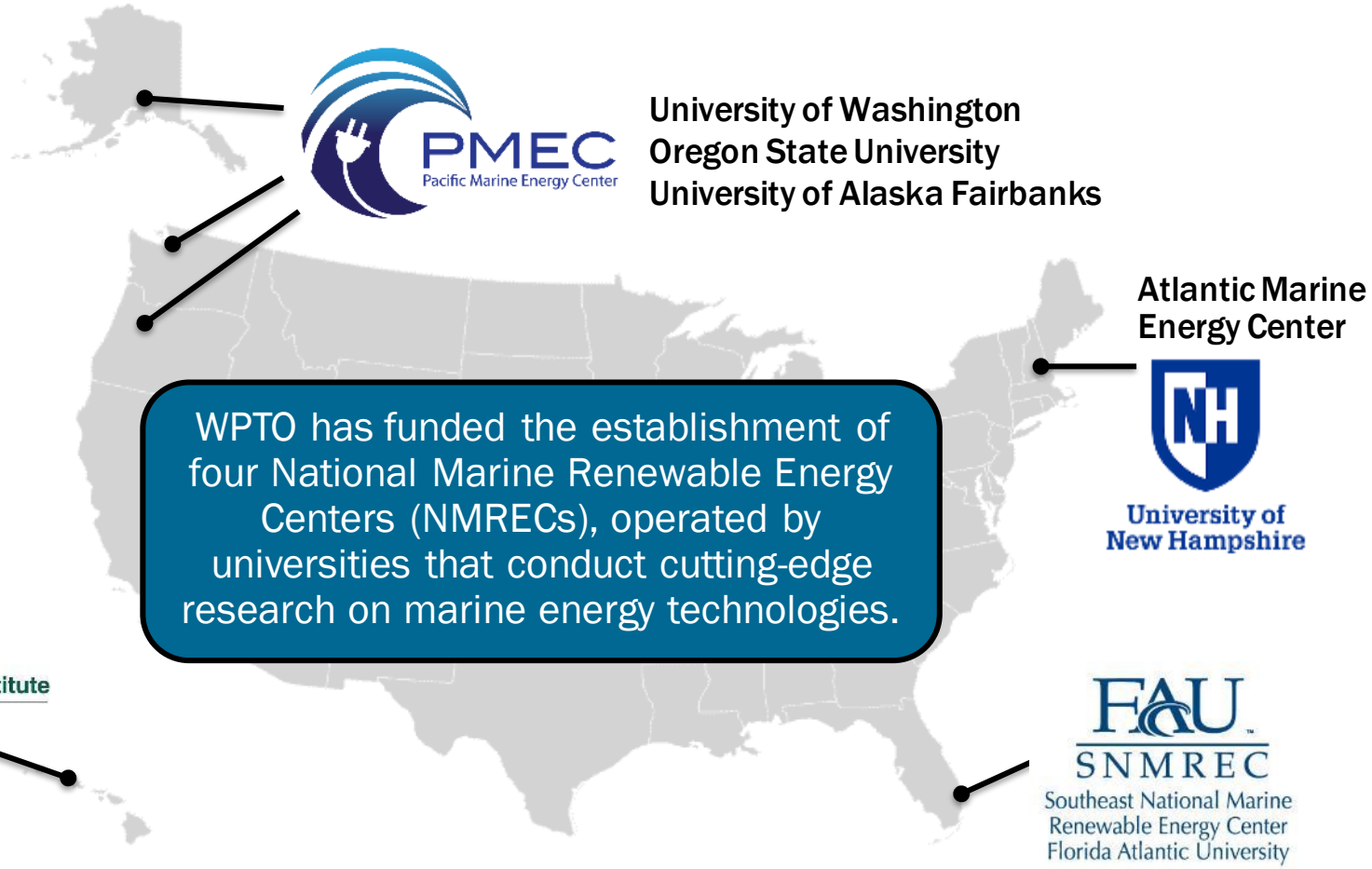
arpa·e
Advanced Research Projects Agency • ENERGY

On February 11, the Advanced Research Projects Agency-Energy's (ARPA-E) announced $100 million for transformative clean energy solutions.

The 2021 opportunity includes multiple categories relevant to marine energy and ocean research, such as power generation from hydrokinetics and non-automotive ground/sea transportation.

$22M in Foundational R&D and Testing Infrastructure

In December 2020, WPTO announced selections for an **Atlantic Marine Energy Center**, the development of **a mobile test vessel for current energy converters**, foundational **research at 7 organizations**, and a **Foundational Research Network Facilitator** (the Pacific Ocean Energy Trust [POET]) to maximize the impact of research carried out across the many different non-federal research institutions.



POWERING the BLUE ECONOMY

Goals

- Assess the value of marine energy in remote communities and emerging blue economy markets
- Develop and deploy marine energy technologies based on end-user needs
- Accelerate marine energy technology readiness

Tools

- Prizes: Ocean Observing, Waves to Water
- SBIR/STTR topic: Marine Energy Co-development
- National lab R&D
- Community-centric partnerships for solutions
- Innovation ecosystem support
- Testing infrastructure

Community

- National labs and universities
- Small businesses
- Existing and new to portfolio innovators
- Remote and isolated regions
- Blue economy end-users
- Federal agencies
- Investors

Powering the Blue Economy, 2019-Present

National Lab R&D

- 35 PBE Seedling projects funded at more $2 million in FY20 and FY21; Saplings projects in Spring 2021
- 10 end-user informed foundational R&D projects
- Infrastructure upgrade reviews underway

Prizes

- More $1.9 million awarded in prizes & competitions
- 50 awards from 200+ solutions submitted

Small Business Innovation Research (SBIR)

- More than $2 million awarded to 11 projects in FY20; FY21 awards in Spring 2021

Energy Transitions Initiative Partnership Project (ETIPP)

- WPTO invested $2 million of $5.5 million multi-office, multi-lab partnership
- First cohort of communities selected Spring 2021

EDA Build2Scale

- WPTO contributed $2 million to the $4 million interagency program, 7 communities selected

Atlantic Marine Energy Center (AMEC)

- $5 million awarded to University of New Hampshire led consortium for advancing the marine energy industry and PBE

NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Pacific Northwest
NATIONAL LABORATORY

POWERING the BLUE ECONOMY
Marine Energy Collegiate Competition
U.S. DEPARTMENT OF ENERGY

WAVES TO WATER

SBIR·STTR
America's Seed Fund

Co-Development of Marine Energy Technologies at Smaller Scales

E·D·A
U.S. ECONOMIC DEVELOPMENT ADMINISTRATION

Build to Scale Program
the Office of INNOVATION *and* ENTREPRENEURSHIP

WPTO is Looking for In-kind Prize Sponsors

What Do Sponsors Do?

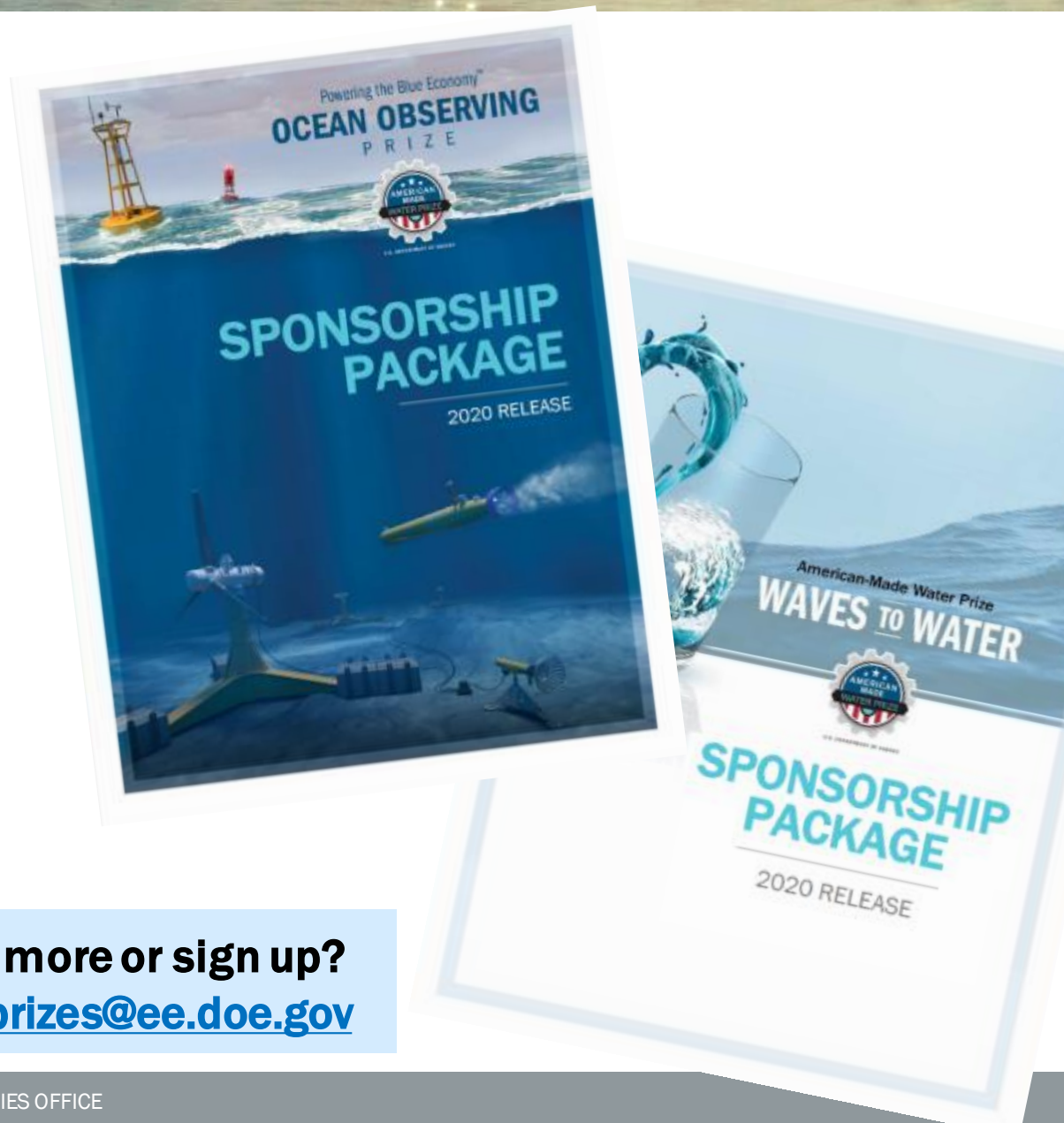
- **AMPLIFY A PRIZE** by helping DOE spread the message.
- **ASSIST COMPETITORS** preparing for the technical elements of the prize.

Who Can Sponsor?

- Non-profits and NGOs
- State and federal agencies
- Venture capital investors
- Consulting firms
- Academic institutions
- Community organizations

Why Get Involved?

- Help support the **acceleration of water power technology innovation.**
- **Be part of a network** of innovators, technical experts, academics, industry professionals, incubators, and investment partners.
- **Promotion for your organization**, including your name and logo displayed on the website, appearance in promotional materials, and inclusion on our list of supporters.



Want to learn more or sign up?
Contact wptoprizes@ee.doe.gov

Energy Transitions Initiative Partnership Project (ETIPP)

- 3-year, multi-office, multi-lab, public-private partnership to support remote and island communities to assess and plan for a more energy resilient future.
- Cross-sector initiative to combine the technical assets of the labs, build on tools developed by EERE, and work alongside community-based organizations pursuing energy transition efforts.
- Results from the project will increase WPTO's ability to have communities assess a mix of resources.
- Allow for de-risking of tidal and in-stream devices deployment at scale by better understanding resources and needs in communities that can use these energy resources to support their resiliency.

Recent Marine Energy In-Water Demonstrations

The Igiugig Village Council and ORPC in Alaska

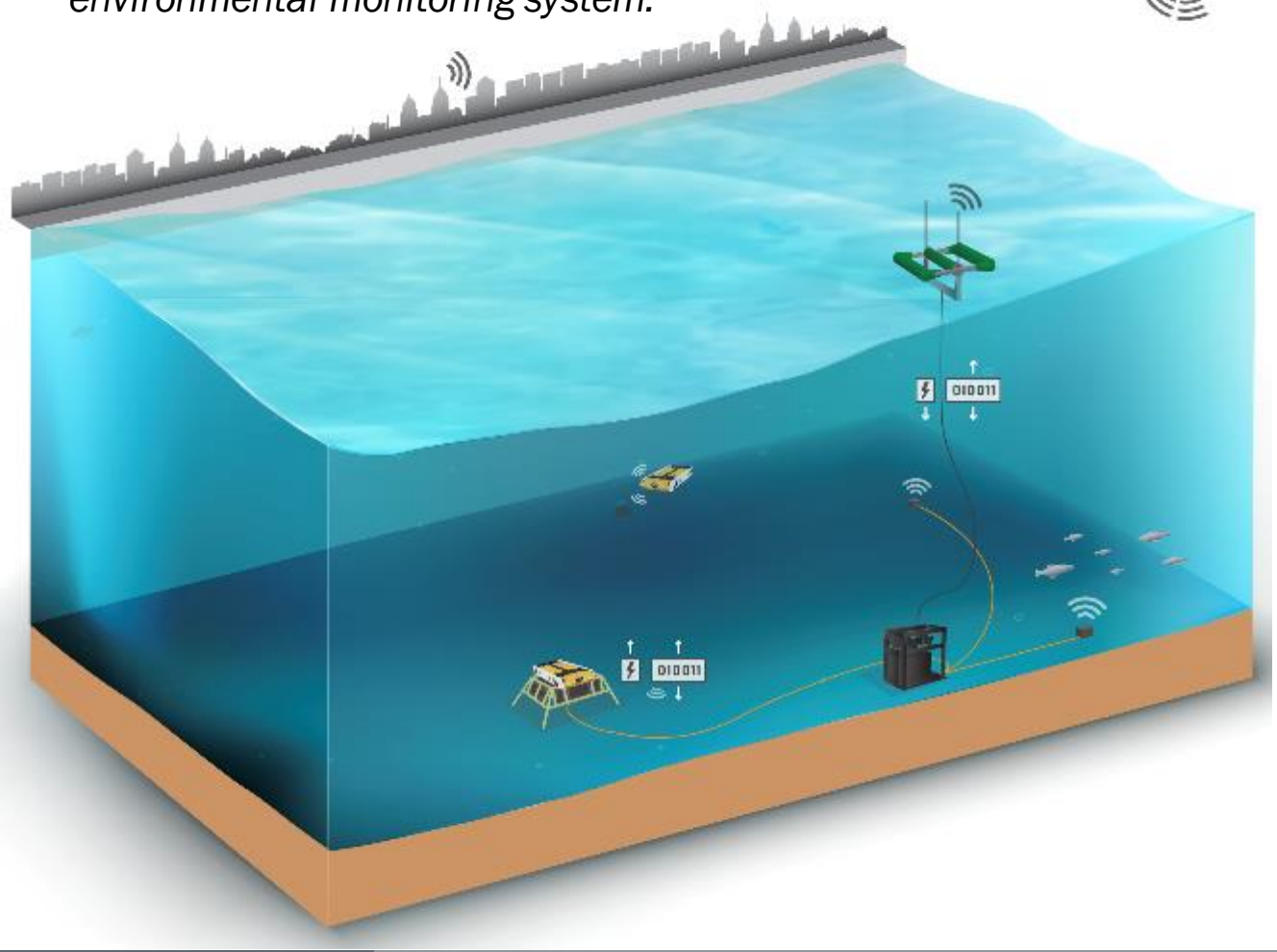
ORPC's RivGen is the longest operating current energy converter in the U.S. No negative interactions were observed with migrating salmon, and a second device is planned to be added in summer 2021.

Verdant Power in New York's East River

On January 27, Verdant reported its 3 tidal power turbines on a new TriFrame mount set a record for U.S. marine energy generation by demonstrating 100% reliability while generating 100 MWh in 85 days of continuous operation.

Upcoming Marine Energy In-Water Demonstrations in 2021

Depiction of SeaRAY autonomous offshore power system (AOPS) deployed with Saab Sabertooth autonomous underwater vehicle (AUV) and BioSonics environmental monitoring system.



Company	Device	Site
OSCILLA power	Triton-C wave energy converter	Navy's Wave Energy Test Site (WETS) in Hawaii
C-POWER power from the next wave	SeaRAY will power a Saab AUV	Navy's Wave Energy Test Site in Hawaii
BioSonics	Perimeter Detector	Navy's Wave Energy Test Site in Hawaii
CalWave Power Technologies	Submerged wave energy converter	Scripps in California
integral consulting inc.	NoiseSpotter acoustic monitoring system	Scripps in California

Pacific Northwest NATIONAL LABORATORY

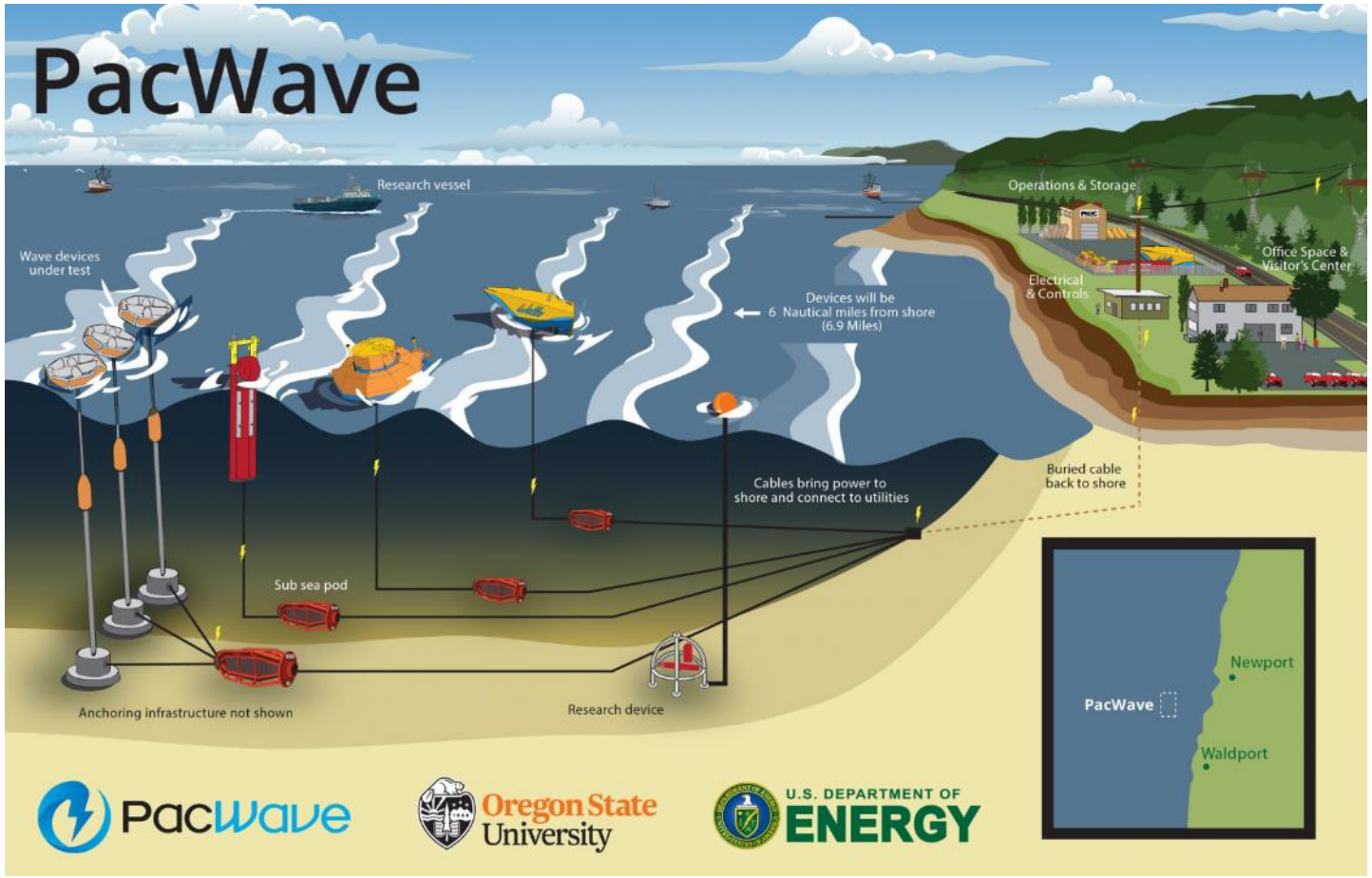
TRITON

BioSonics and Integral are supported by PNNL's Triton initiative.

PacWave Achieves a Major Milestone with BOEM Lease

License & Permit Updates

- The Bureau of Ocean Energy Management (BOEM) issued a lease for PacWave.
- This is the first time BOEM has issued a lease for marine energy research off the U.S. West Coast.
- Lease issuance is a prerequisite for a license from the Federal Energy Regulatory Commission (FERC), which is the federal agency that would approve project construction and operations.

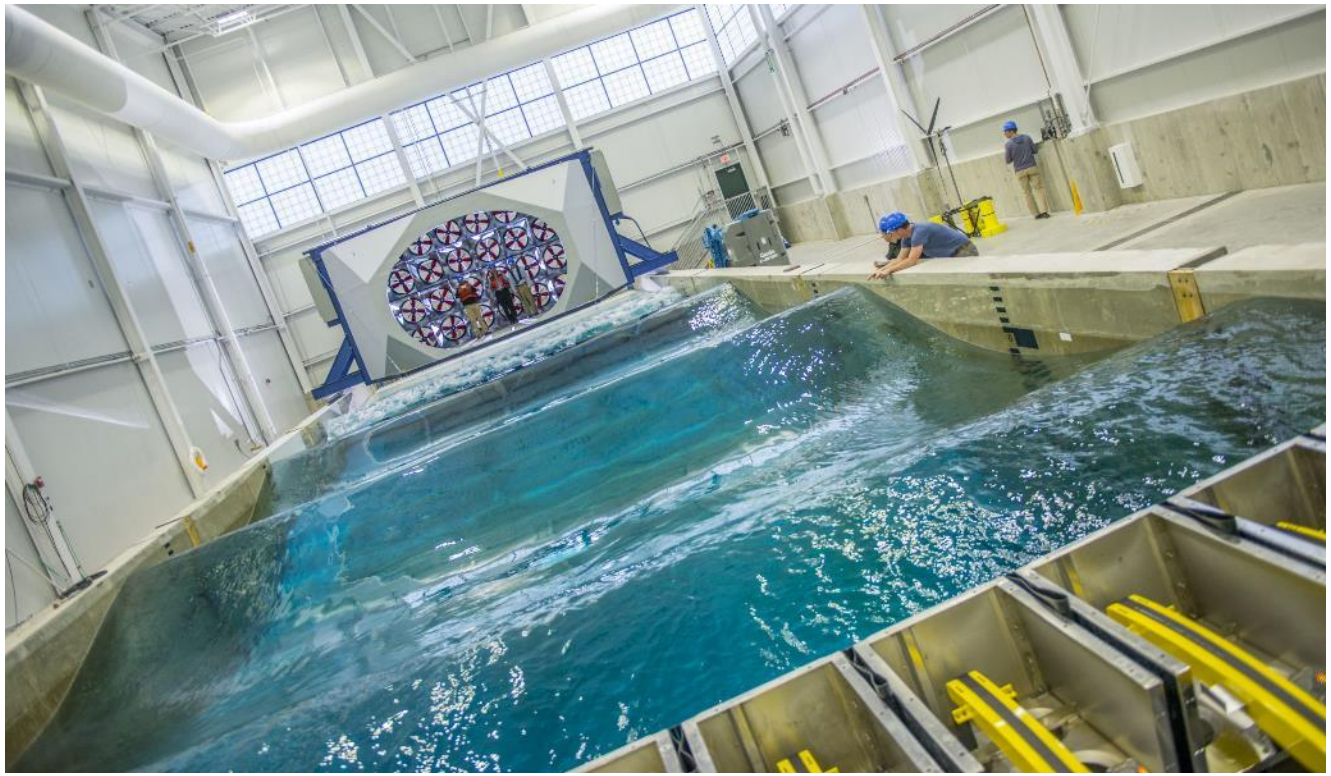


PacWave will be the first grid-connected, pre-permitted wave energy test facility in the U.S.

Dozens of Projects Supported in TEAMER's First Year

TEAMER
Testing & Expertise for Marine Energy

- 3-year testing campaign
- $16M program – support 100+ projects
- 20+ facilities involved and thousands of hours technical assistance to be provided
- The program director, Pacific Ocean Energy Trust (POET) announced on September 29 that **16 projects** were selected in its first Request for Technical Support (RFTS).
- Earlier today, POET announced selections for **23 projects** from its second RFTS.

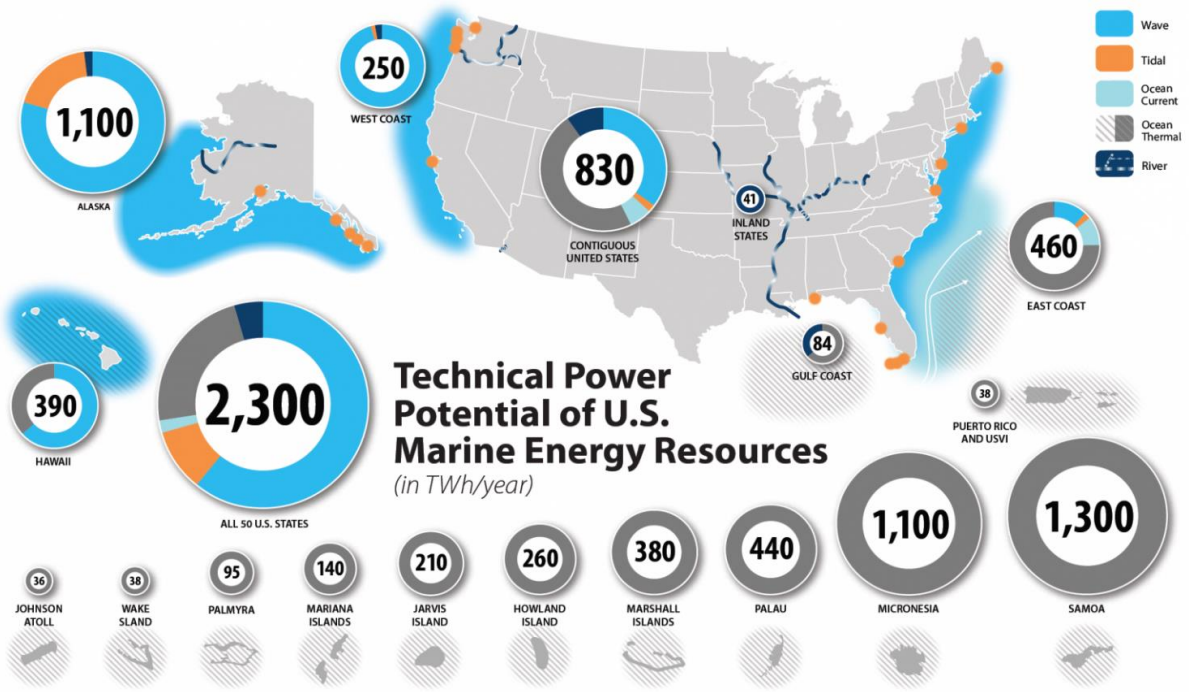


The University of Maine's Alfond W2 Ocean Engineering Laboratory, a TEAMER facility.

The application period for TEAMER's next RFTS is expected to open in April 2021.

Multiple Big Reports Published in the Last Few Months, Including:

A new NREL report, published last week, summarizes the best available data on U.S. marine energy resources.



The 2020 State of the Science report presents the most comprehensive summary of the science related marine energy's potential environmental effects.

NREL
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Kelly Speakes-Backman, Acting Assistant Secretary for Energy Efficiency and Renewable Energy

Kelly Speakes-Backman is the Principal Deputy Assistant Secretary for the Office of Energy Efficiency and Renewable Energy (EERE), and Acting Assistant Secretary at the U.S. Department of Energy. In her role, Speakes-Backman leads and directs the Office of Energy Efficiency and Renewable Energy, focused on creating and sustaining American leadership in the transition to a global clean energy economy. She oversees the planning and execution of the organization's $2.8B portfolio of research, development, demonstration, and deployment activities in energy efficiency, renewable energy, and sustainable transportation.

Speakes-Backman most recently served as the first CEO of the Energy Storage Association, the national trade organization for the energy storage industry. She has spent more than 20 years working in energy and environmental issues in the public, NGO, and private sectors. In 2019, Speakes-Backman was honored by The Cleanie Awards as Woman of the Year.

Our Programmatic Priorities

To put the U.S. on an irreversible pathway to achieve carbon-free electricity sector by 2035 and a 100% clean energy economy by 2050:

1. Address grid analysis, modernization, and integration
2. Decarbonize transportation: air, sea, rail, road
3. Decarbonize energy-intensive industries
4. Reduce the carbon footprint of buildings
5. Enable a net-zero agricultural sector

Our Principles

To accomplish those five programmatic goals we must:

- Advance diversity, equity, and inclusion in STEM
- Provide workforce training and support the creation of millions of good-paying, middle-class clean energy jobs with the opportunity to join a union
- Ensure 40% of the overall benefits of relevant federal investments are delivered to disadvantaged communities

Water Power and the Biden Agenda

Improvement of Water Power Renewables Key to a Fully Decarbonized Grid: Hydro is the most easily dispatchable firm resource, and marine energy is highly predictable. These attributes make water power technologies key to integrating more variable renewables and achieving a fully decarbonized grid.

Water Systems are Changing with the Climate, and We Need to Know How: Water power technologies can serve as invaluable assets in a 100% renewables future and serve the energy needs of climate impacted communities, but we need to understand how these systems are impacted by changing weather patterns and plan for future water utilization and competing needs. This includes addressing hydrologic impacts and extreme weather.

Water Power Forges Pathways to Economic and Community Resilience: There is an opportunity to reimagine the way we use and deliver water power, including more resilient infrastructure, upgrading and modernization of dams, producing clean water, unlocking the full potential of all ocean resources, and better aligning technology development with end users and communities.

Strong Jobs Pathways through the Future of Water: Hydropower has an aging workforce, and so offers strong, well-paying careers to a new workforce generation; marine energy holds promise for jobs from ports to remote communities, to developing solutions far out at sea, and both offer local manufacturing potential.

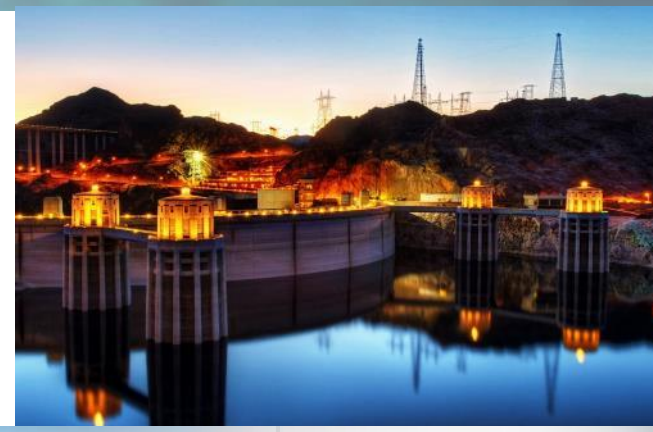
Q&A with Kelly & Alejandro

Kelly Speakes-Backman
Acting Assistant Secretary for Energy Efficiency and Renewable Energy

Alejandro Moreno
WPTO Director & Acting Deputy Assistant Secretary for Renewable Power

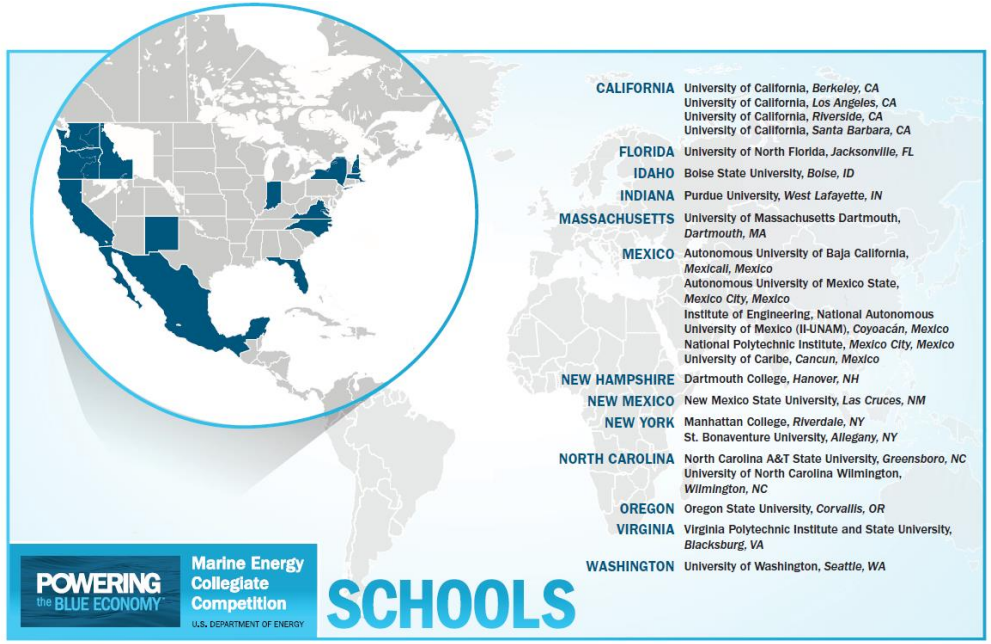
Long-term Priorities for WPTO

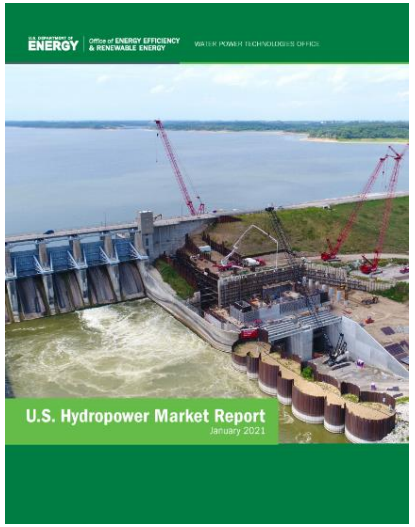
1. Optimize U.S. hydropower and pumped storage hydropower (PSH) to support renewables integration and a 100% clean energy grid.
2. Ensure 21st century hydropower is environmentally sustainable and fully resilient to climate change.
3. Reduce the costs of grid-scale marine renewable energy to enable a fully-renewable grid.
4. Deploy marine energy systems to catalyze and unlock new economic, climate resiliency, and scientific opportunities in the ocean.
5. Develop and advance water power and water systems to increase resiliency critical for remote communities and hard-to-decarbonize applications.



Upcoming Public Events with WPTO Involvement

Event	Dates	Host
2021 CEATI Hydropower Conference	March 2-4	CEATI
Workshop on the DOE Marine Energy Collegiate Competition	March 9	WPTO, NREL, the Hydropower Foundation
Key Industry Trends for U.S. Hydropower: An Overview of the 2021 Edition of the U.S. Hydropower Market Report	March 31	WPTO; ORNL presenting
Marine Energy Collegiate Competition - Team Pitches	April 26-27	WPTO & NREL; ICOE side event
Marine Energy Collegiate Competition – Awards Ceremony	April 29	WPTO & NREL; ICOE side event
2021 International Conference on Ocean Energy	April 28-30	NHA; WPTO is a sponsor
2021 Waterpower Week	April 28-30	NHA





Q&A and Thank You For Joining!

This Q&A session will conclude the webinar.

The webinar will be recorded, transcribed, and shared in a future edition of the Water Wire.

Thank you for joining us today!

Best ways to learn more or stay in touch with WPTO:

1. Follow **the Water Wire newsletter** for periodic updates on funding opportunities, publications, and events.
2. Sign up for WPTO's new **hydropower and marine energy listservs** for technology-specific updates on tools, analysis, and emerging technologies, as well as invites to our **new R&D Deep Dive Webinar Series**.
3. Visit **energy.gov/eere/water** to learn more about the office and its R&D programs.
4. Have a question we didn't get to today? Email us directly at **WaterPowerTechnologiesOffice@ee.doe.gov.**