## DOE's Water Power Technologies Office (WPTO)



Energy Efficiency & Renewable Energy



#### **Overview of WPTO**

Alejandro Moreno WPTO Peer Review October 8, 2019

#### Peer review is defined as:

A rigorous, formal, and documented evaluation process using objective criteria and qualified and independent reviewers to make a judgment of the technical/ scientific/business merit, the actual or anticipated results, and the productivity and management effectiveness of an Office's portfolio of projects.<sup>2</sup>

- Essential to providing robust, documented feedback to inform program planning
- Essential to designing future program and to enhancing existing efforts

FY17, FY18, Q1 and Q2 of FY19 (October 2016 – March 2019)
 Projects with industry & academia as well as national



- Gather important feedback to inform the future of water power R&D. Assess past accomplishments and challenges to inform the future.
- Enable all participants (not just reviewers) to provide feedback on the future of WPTO and the programs' strategic direction through:
  - dedicated networking breaks and discussion time throughout the week, in addition to Q&A sessions
  - comment boxes in all session rooms for attendees to submit feedback anonymously
  - end-of-review Town Hall on Thursday
    afternoon (open feedback forum with WPTO staff for all Peer Review attendees)



# Water Power Technologies Office – Topline numbers over the years

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Program	FY 2013 Enacted		FY 2014 Enacted		FY 2015 Enacted		FY 2016 Enacted		FY 2017 Enacted		FY 2018 Omnibus		FY 2019 Appropriations	
МНК	\$	35,456,000	\$	41,275,000	\$	41,100,000	\$	45,000,000	\$	59,000,000	\$	70,000,000	\$	70,000,000
Hydro	\$	19,231,000	\$	17,290,000	\$	19,200,000	\$	25,000,000	\$	25,000,000	\$	35,000,000	\$	35,000,000
Total	\$	4,687,000	\$	58,565,000	\$	60,300,000	\$	70,000,000	\$	84,000,000	\$	105,000,000	\$	105,000,000



## DOE's Office of Energy Efficiency and Renewable Energy



**ENERGY** Energy Efficiency & Renewable Energy

**ENERGY** Energy Efficiency & Renewable Energy

The U.S. Department of Energy's Water Power Technologies Office enables research, development, and testing of emerging technologies to advance marine energy as well as next generation hydropower and pumped storage systems for a flexible, reliable grid.

WPTO invests in earlystage research to accelerate development of innovative water power technologies while ensuring that long-term sustainability and environmental issues are addressed. WPTO supports efforts to validate performance and grid-reliability for new technologies, develop and increase accessibility to necessary testing infrastructure, and evaluate systems-level opportunities and risks. WPTO aggregates, analyzes and disseminates relevant, objective, technical information on water power technologies and related issues to stakeholders and decision-makers.

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#### In pursuing its objectives, the Water Power Technologies Office always endeavors to:

- Catalyze **innovation** in technology and science
- Steward natural resources and support the public good
- Expand access to affordable, reliable and secure energy
- Invest taxpayer funds wisely and to drive the greatest **impact**
- Collaborate and actively seek *input* from stakeholders and partners
- Be transparent and share results widely

![](_page_7_Picture_1.jpeg)

#### Water Power Technologies Office

![](_page_7_Figure_3.jpeg)

#### Marine Energy

![](_page_8_Picture_1.jpeg)

![](_page_8_Figure_2.jpeg)

## **COST-EFFECTIVE MARINE ENERGY**

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#### Marine Energy: Activities

![](_page_9_Picture_1.jpeg)

![](_page_9_Figure_2.jpeg)

# WPTO's R&D approaches to address hydropower challenges

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![](_page_10_Figure_2.jpeg)

# Expanding to new areas where we can have major impact: HydroWIRES

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The HydroWIRES (Water Innovation for a Resilient Electricity System) portfolio is organized into four interrelated research areas. Five national laboratories are investigating **the contribution of hydropower resources to the reliability and resiliency of the national electric power system**.

DOE Hydropower Program Strategy Hydropower Program's Strategic Approaches Big-Data Access and Management Environmental R&D and Hydrological Systems Science R&D for Low-Impact Hydro Growth Upgrades, and Security Storage

Value under Evolving System Conditions Understand the needs of the rapidly evolving grid and how they create opportunities for hydropower and PSH.

"What will the grid need?"

<u>Capabilities and Constraints</u> Investigate the full range of hydropower's capabilities to provide grid services, as well as the machine, hydrologic, and institutional constraints to fully utilizing those capabilities. *"What can hydropower do?"* 

![](_page_11_Picture_7.jpeg)

#### **Operations and Planning**

Optimize hydropower operations and planning—alongside other resources—to best utilize hydropower's capabilities to provide grid services.

"How can hydropower best align what it can do with what the grid will need?"

#### **Technology Innovation**

Invest in innovative technologies that improve hydropower capabilities to provide grid services.

"What new technology could expand what hydropower can do to meet grid needs?"

![](_page_11_Picture_14.jpeg)

Argo

![](_page_11_Picture_15.jpeg)

![](_page_11_Picture_16.jpeg)

Expanding to new areas where we can have major impact: Powering the Blue Economy<sup>™</sup> Initiative

# Key Messages

- Potential market opportunities where marine energy may hold a unique value proposition to meet the energy needs of the blue economy.
- Technology attributes of marine energy beneficial to many blue economy markets:
  - the ability to provide both electrical and mechanical power
  - minimal surface expression improving storm
    survivability
  - opportunities for co-design and integration with other infrastructure;
  - the ability to leverage existing maritime supply chains
  - marine energy devices are inherently designed to remove energy from ocean resources instead of fight against them.

U.S. DEPARTMENT OF

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**Renewable Energy** 

## Funding mechanisms: multiple options

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**Externally Distributed Competitions** – Vehicles to fund competitive solicitations that aim to identify and fund solutions or ideas that are developed by private industry.

- **FOAs** Long term, multi-year, with serious funding commitment.
- **Prizes** Focused application or attention-focusing, smaller funding awards and faster timeline. Often interdisciplinary, and attracts new performers.
- **SBIR/STTR** Available to startups and small businesses, specific for prototyping and commercialization.

Lab-Led/Executed Solicitations with Industry Focus – Mechanisms that leverage the expertise and resources of the National Laboratories, with the intended recipient being industry or academia.

**CRADAs** – Can be used as a vehicle for either support on competitive solicitations (light form), or through direct agreements between labs and industry. Could include vouchers.

**Notice of Technical Assistance (NOTA)** – Funded support by DOE available to industry competitively.

National Lab - DOE Contract Only – Agreements between National Labs and the DOE, with the Labs being the recipient of the funds.

- **Lab Calls** Competitive call to labs, with multi-year agreements.
- **Annual Operating Plans** Annually reviewed plans, managed by DOE staff.
- **Request for Innovation** Light competition to find new ideas to fund at the labs.
- **Technology Commercialization Fund (TCF)** Commercialization funding available to labs to work directly with industry on tech transfer.

**Mechanisms with Other Agencies** – Mechanisms to conduct funded work with other federal agencies.

- **Broad Agency Announcements (BAA)** Interagency call, typically for technologies.
- **Interagency Agreements (IAA)** Agreements between agencies for joint work or solicitations.

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![](_page_15_Picture_0.jpeg)

# Just a few of the things WPTO staff are excited about...

# Reimagining new hydropower: Natel's watershed approach

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**Restoration Hydro<sup>TM</sup>:** A watershed approach to

standard modular new hydropower

![](_page_16_Picture_2.jpeg)

By linking power generation, river restoration, and recreation, Restoration Hydro will improve the

- environmental performance,
- social acceptability,
- permit-ability
- and cost-effectiveness of new streamreach Standard Modular Hydropower projects

Innovative Design Concepts for Standard Modular Hydropower and Pumped Storage Hydropower (FOA 1836)

![](_page_16_Figure_9.jpeg)

![](_page_17_Figure_2.jpeg)

## Marine energy technologies in the water

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Ocean Renewable Power Company RivGen<sup>®</sup> in Kvichak River Igiugig, Alaska – July 2019

![](_page_18_Picture_3.jpeg)

Coming soon: Verdant Power in the East River again in 2020

-OCEANENERGY

#### **NOAA & DOE: Prize focused on marine energy for ocean observation**

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![](_page_19_Picture_2.jpeg)

**3** Underwater Vehicle

Charging

# Join the challenge!

#### americanmadechallenges.org/oceanobserving

![](_page_19_Picture_5.jpeg)

ECO

Energy in Maritime Markets

nril 2019

**Opportunities for Marine Renewable** 

Advancing control system designs with industry partners and national labs

U.S. DEPARTMENT OF Energy Efficiency & Renewable Energy

Studies have shown that advanced control can provide 200-300% increased in Wave Energy Capture energy absorption.

![](_page_20_Picture_3.jpeg)

![](_page_20_Picture_4.jpeg)

CHANGING WHAT'S POSSIBLE

![](_page_20_Picture_6.jpeg)

Sandia

![](_page_20_Picture_7.jpeg)

![](_page_20_Picture_8.jpeg)

![](_page_20_Picture_9.jpeg)

![](_page_20_Picture_10.jpeg)

## MHK Environmental Monitoring

![](_page_21_Picture_1.jpeg)

![](_page_21_Picture_2.jpeg)

Annex IV State of the Science Report: look out for the 2020 release PNNL-led Triton Initiative is supporting field testing of 6 environmental monitoring technologies (competitive awards).

![](_page_21_Picture_5.jpeg)

# Developing better monitoring technologies to evaluate environmental impacts

![](_page_22_Picture_1.jpeg)

![](_page_22_Picture_2.jpeg)

![](_page_22_Picture_3.jpeg)

#### A few of the patents that have resulted...

- Capability to develop a self-powered fish (PZT) tag demonstrated. Patent for transmitter filed March, 2016
- Injectable acoustic transmitter patented July, 2018
- Sensor Fish Patented September, 2018
- Sensor Fish Commercially Licensed October, 2018
- Sensor Fish Mini Patented April, 2019
- Eel/Lamprey Acoustic Transmitter Patented September, 2019
- Non-toxic coating for invasive mussel prevention patented March, 2019

![](_page_22_Picture_12.jpeg)

![](_page_22_Picture_13.jpeg)

# Industry and lab partnership to apply new dissolved oxygen technologies

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![](_page_23_Picture_2.jpeg)

New GE Aerating Turbine installed at Cube Hydro's High Rock Hydropower Project

![](_page_23_Picture_4.jpeg)

#### GO HYDRO

#### Cube Hydro Commissions 1st of a Kind GE Aerating Turbine May 28 2019 | Cube Hydro | News

- the 1st-of-a-kind GE retrofitted dissolved oxygen runner installed at High Rock,
- the Cube designed linear aeration valve
- and the piloted real-time and Autonomous Hydropower Water Quality Monitoring System being developed by PNNL

![](_page_23_Picture_10.jpeg)

## WPTO's Outreach and Engagement Strategy

**GOAL ONE – TRANSPARENCY:** Demonstrate good stewardship of taxpayer funds by persistently and transparently communicating how WPTO funds are being utilized and evaluate project impacts

**GOAL TWO – FEEDBACK:** Get feedback from stakeholders to inform and improve WPTO projects and strategy

**GOAL THREE – DISSEMINATION:** Maximize the impact of WPTO-supported research by effectively disseminating results of projects and tracking usage of various products

**GOAL FOUR – OBJECTIVE AND ACCURATE INFORMATION:** Provide access to accurate and objective information and data that can help to accelerate industry development and inform decision-makers

## Stay up-to-date with WPTO

![](_page_25_Picture_1.jpeg)

#### The Water Wire

- Monthly e-newsletter from WPTO
- Get updates on funding opportunities, events, publications, webinars, R&D successes and more

ENERGY.GOV								
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY								
The Water Wire								
October 1, 2019	October 1, 2019							
Energy Department Announce Marine Energy Research and	Energy Department Announces Network Director for Marine Energy Research and Testing Program							
The Water Power Technologies Office has sele support testing and research for marine energy and Access for Marine Energy Research (TEAM capabilities from universities and the national la developers ready-access to unique, world-class network of facilities and testing protocols, the pr of testing for MHK technology developers – ens the appropriate time.	The Water Power Technologies Office has selected a network director for a new program to support testing and research for marine energy technologies—the U.S. Testing Expertise and Access for Marine Energy Research (TEAMER) Program. TEAMER will bring together capabilities from universities and the national laboratory system to provide marine energy developers ready-access to unique, world-class testing facilities and expertise. Through its network of facilities and testing protocols, the program will simplify access and reduce costs of testing for MHK technology developers – ensuring access to the appropriate facilities at the appropriate time.							
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https://www.energy.gov/eere/water/water-power-news-events

#### **Interactive Projects Map**

![](_page_25_Figure_8.jpeg)

- Features multiple filters to isolate specific details on DOE hydropower and marine energy projects
- Contains historical information on completed projects with research findings, and publication links

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

#### Creating and constantly improving our data repositories

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![](_page_26_Picture_2.jpeg)

The Portal and Repository for Information on Marine Renewable Energy (**PRIMRE**) provides centralized access, standardization, community building, and integration of WPTO-funded marine energy data repositories and knowledge bases.

By bringing key databases together knowledge will be increased by reducing redundancy and improving search and analysis efficiencies.

![](_page_26_Figure_5.jpeg)

#### Hydrosource.ornl.gov

![](_page_26_Picture_7.jpeg)

#### WPTO in the news

# **ENERGY** Energy Efficiency & Renewable Energy

![](_page_27_Picture_2.jpeg)

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**ENERGY** Energy Efficiency & Renewable Energy

Tune into the second installment of WPTO's semiannual stakeholder webinar on **November 5<sup>th</sup> 3pm-5pm EDT** for our recap of this week and key takeaways.

You can **reach out to WPTO** to ask a question, offer feedback, or request a meeting by writing to <u>WaterPowerTechnologiesOffice@EE.DOE.GOV</u>

Alejandro.Moreno@EE.DOE.GOV

Want **periodic updates** on water power funding opportunities, events, and publications?

![](_page_28_Picture_6.jpeg)

![](_page_28_Picture_7.jpeg)

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Enter Email Address

GO