

# water

## **Introduction to Working with the U.S. Department of Energy: A Deep Dive into Hydropower & Marine Energy Opportunities for Students, Researchers, and Faculty**

April 6, 2021, 1 – 3 PM ET

# Welcome!

- This webinar will be recorded and made available to registrants. Q&A sessions will not be recorded.
- Attendees' microphones are muted and attendees are not visible on video.
- Questions will be answered during Q&A sessions after presentations.
- To ask questions during the Q&A sessions:
  - Submit question into the Q&A box OR
  - Click 'Raise Hand' button and unmute your microphone when called on
- If you have technical issues, try calling into the webinar via phone.
- Thank you for participating!

# Agenda

1:00	1:05 PM ET	Webinar Guidelines and Opening Remarks
1:05	1:25	DOE Water Power Technologies Office (WPTO) Overview from <i>Jennifer Garson</i> , Senior Advisor at WPTO
1:25	2:10	<b>Opportunities for students and student mentors</b> , with Q&A: Student internships, fellowships, and competitions.
2:10	3:00	<b>Opportunities for researchers and faculty</b> , with Q&A: Prizes and competitions, testing support, and funding opportunities.

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**WATER POWER TECHNOLOGIES OFFICE**

**Jennifer Garson**  
**Acting Outreach, Engagement & Analysis Manager**

# Water Power Technologies Office – FY2021 \$150M

**Hydropower**  
**FY2021: \$41M**



Modernizing the Existing Fleet



Pumped Storage Hydropower (PSH)



New Low Impact Projects

**Marine Energy**  
**FY2021: \$109M**



Wave



Tidal, River and Ocean Current



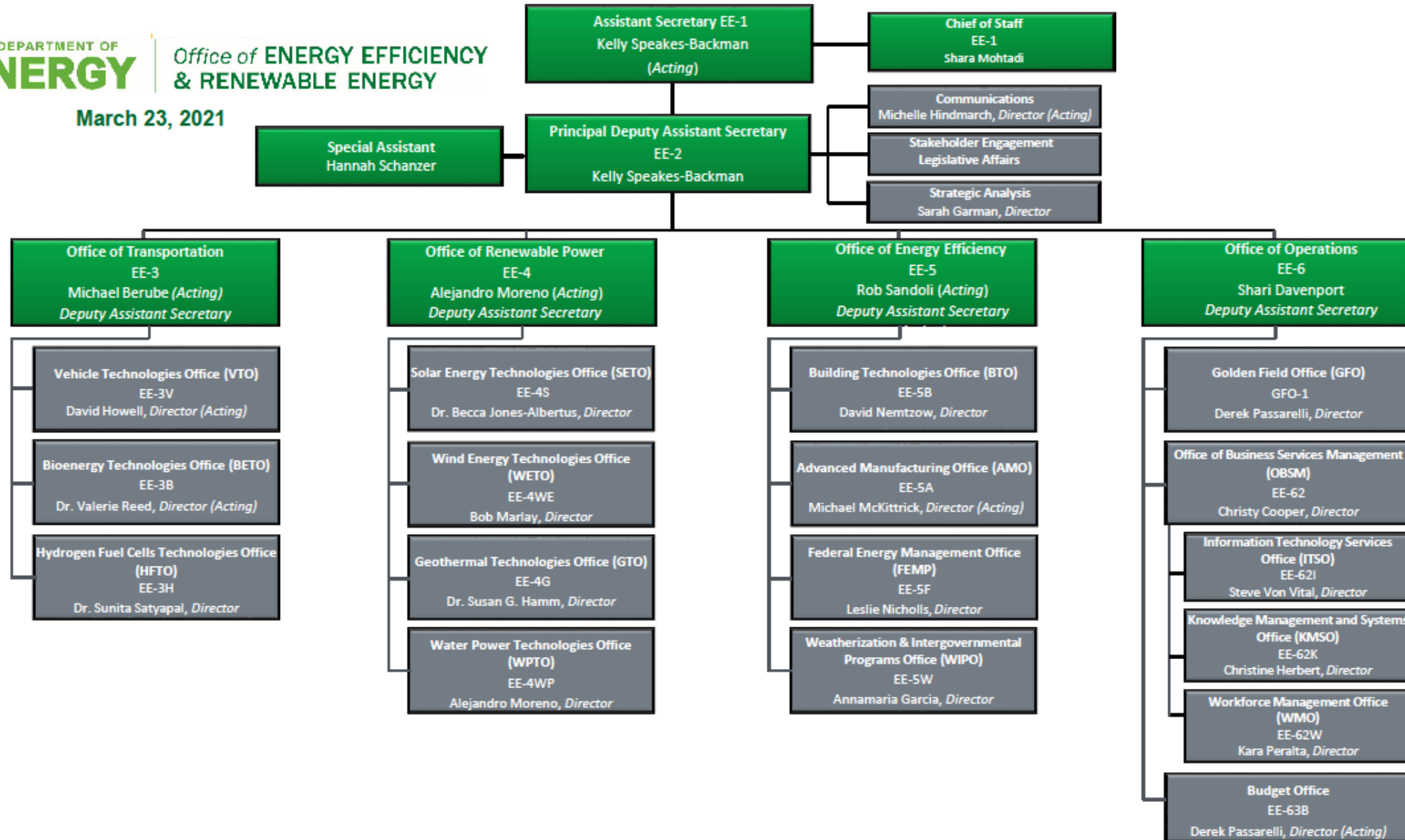
Ocean Thermal (OTEC)

# DOE's Office of Energy Efficiency and Renewable Energy

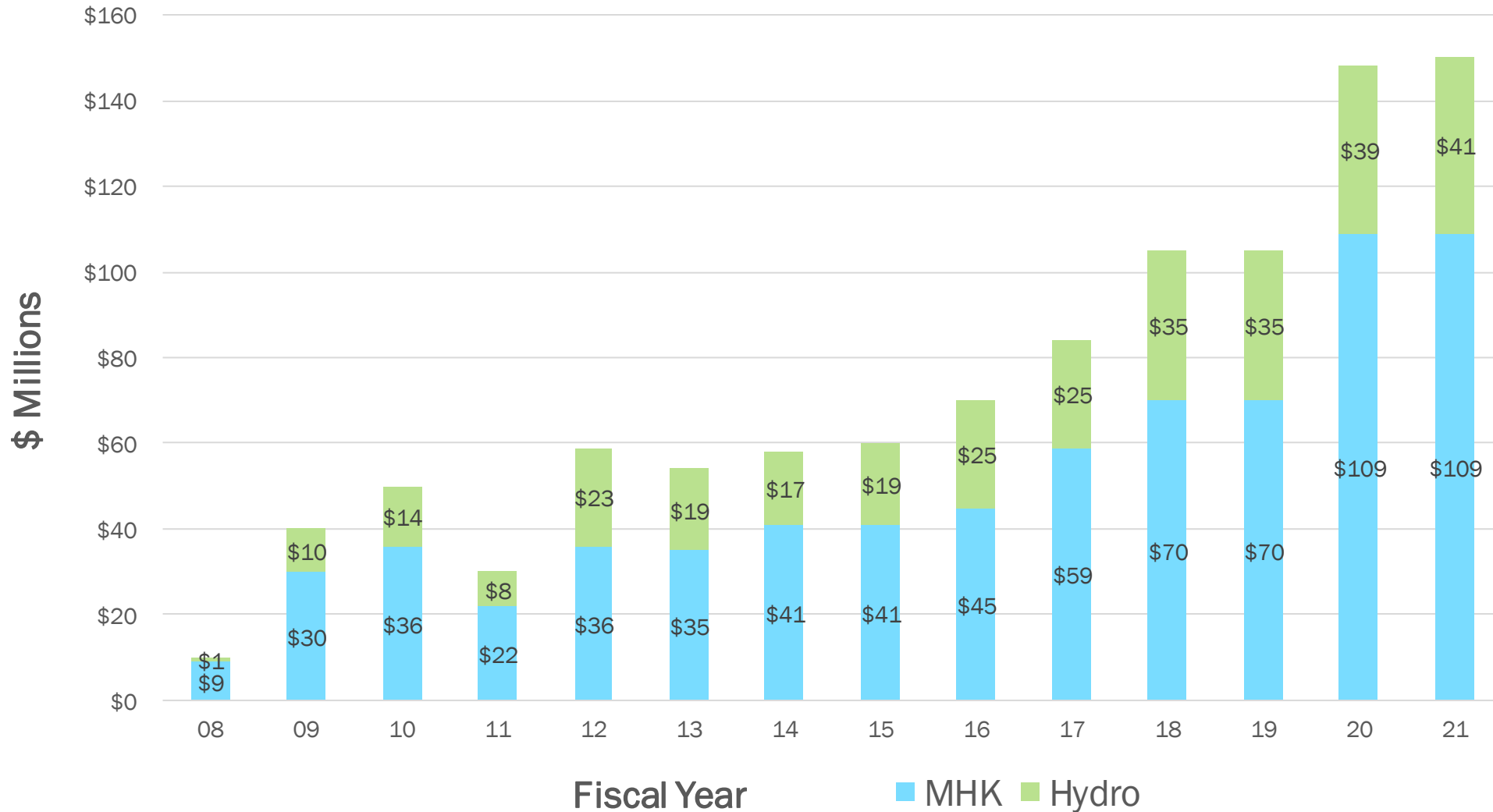


Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

March 23, 2021



# WPTO Budget Over Time



# Water Power Technologies Are Critical to the Biden Agenda

## Water Power Technologies Are Key to a Fully Decarbonized Grid

- Hydro is the only generation resource that is renewable and fully flexible, but systems need enhancements to integrate wind/solar.
- Pumped storage is critical as a balancing storage, and long duration storage. But there are critical challenges that need to be addressed in order to deploy PSH, and support a reliable grid dominated by renewables.
- Marine energy offers large theoretical potential, and tidal power is perfectly predictable.

## Water Power Forges Economic and Community Resilience

- Hydropower is simultaneously water and power infrastructure. This dual infrastructure connects benefits for environmental, agricultural, and recreational purposes.
- Unlike other utility-scale renewable power systems, hydropower – particularly reservoirs - are integrated into communities. This offers both opportunities for direct local engagement, and challenges for changing the infrastructure.
- Marine energy can provide power where it may otherwise be impossible to have any other renewable resources available, including serving the burgeoning blue economy and powering remote locations. Community-level work and engagement are critical.

## Water Systems are Changing with the Climate

- Massive changes are expected for water systems due to climate change; quantifying the magnitude and timing on water power systems through climate modeling and hydrologic assessment, including assessing infrastructure resiliency, is critical.

## Strong Jobs Pathways through the Future of Water Power

- Hydro employs more than 66k people, many in well-paid union jobs, however it has an aging workforce. Also, hydro could add an additional 150k jobs by 2050. Marine energy is new, with near-term STEM opportunities, and long-term manufacturing jobs.

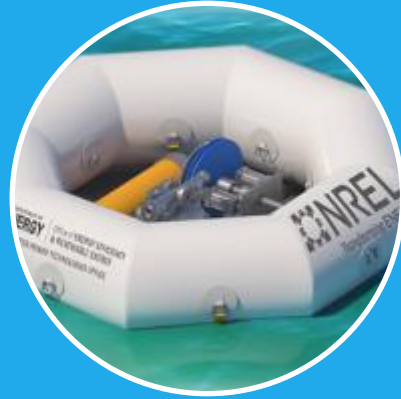


# Water Power Matters at All Scales



## 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.**

# How We Accomplish Our Mission

**Foundational R&D:** Invest in the technologies, materials, and approaches to advance the readiness of all water technologies.

**Support the Pipeline of Solvers:** Through solicitations, fund the solvers, the entrepreneurs, and the technical experts through solicitations to help solve our challenges.

**Infrastructure & Access:** Fund the infrastructure needed to test technologies and use those assets for more researchers and organizations.

**Demonstrations:** Fund in the water demonstrations of hydro and marine energy research. De risk technologies for deployment and understand how these technologies work in the field.

**Environmental Assessments:** Support the analysis, technology development, and partnerships needed to advance water power in rivers and oceans.

**Address Regulatory Barriers:** Work alongside the partners in the federal and state governments to understand the complexities of deployment.

**Partnerships and Community Engagement:** Identify the partners critical to work, catalyze the private and public sector partnerships to ensure success, fund the innovation ecosystem and community partnerships, and bring new people and organizations to the table, including a diverse, representative portfolio and programs.

# Financing Innovation at WPTO

## Structuring Financing Mechanisms

### Innovative Technical Assistance (TA) & Lab Testing

- Direct TA from the labs to support analysis, including Pumped Storage Valuation and HydroWIRES Notice of Technical Assistance
- Combination of lab and university TA and testing TEAMER
- Community based orgs, multiple offices & labs partnership on Energy Transitions Initiative Partnership Project (ETIPP)

### Prizes & Competitions

- Six Prizes, One Collegiate Competition
- Combine lab work and interagency partnerships

### Catalyzing the Innovation Ecosystem

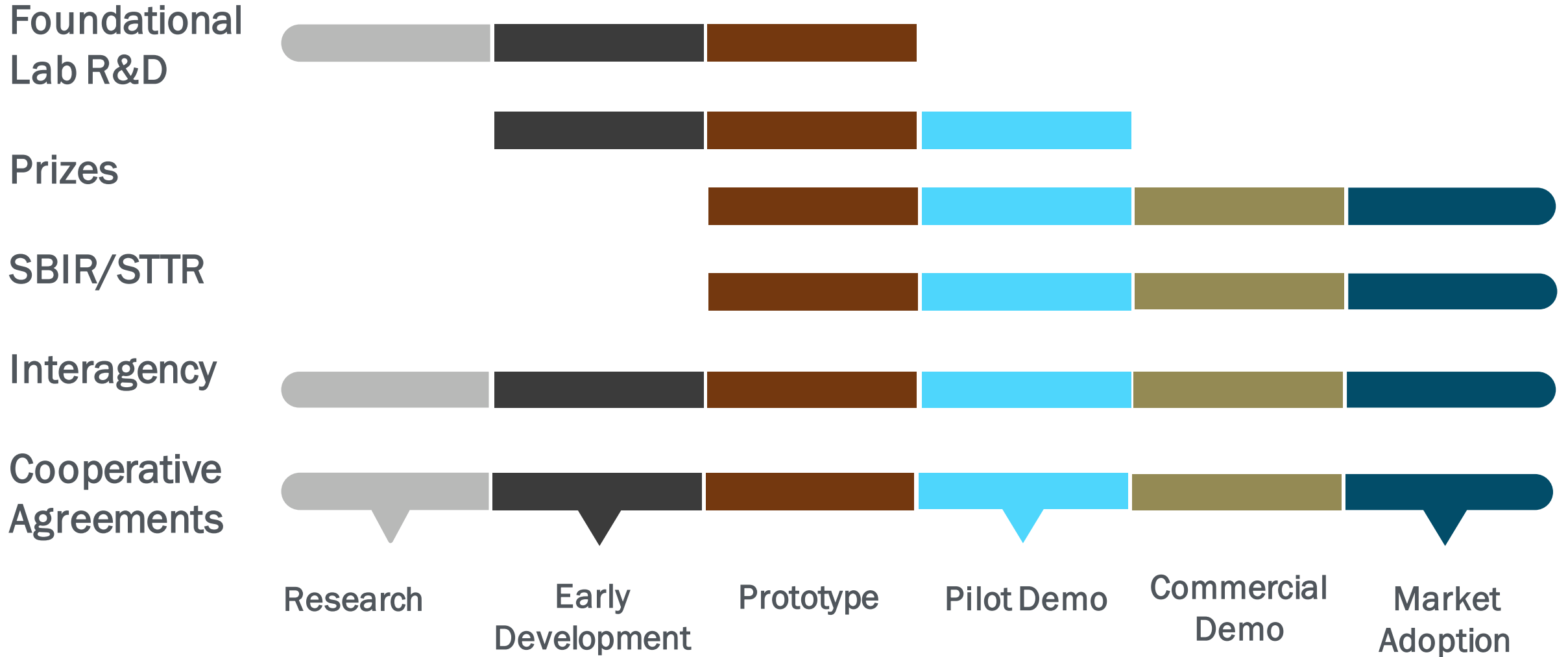
- Lab-directed programs in support of prizes and entrepreneurs.
- Interagency solicitations, including focused on building out the blue economy innovation ecosystem.

### Requests for Innovation (RFIn)

- Lab Seedlings created new mechanism to support \$50-100k in novel approaches at labs, and lead pathways to new research
- Multi-office plastics and water resource assessment to understand opportunities and magnitude of US waterborne plastics initiated



# Harnessing a Multitude of Financing Mechanisms





# WPTO Research Priorities Q&A



# Opportunities for Students & Student Mentors

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# WPTO Undergraduate Opportunities

## Delaney Heileman, Senior

### The University of New Mexico

- Minority Educational Institution Student Partnership Program (MEISPP) Participant in the WPTO office
  - Applied in March
  - Lodging, airfare, stipend
  - Was able to attend an ARPA-E conference and visit NREL and other opportunities
  - Helped define the trajectory of my career / make important connections
  - [doemeispp.org](http://doemeispp.org)
- Led to internship at Sandia National Labs
- Now applying to graduate programs in energy and public policy
  - Rec letters from DOE manager and SNL manager



*Sandia National Laboratories Summer 2019*  
Looking at the waves made during a test run of our mini wave tank summer project

# Science Undergraduate Laboratory Internship (SULI) & ORISE Fellowship

Hannah Mankle, PhD Student  
Oregon State University

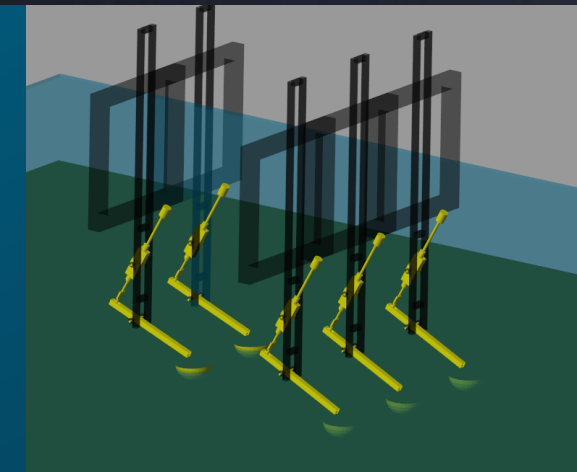


## SULI, Fall 2019

- 16 week internship
- Professional development seminars
- My research was an wave energy converter (WEC) array verification study using the NREL toolbox WEC-Sim

## ORISE, MHK Graduate Student Research, 2020-2021

- Collaborative fellowship with an industry partner or national lab
- My research is investigating the role size plays when optimizing the hull shape of a point absorber WEC





# Science Undergraduate Laboratory Internship (SULI) & ORISE Fellowship

## SULI

- Qualifications
  - Must be currently enrolled as a full-time undergraduate student at an accredited institution (including accredited community colleges)
- 17 participating DOE laboratories/facilities
- Offered year round (10-16 week programs)

## ORISE: WPTO MHK Graduate Student Research

- Qualifications
  - Full-time doctoral graduate student
  - Research must align with the WPTO-MHK's priority research areas
- Collaborative proposal with Laboratory/Industry Partner
  - Fellowship time is split between your university and the host facility

# WPTO Internships

Logan Mendenhall, DOE Intern for Summer 2019

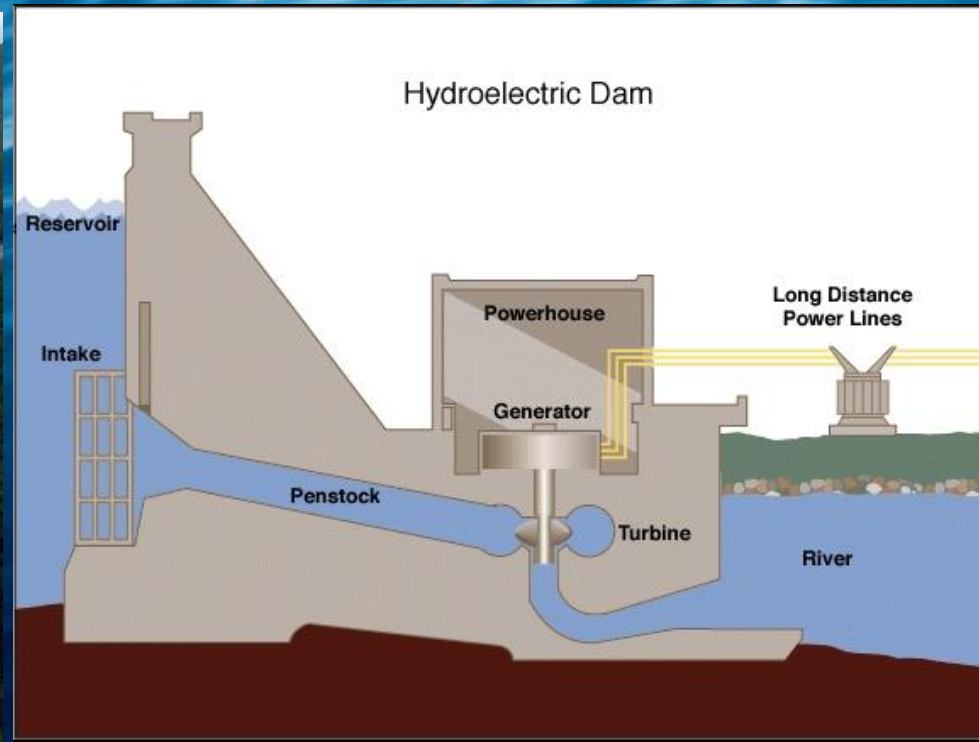
Hydropower and Marine Hydrokinetic Technologies

Collaborative Project Research

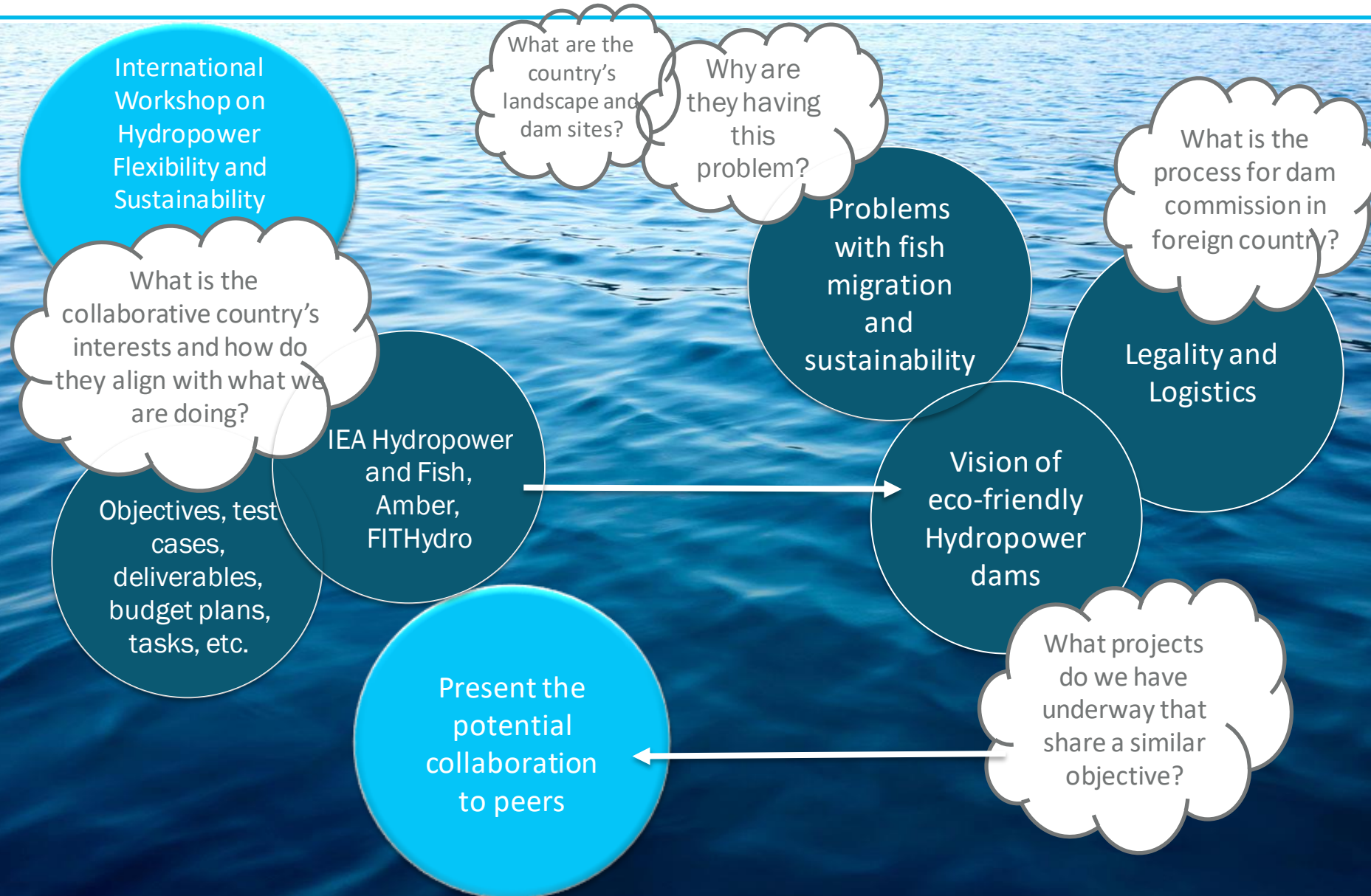
 UNIVERSITY of VIRGINIA



LEONARD D. SCHAEFFER  
FELLOWS IN GOVERNMENT SERVICE



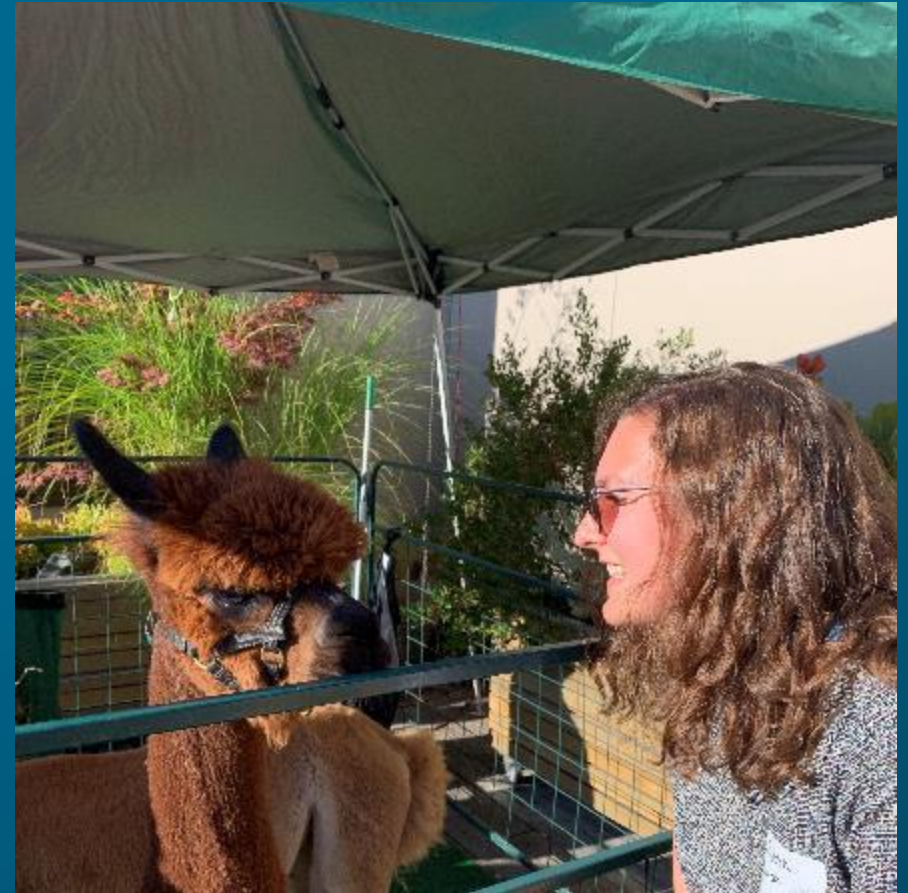
# Innovative fish-friendly Technology for Hydropower



# ORISE Fellowship

## Madden Sciubba – Hydropower Fellow Water Power Technologies Office

- Open to any education level; internships available as well
- Renewable for up to 5 years
- Great opportunity to learn about the types of government jobs available and what the day-to-day responsibilities are
- Fantastic way to get involved in strategic initiatives
- [www.zintellect.com](http://www.zintellect.com)



Each fellow has funds available for travel and professional development – some of that brought me to this alpaca!

# NREL Marine Energy Collegiate Competition

**Murphy Gay, Ocergy Consultant**  
(Previously North Carolina A&T  
Mechanical Engineering Senior Design  
Project Team Lead)

- The NREL MECC is an international contest focused on creating electricity from the ocean and developing a business plan
- Any college can create a team
- It was great being able to work with a talented team and being able to test our work
- I met the Ocergy representatives that I work with now during the MECC presentations



Large Scale Model Wave Tank Testing

# Open opportunities for students

## **Apply by April 30 to be a HydroWIRES Fellow with WPTO**

WPTO has 3 openings in the areas of engineering, economics, and power system modeling through the Oak Ridge Institute for Science and Education (ORISE) Fellowship Program. The fellows will support the HydroWIRES (Water Innovation for a Resilient Electricity System) initiative whose mission is to understand and support hydropower's role in a 100% clean energy future. As full members of the WPTO team, the fellows will both learn and contribute across the range of activities associated with managing applied research. Find the announcement with more details on WPTO's webpage ([www.energy.gov/eere/water](http://www.energy.gov/eere/water))

## **Apply by May 7 to participate in the 2022 Marine Energy Collegiate Competition**

The National Renewable Energy Laboratory (NREL) is accepting applications for the 2022 Marine Energy Collegiate Competition. This will be the 3rd year of the annual competition designed to challenge interdisciplinary teams of undergraduate and graduate students to unlock the power of the ocean, rivers, and tides to develop, design, and test the technologies that build resilient coastal communities and provide power at sea.



# Opportunities for Students & Student Mentors Q&A Session

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# Opportunities for Researchers & Faculty

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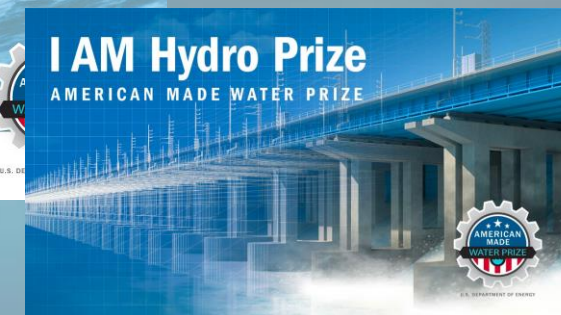
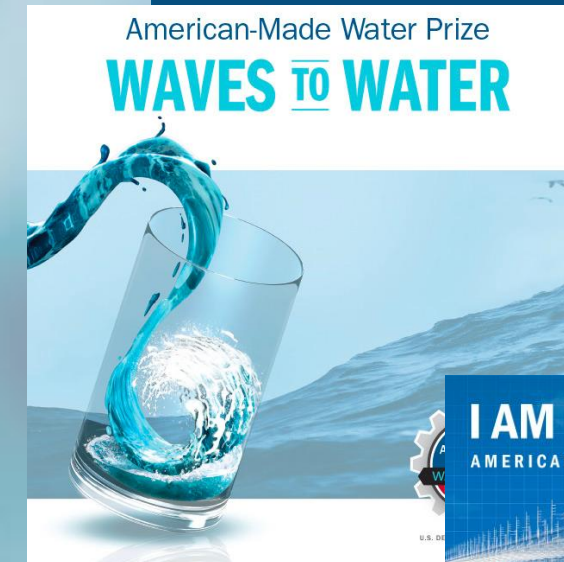
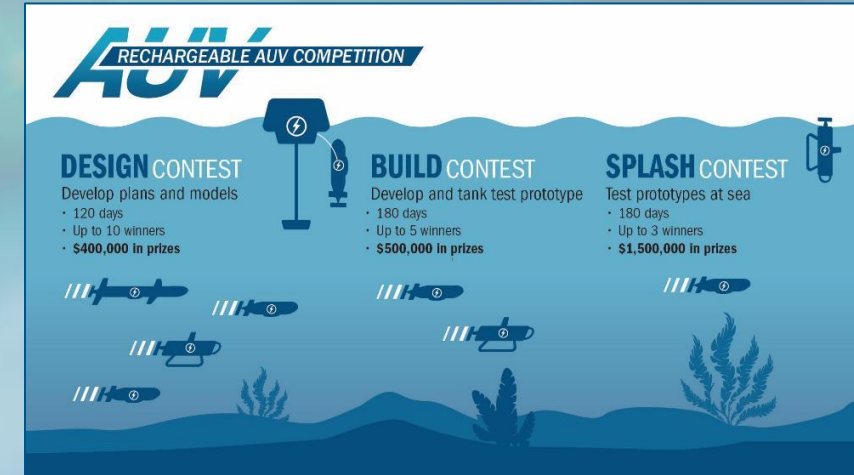
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# Prizes and Competitions

Rukmani Vijayaraghavan, AAAS Science & Technology Policy Fellow  
U.S. Department of Energy, Water Power Technologies Office

- WPTO and DOE have several prizes and competitions with a low barrier to entry, suited to teams of students and faculty engagement.
- Prizes incentivize the development of specific ideas and technologies and may have multiple stages with cash and in-kind support.
- Prizes can be single stage concept papers and ideas with cash awards.
- WPTO prizes may also include in-kind sponsorship and support for outreach, commercialization, and networking
- Collegiate competitions, unlike prizes are designed to increase engagement of students
- Follow [americanmadechallenges.org](http://americanmadechallenges.org)



# Marine Energy Collegiate Competition

**Michael Atkinson**, Assistant Professor  
North Carolina A&T State University

- **Support Academic Curriculum**
  - Undergraduate Senior Capstone Projects
  - Graduate Research Assistants (MS /PhD)
- **Educational Diversity**
  - Include students from STEM and non-STEM background
  - Promote undergraduate research
- **Collaboration**
  - External universities / departments
  - Local/National/International Businesses
  - Mentors / Hobbyist / Rapid prototyping
- **NC A&T 2020 ‘Rising Star Award’**



2020 NCAT team at the University of North Carolina  
Coastal Studies Institute Feb 24, 2020

**Novel Oscillating Water Column**

# Community Engagement / Transdisciplinary Education

## Forge: Greensboro



## ImpactHUB: Madrid



- Community Engagement with local businesses
- Encouraged by most Colleges and Universities
- Discounts/Sponsorships for Students
- Wealth of Knowledge (Equipment/Ideas)

# Experimental Testing at UNC-CSI

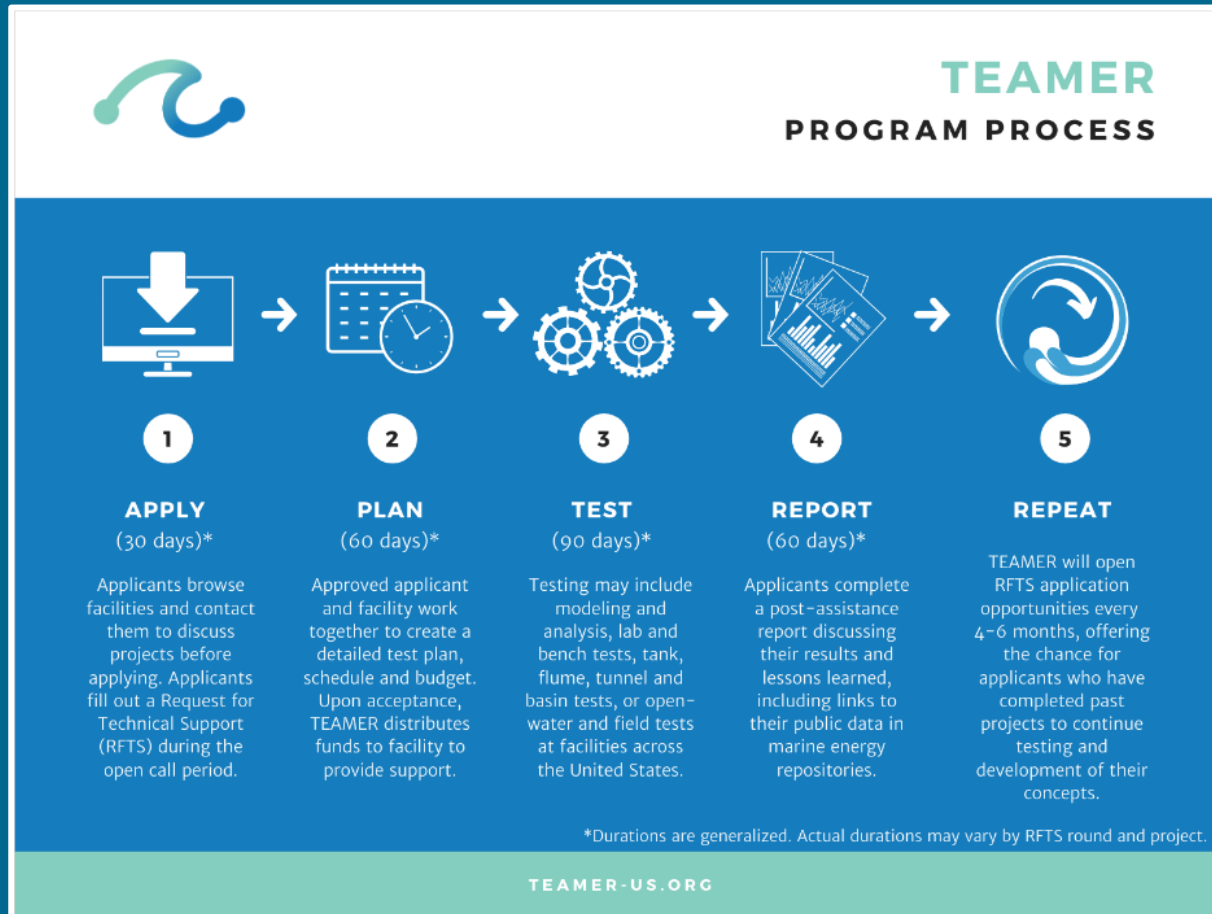


- **Engage DOE**
  - TEAMER / University Connections / SMEs / Webinars
- **Active Participation**
  - Conferences ICOE / Regional / State / University
- **Student Recruitment**
  - Sustain student pipeline / creative student activities
- **Innovative Opportunities**
  - Remote testing / Short-term study abroad



# Testing Expertise & Access to Marine Energy Research (TEAMER)

Lauren Ruedy, Marine Energy  
Technology Manager, DOE WPTO



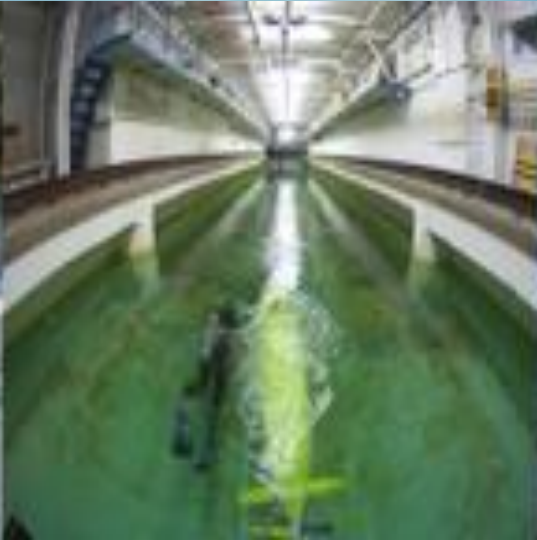
ABOVE: TEAMER Facility Network details can be found: <https://teamer.us.org/teamer-facility-network/>

LEFT: Overview of TEAMER Application Process to Request Technical Support from a TEAMER Facility

# Funding Opportunities (FOAs) & Reviewer Opportunities

*Carrie Noonan, Technology Manager*

*Department of Energy Water Power Technologies Office*



# Opportunities

## 1. Funding Opportunity Announcements (FOAs)

- FOA 2234
- Future FOAs

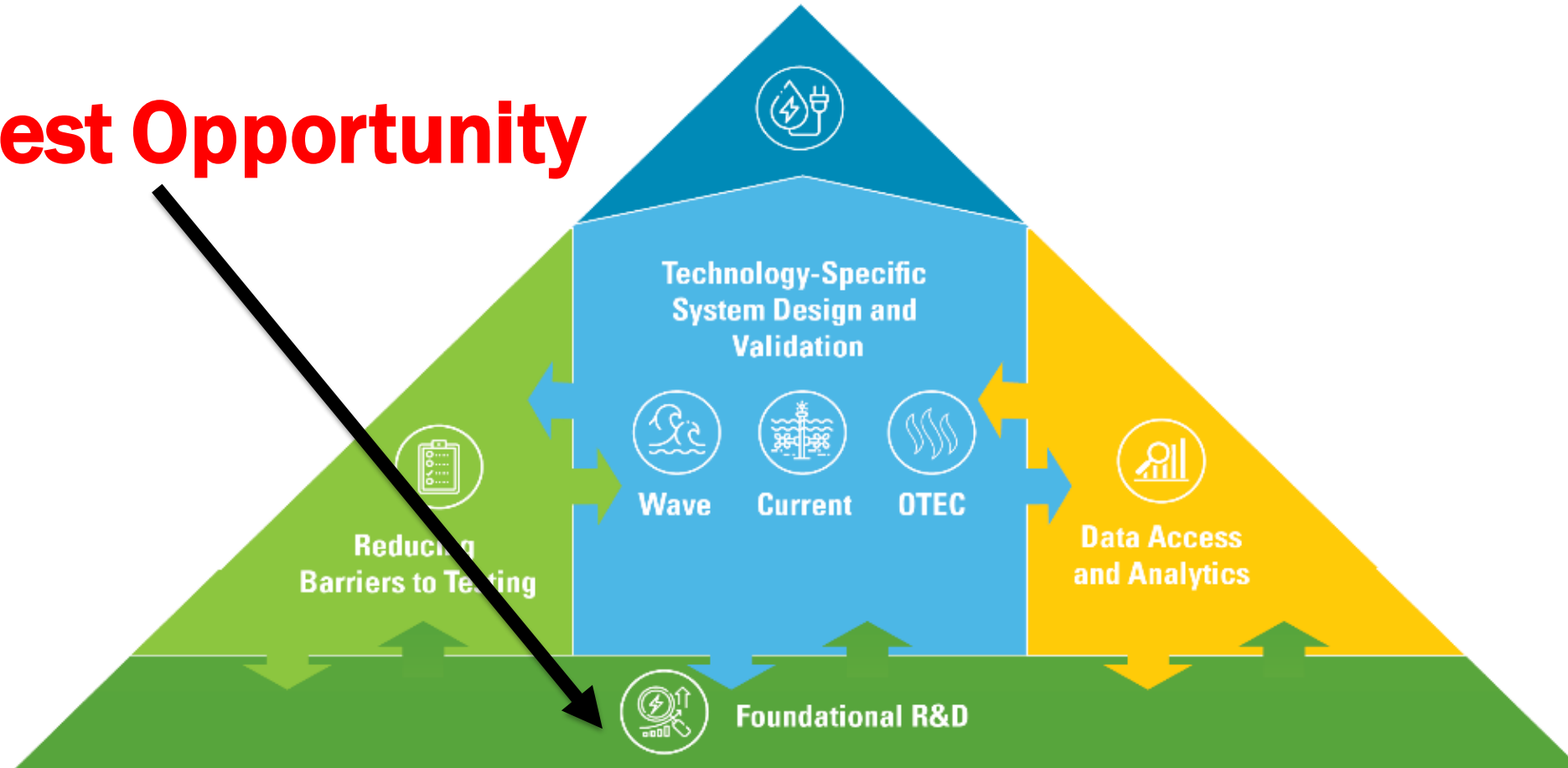
## 2. Paid Reviewer Opportunities

## 3. Resources

# WPTO Marine Renewable Energy Approaches

Cost-effective & reliable marine energy for numerous at-sea power needs, resilient coastal and remote communities, and grid-scale electricity markets

**Biggest Opportunity**



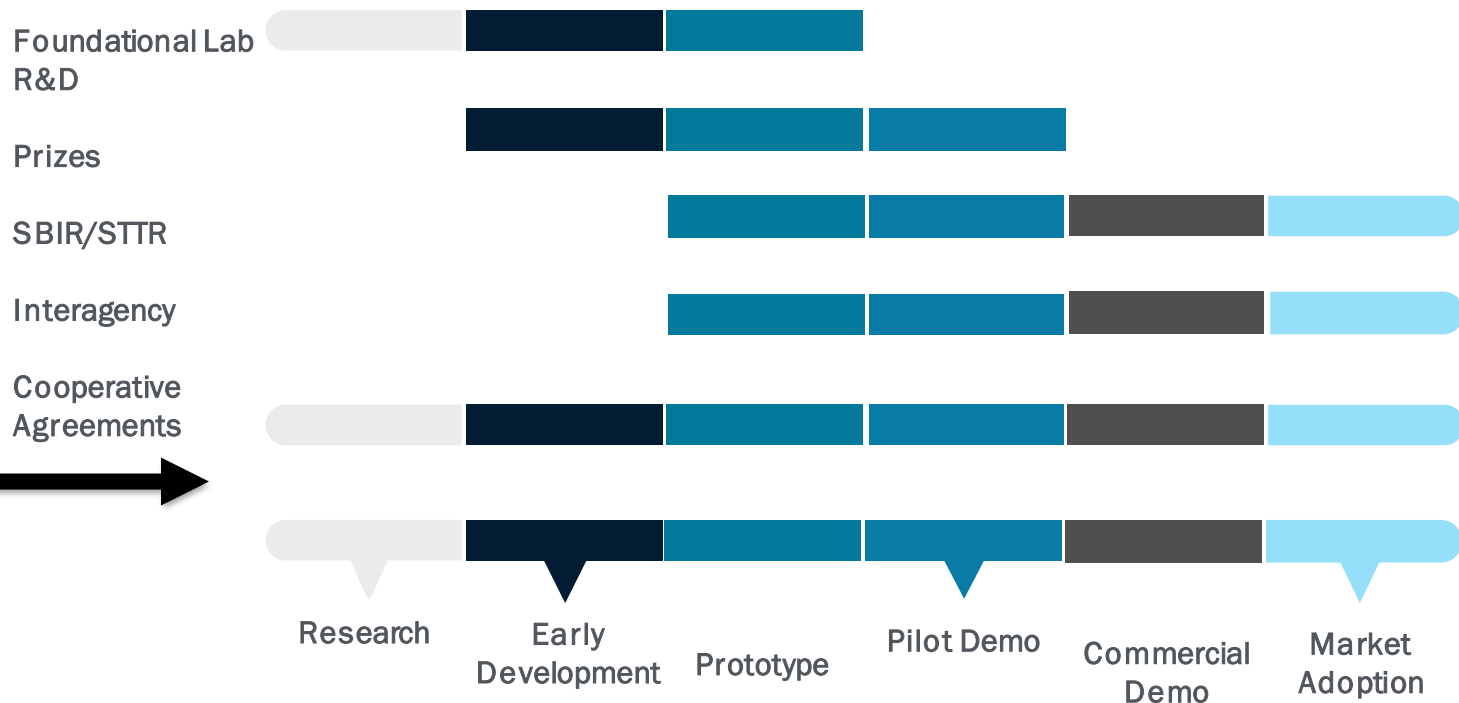


# Diverse Funding Mechanisms

## Externally Distributed

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

- **FOAs & Cooperative Agreements**
- **Prizes**
- **SBIR/STTR (Small Business Innovation Research Grants)**



# 2019/20 FOA: \$22M for Marine Energy R&D

## **1 - Foundational Research and Development (R&D) - \$10.5M**

Impactful R&D to enhance the commercial viability of the U.S. marine energy technologies. Topic areas of interest include: 1) Advanced Materials, 2) Controls, 3) Numerical Modeling, 4) Components/subsystems, and 5) Resource Characterization. Other areas of interest include, but not limited to, project or types of technology areas in the PBE space as well as research on Installation, Operations and Maintenance, and other Transformative Challenges.

## **2 - Atlantic Marine Energy Center (AMEC) - \$5M**

There are currently three National Marine Renewable Energy Centers (NMRECs) established through past WPTO funding. The new AMEC will support and further develop the marine energy industry in this region. AMEC, similar to other NMRECs, will complement and enhance the TEAMER program by providing additional choice of and access to test facilities in the Atlantic region.

## **3 - Foundational Research Network Facilitator (FRNF) - \$1.5M**

A FRNF will work with and expand the WPTO network of research entities working on marine energy research. The FRNF's role is to help maximize the impact of research carried out across many different non-federal research institutions that will be supported under Topic Areas 1 and 2.

## **4 - Current Energy Technology Testing Infrastructure - \$5M**

To address a gap in the U.S. testing infrastructure, WPTO will solicit proposals for open water, non-grid connected testing capabilities for current energy converters (CEC). Funds will support design, planning, fabrication, accreditation, and the first year of operations and maintenance for a mobile CEC test vessel.

# Paid Reviewer Opportunities

- **Define your area of expertise**
  - Does it fall within the 4 WPTO approaches?
- **Get involved with the new UMEREC network**
- **Sign up for WPTO's Water Wire newsletter**
- **Network**

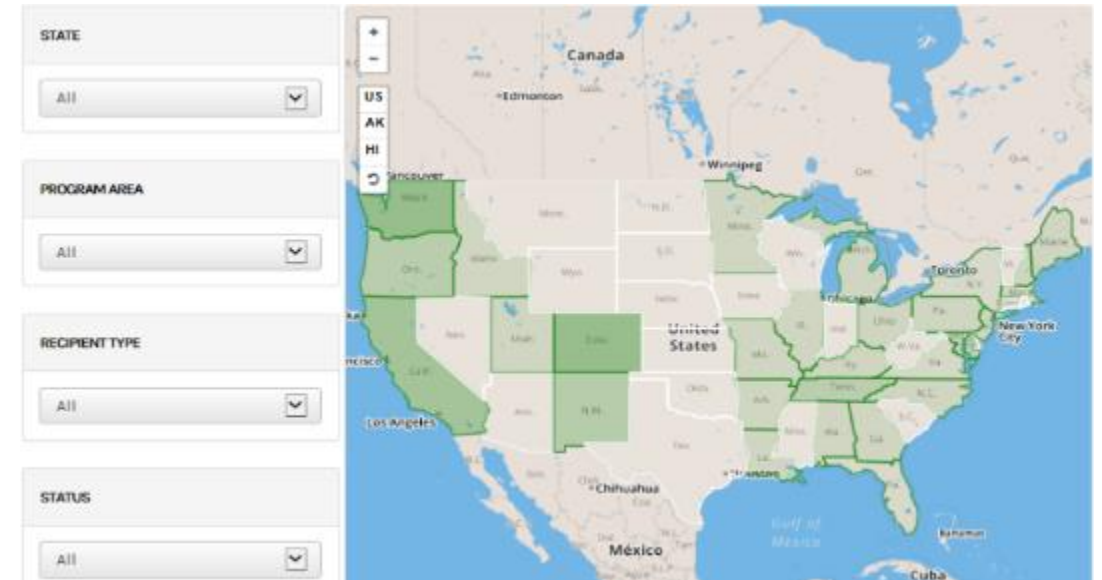
# Resources

**Website: [buildbackbetter.gov](https://buildbackbetter.gov)**

You can always reach us at:

[WaterPowerTechnologiesOffice@ee.doe.gov](mailto:WaterPowerTechnologiesOffice@ee.doe.gov)

## Interactive Projects Map



Contains historical information on completed projects with research findings, and publication links

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

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



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# Open opportunities for researchers and faculty

**Submit a pre-proposal by May 14 to improve understanding of the effects of ocean renewable energy development on coastal communities, including the fishing industry:**

On March 29, WPTO and partners—including the U.S. Department of Energy’s Wind Energy Technologies Office, NOAA’s Northeast Fisheries Science Center, and the Northeast Sea Grant Consortium—announced more than \$1M for new research to improve understanding of offshore renewable energy interactions with fishing and coastal communities to optimize ocean co use. The funding competition is accepting pre proposals from eligible Northeast researchers through May 14 ([seagrant.mit.edu/ocean energy research](https://seagrant.mit.edu/ocean-energy-research)).

## **Apply by May 7 to participate in the 2022 Marine Energy Collegiate Competition**

The National Renewable Energy Laboratory (NREL) is accepting applications for the 2022 Marine Energy Collegiate Competition. This will be the 3rd year of the annual competition designed to challenge interdisciplinary teams of undergraduate and graduate students (led by a faculty mentor) to unlock the power of the ocean, rivers, and tides to develop, design, and test the technologies that build resilient coastal communities and provide power at sea.

## **Apply by April 30 to be a General Engineer with the WPTO Hydropower Program:**

As a Hydropower Technology Manager and Technical Project Officer, you will manage research, development, and demonstration activities related to hydropower technologies. The candidate must have expertise in hydropower and experience in project management. Find the announcement with more details on WPTO’s webpage ([www.energy.gov/eere/water](https://www.energy.gov/eere/water)).



# Opportunities for Researchers & Faculty Q&A Session

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**Thank you for participating!**

**Check the opportunities handout (emailed to attendees) for more resources, internships & fellowships, and faculty programs**