



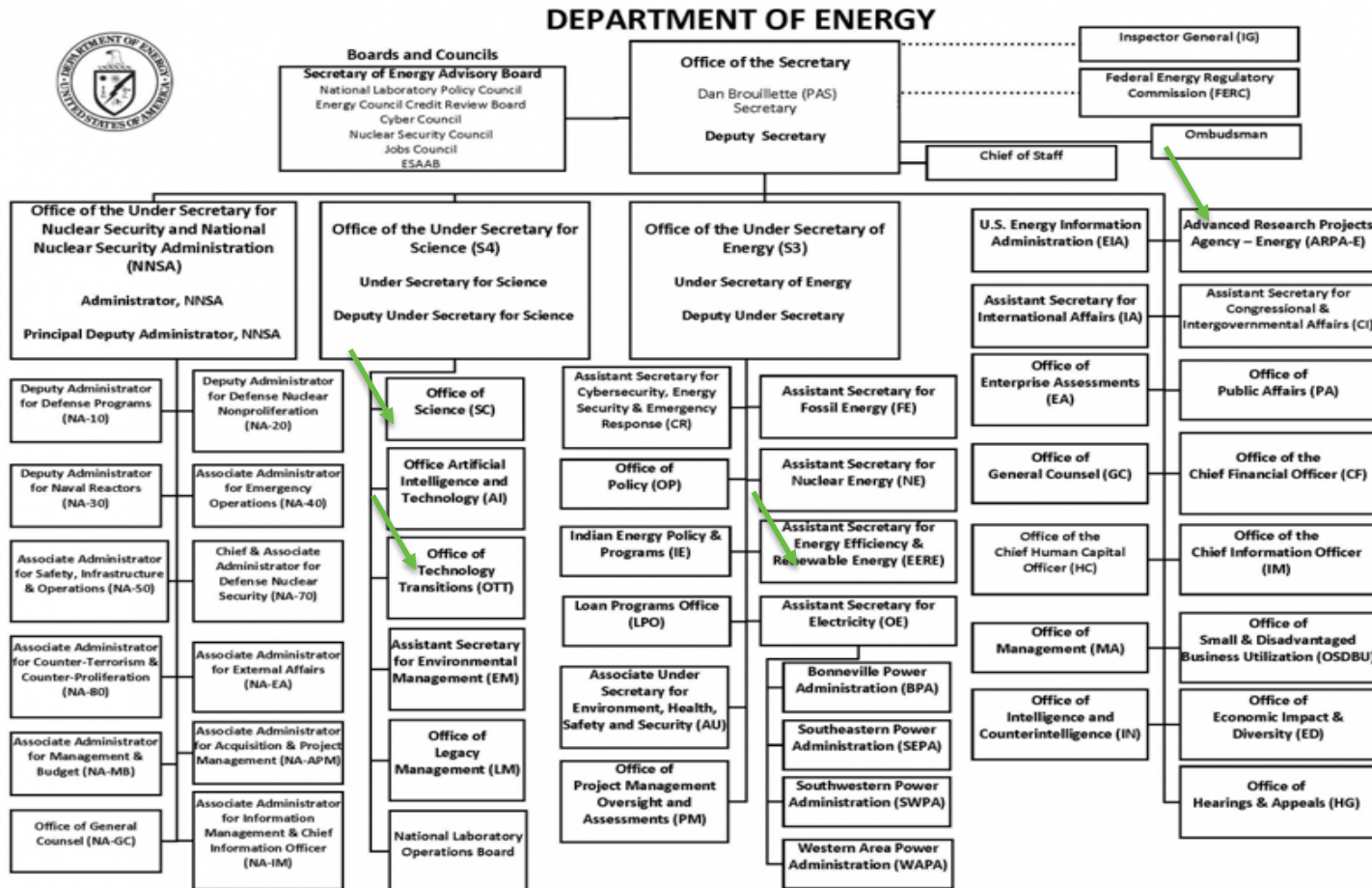
## Offshore Renewable Energy and Road to Net Zero

Carrie Noonan  
WPTO Marine Energy Technology Manager  
Supergen ORE Hub Annual Assembly  
January 18, 2021

# Outline

- DOE → EERE → WPTO
- Changes to U.S. Regulations Supporting ME
- WPTO
- Budget
- Funding Mechanisms
  - FOA 2234
- Collaboration and Partnerships
  - Labs/universities/other
- Future Plans
- Other Resources

# DOE OFFICES doing some ME R&D

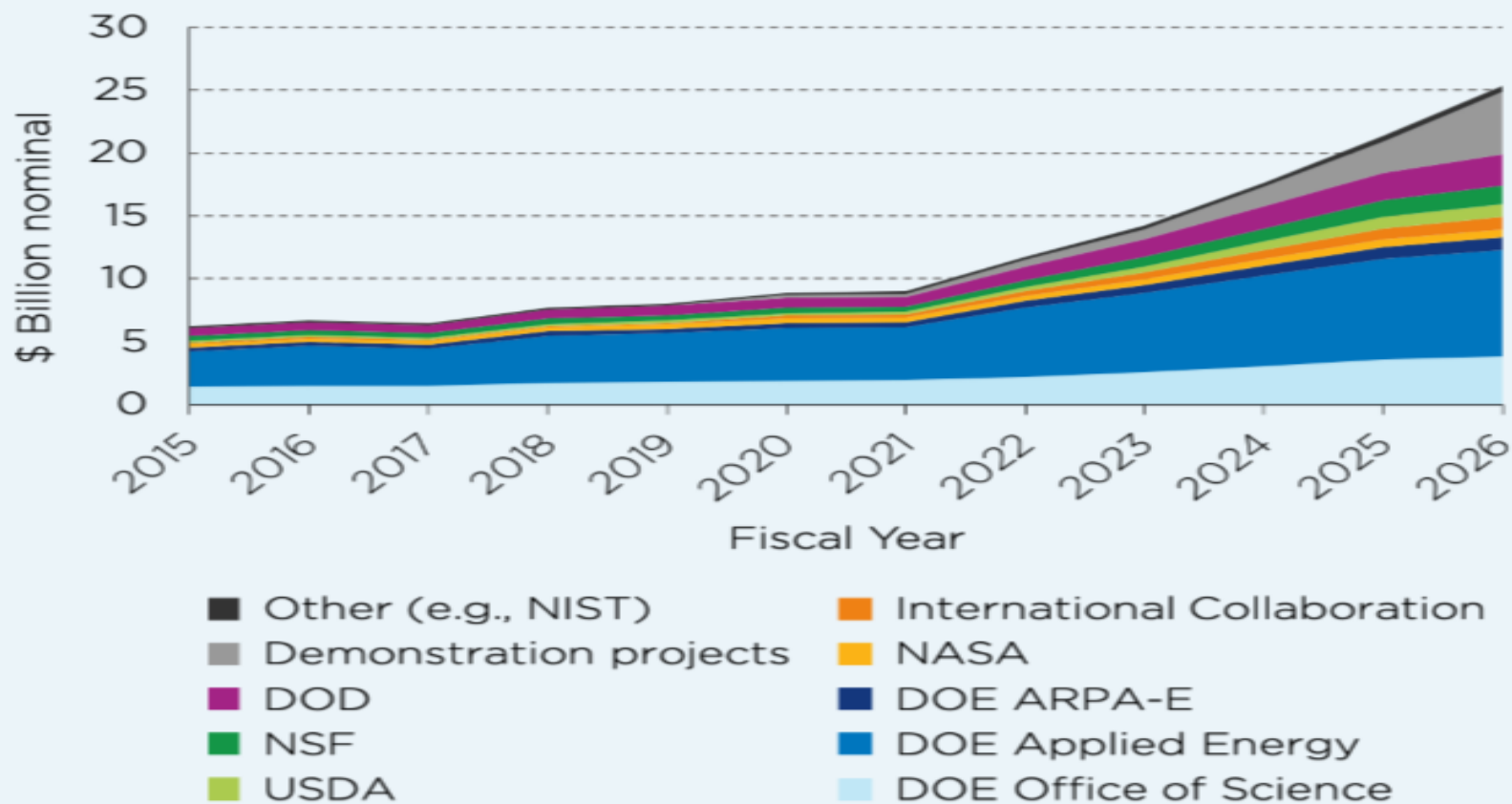


- Office of Science
- Office of Technology Tsf
- EERE
- ARPA-E

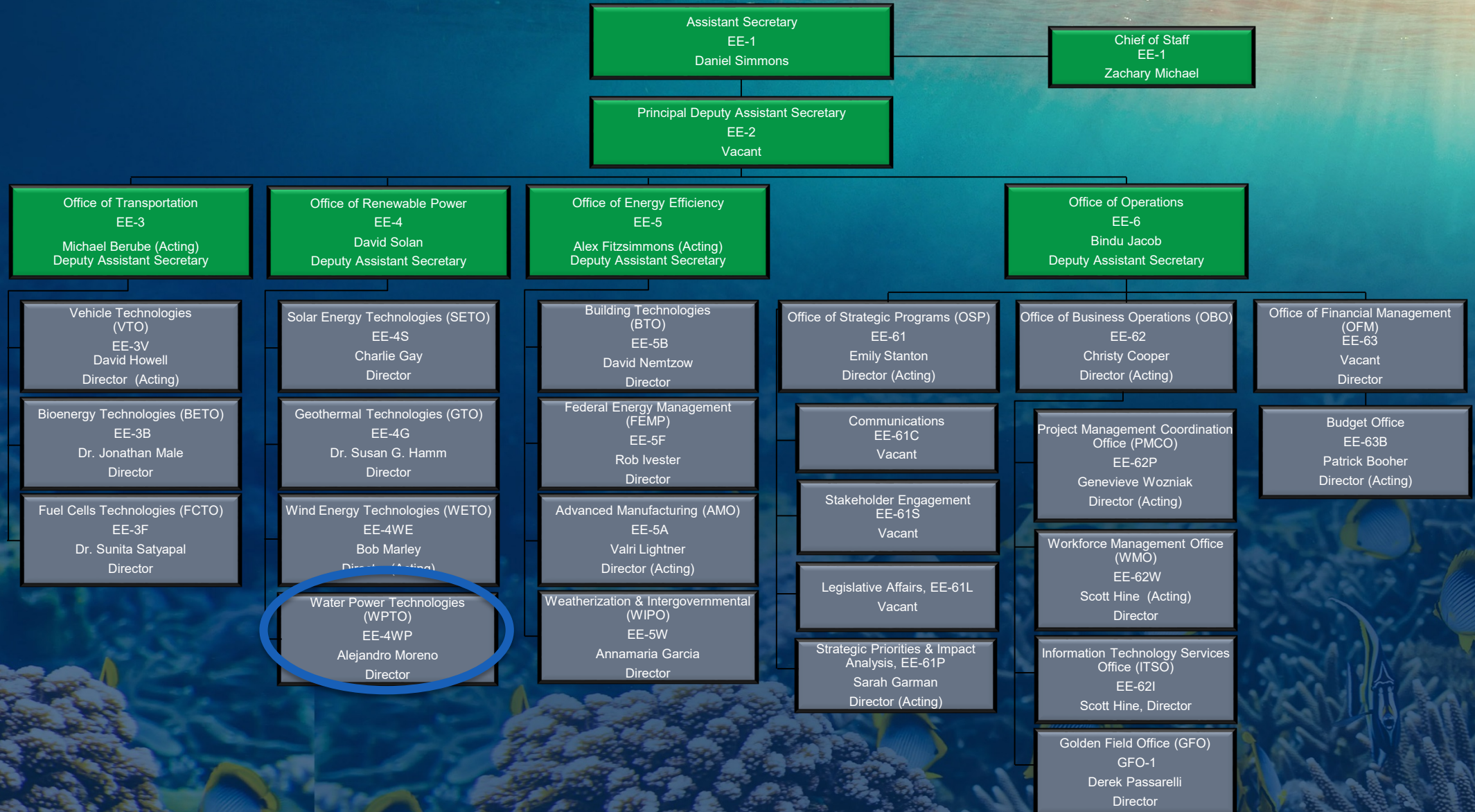
Updated 12/10/2019

# CLEAN ENERGY RESEARCH

**FIGURE ES-2:** Historical clean energy RD&D funding by federal agency and proposal to ramp up to an annual clean energy innovation budget of \$25 billion by 2025



# DOE's Office of Energy Efficiency and Renewable Energy



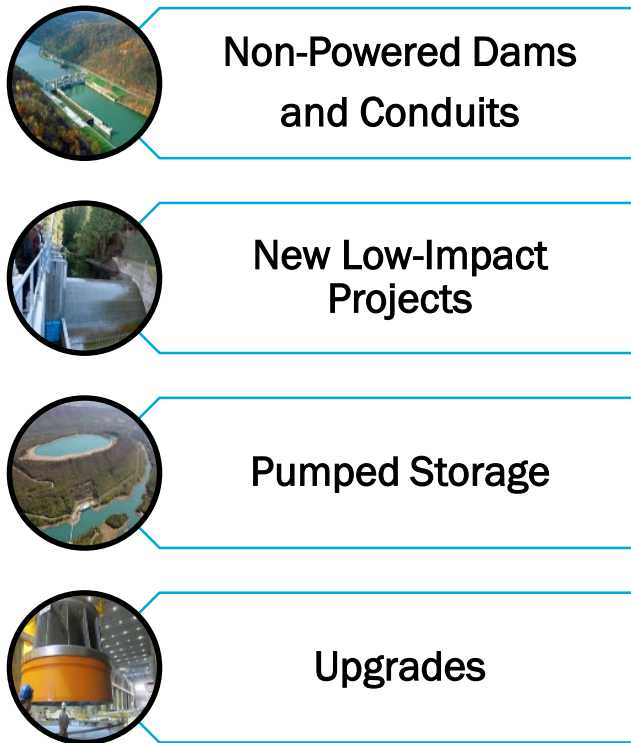
# U.S. Regulations – Energy Independence Security Act (EISA) amendments

- **New 2020 Authorizing Language → *first time since enactment in 2007***
- **Marine Hydrokinetics (MHK) → Now ME = Marine Energy**
- **Ocean Thermal Energy Conversion (OTEC), Salinity and Pressure Gradients**
- **Power the Blue Economy (PBE) - Official**
- **Maritime Transportation**
- **International Collaboration**

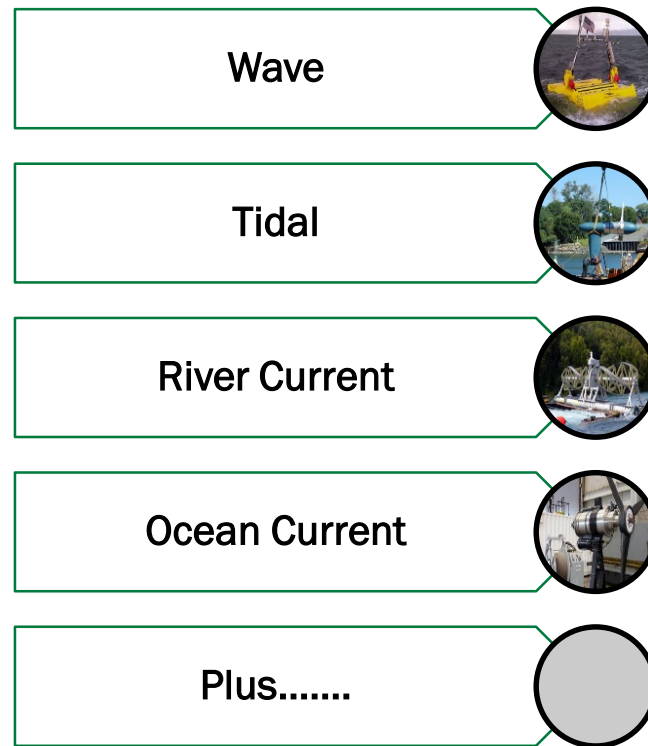
# Water Power Technologies Office Overview

The U.S. Department of Energy's Water Power Technologies Office (WPTO) 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.

## Hydropower Program



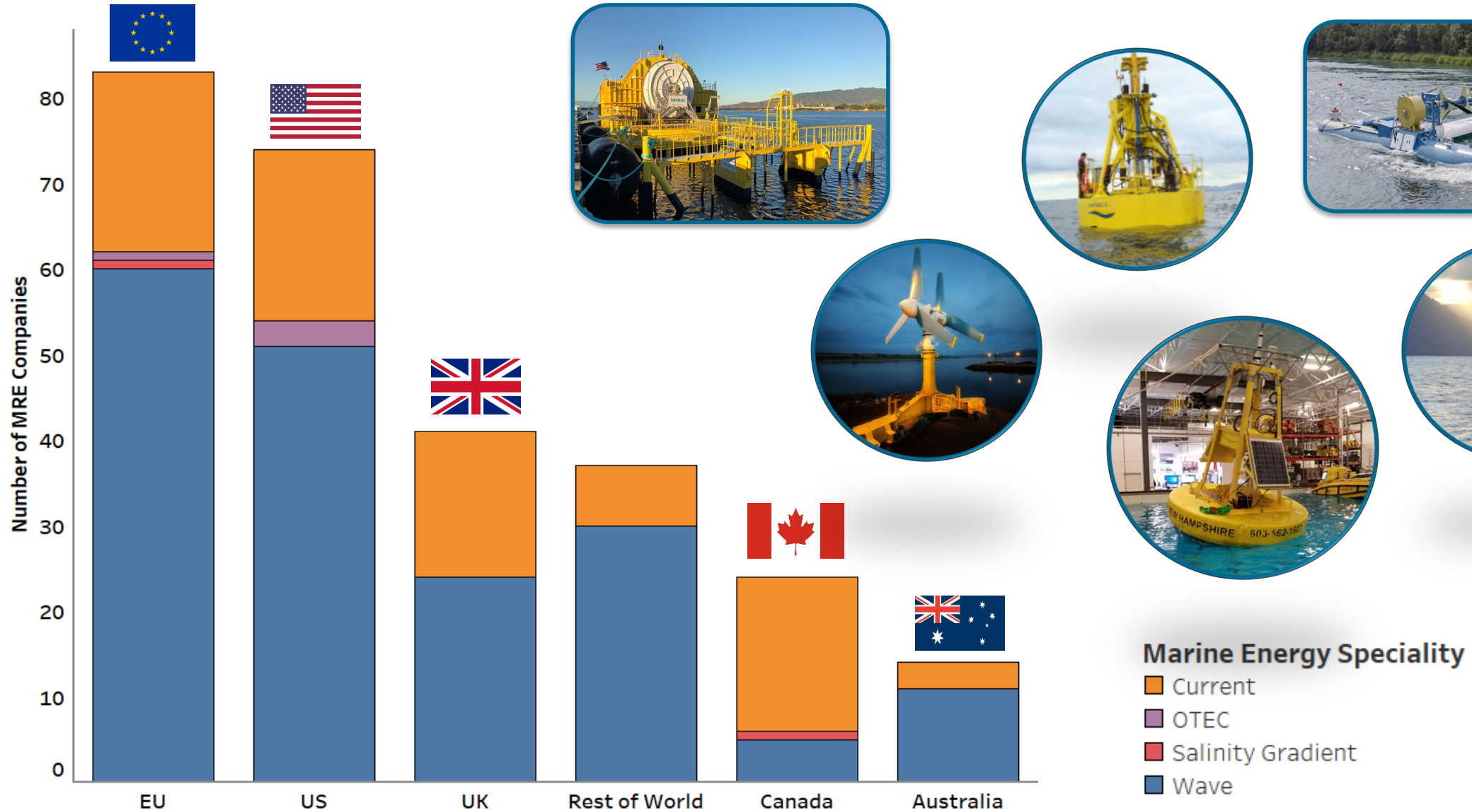
## Marine & Hydrokinetics Program



## Federal Agency Partners



# The U.S. is home to more than a third of all active marine energy companies operating globally

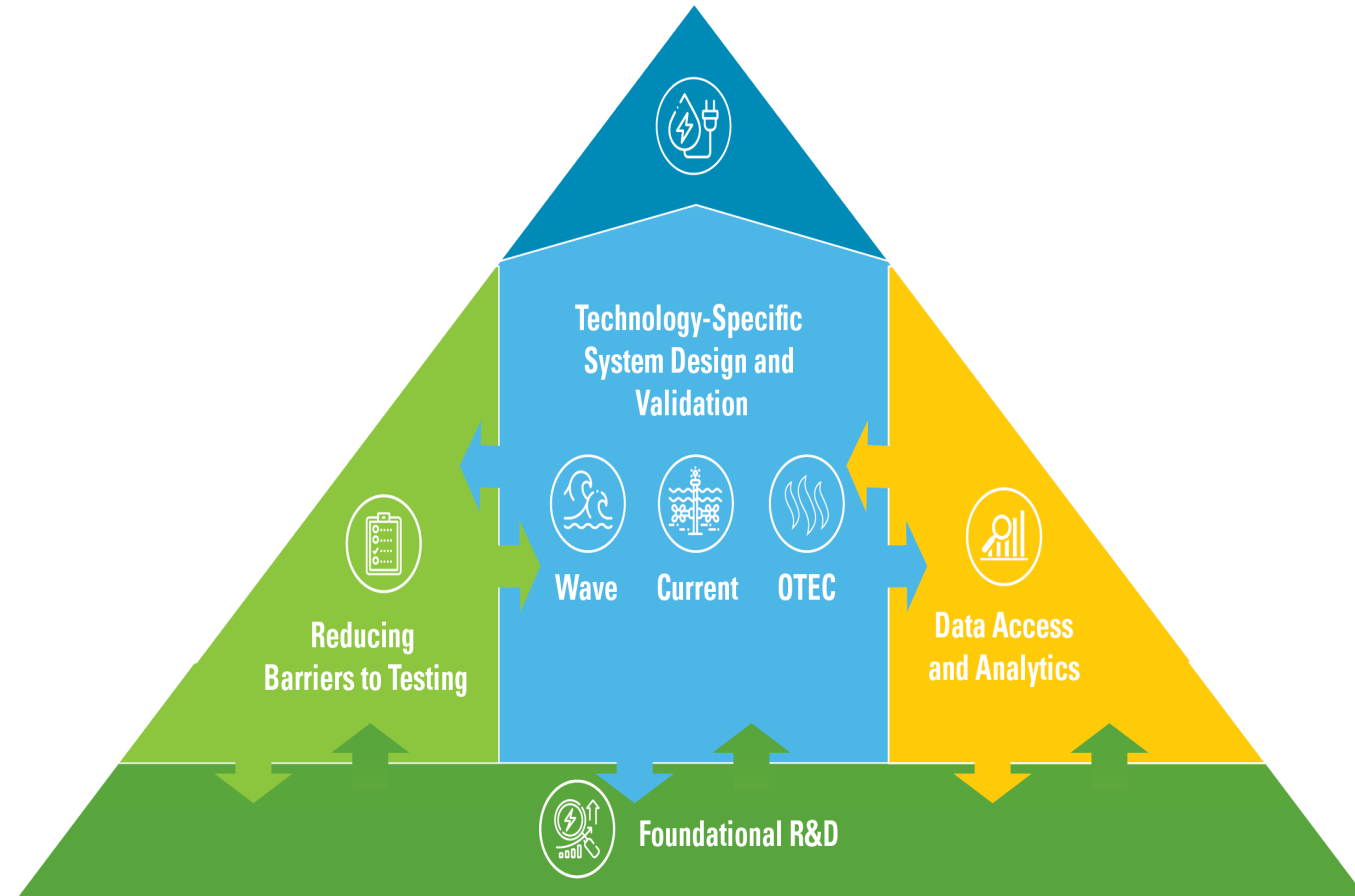




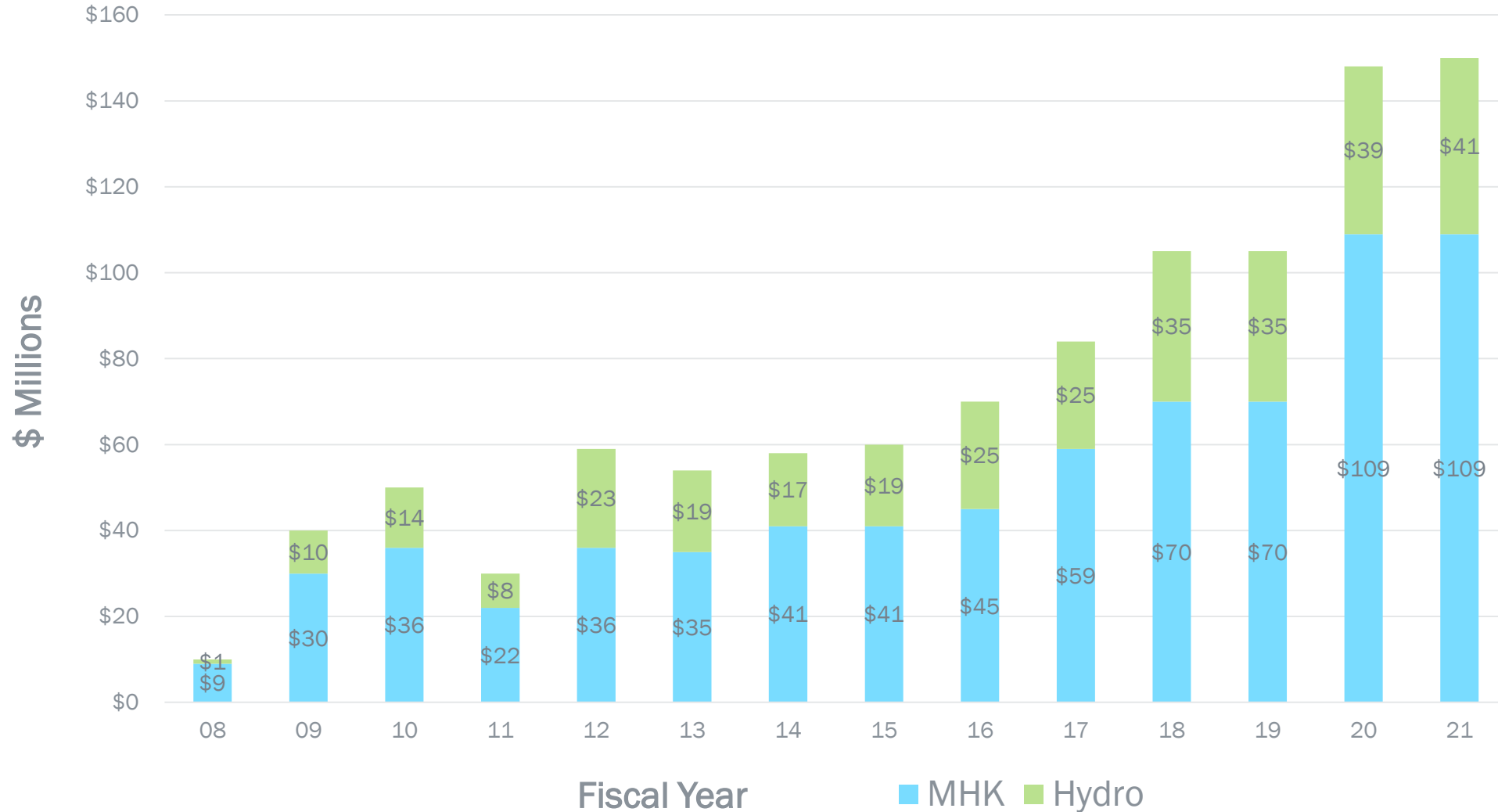
# Marine Renewable Energy Challenges and Approaches

1. Fundamental **scientific and engineering challenges** in capturing energy from multi-directional water flows.
2. Complexities in **installing, operating, and maintaining devices** in harsh marine environments.
3. Prolonged **design and testing cycles**, partially due to long, costly permitting processes, is exacerbated by **limited access to testing infrastructure**.
4. Limited **data on technology performance and end-user applications**, including emerging applications in the blue economy.

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



# WPTO Budget Over Time



# We leverage a variety of 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.

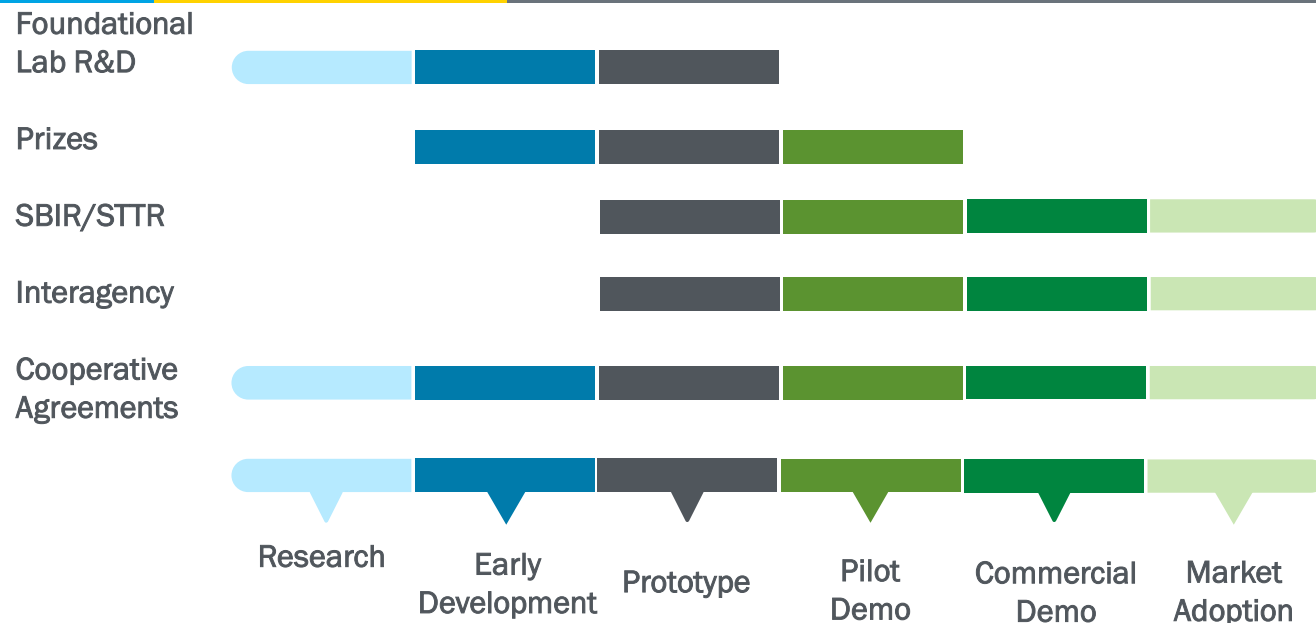
- **FOAs & Cooperative Agreements**
- **Prizes**
- **SBIR/STTR (Small Business Innovation Research Grants)**

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

- **Cooperative Research and Development Agreements (CRADAs)**
- **Notice of Technical Assistance (NOTA)**

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

- **Lab Calls**
- **Annual Operating Plans**
- **Request for Innovation, Seedlings (Pioneered at WPTO)**



**Other Mechanisms** – Other contractual mechanisms to conduct work, including directed funding and contracting agreements.

- Determination of Noncompetitive Funding Award (DNFA)
- GSA Schedules.

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

- Broad Agency Announcements (BAA)
- **Interagency Agreements (IAA)**

# Open Funding Opportunity: \$22M for Marine Energy R&D at Research Institutions

## **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.

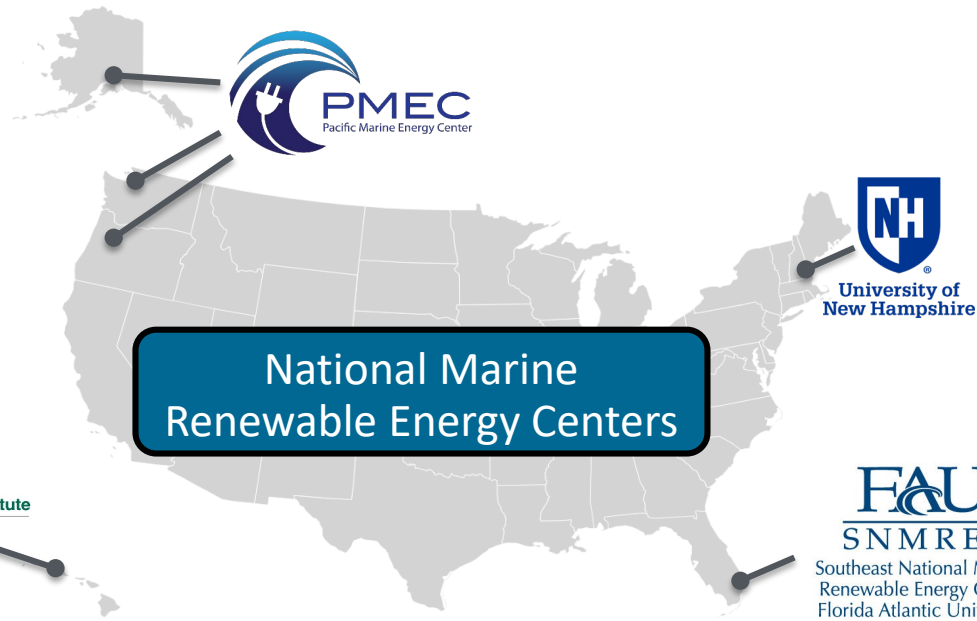
## **3 - Foundational Research Network Facilitator (FRNF) - \$1.5M**

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.

# The U.S. marine energy community – sample of partners



## National Marine Renewable Energy Centers

## National Laboratories



## Testing Infrastructure & Programs



## Technology Developers



## Federal Permitting & Licensing



## Federal R&D Partners



# DOE National Laboratories

## Office of Science Laboratories

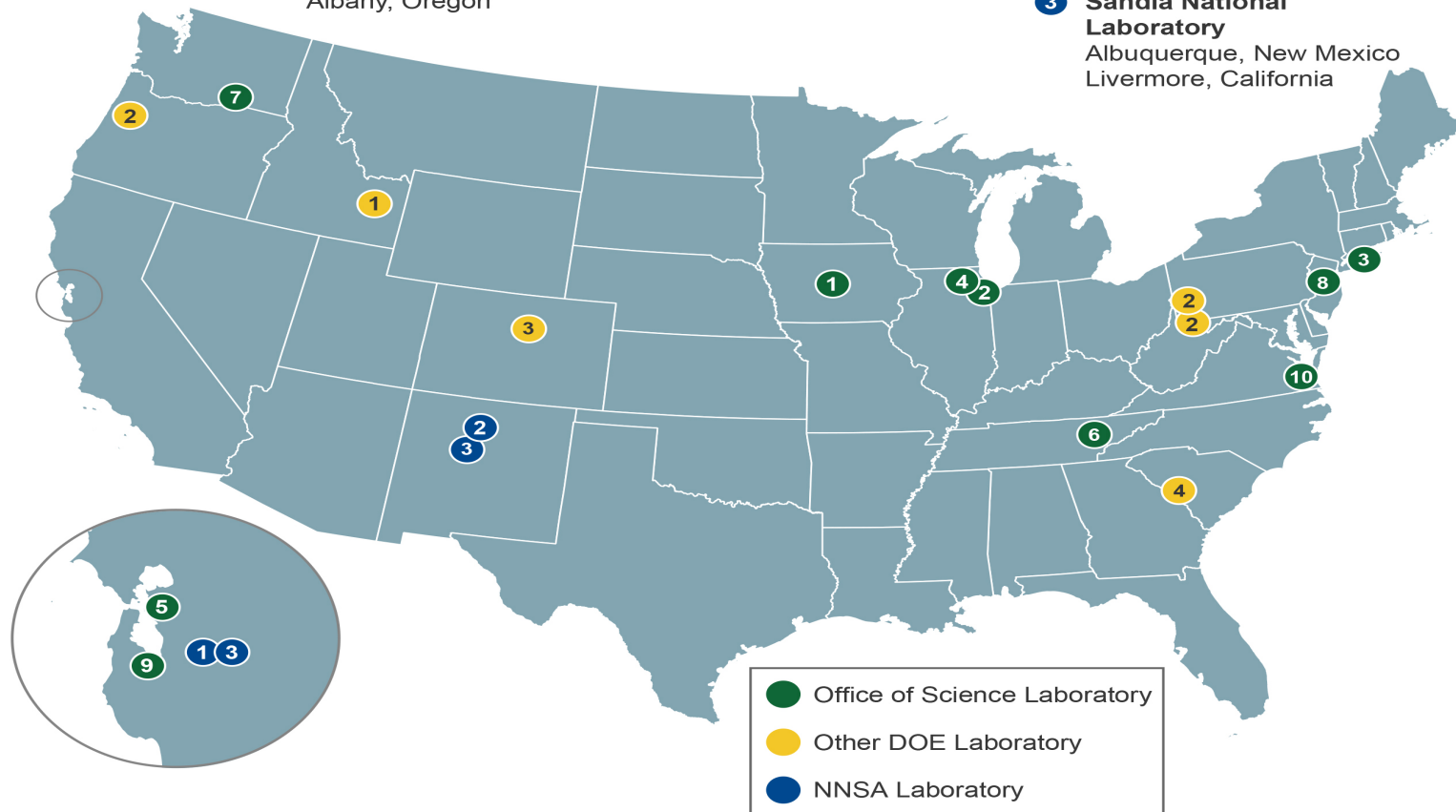
- 1 Ames Laboratory  
Ames, Iowa
- 2 Argonne National Laboratory  
Argonne, Illinois
- 3 Brookhaven National Laboratory  
Upton, New York
- 4 Fermi National Accelerator Laboratory  
Batavia, Illinois
- 5 Lawrence Berkeley National Laboratory  
Berkeley, California
- 6 Oak Ridge National Laboratory  
Oak Ridge, Tennessee
- 7 Pacific Northwest National Laboratory  
Richland, Washington
- 8 Princeton Plasma Physics Laboratory  
Princeton, New Jersey
- 9 SLAC National Accelerator Laboratory  
Menlo Park, California
- 10 Thomas Jefferson National Accelerator Facility  
Newport News, Virginia

## Other DOE Laboratories

- 1 Idaho National Laboratory  
Idaho Falls, Idaho
- 2 National Energy Technology Laboratory  
Morgantown, West Virginia  
Pittsburgh, Pennsylvania  
Albany, Oregon
- 3 National Renewable Energy Laboratory  
Golden, Colorado
- 4 Savannah River National Laboratory  
Aiken, South Carolina

## NNSA Laboratories

- 1 Lawrence Livermore National Laboratory  
Livermore, California
- 2 Los Alamos National Laboratory  
Los Alamos, New Mexico
- 3 Sandia National Laboratory  
Albuquerque, New Mexico  
Livermore, California



# Universities are key partners on foundational research

**PacWave**  
TESTING WAVE ENERGY FOR THE FUTURE

**PMEC**  
Pacific Marine Energy Center

University of Washington  
Oregon State University  
University of Alaska Fairbanks

Hawaii National Marine Renewable Energy Center

**HNEI**  
Hawai'i Natural Energy Institute  
University of Hawai'i at Mānoa

Three National Marine Renewable Energy Centers (NMRECs) established in 2008. Operated by universities to conduct cutting-edge research on marine energy technologies.

Coming soon:  
**Atlantic Marine Energy Center**  
(FY20 FOA)

**FAU**  
**SNMREC**  
Southeast National Marine Renewable Energy Center  
Florida Atlantic University

**POWERING**  
the BLUE ECONOMY

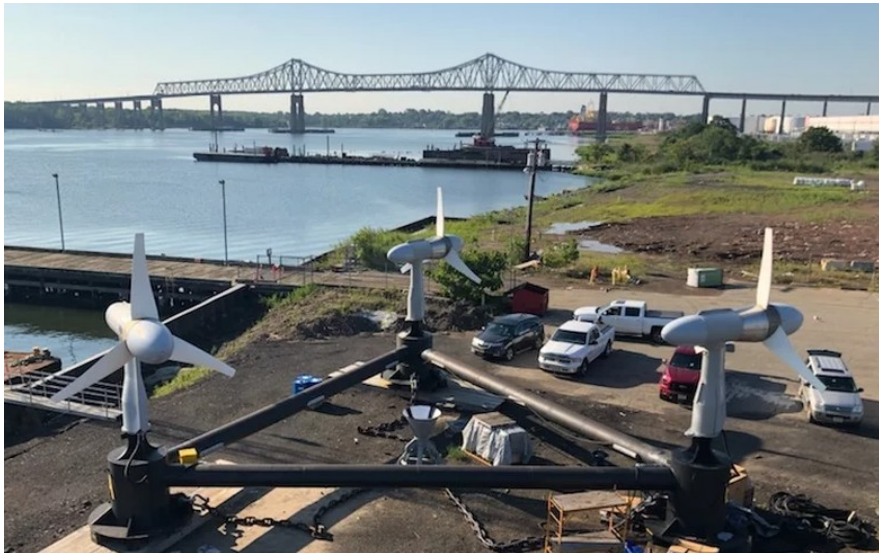
Marine Energy Collegiate Competition

U.S. DEPARTMENT OF ENERGY

# 2021 and 2022 will be important years for U.S. marine energy

A few things on the horizon...

- 2021: **At least 5 open-water tests** of different device types (wave, tidal, river current) will continue or start.
- 2021: **Dozens of lab and tank tests** of small prototypes through the WPTO TEAMER Program.
- 2022: **Testing of wave-powered-desalination systems** off the NC coast as part of the Waves to Water Prize.
- 2022: The first pre-permitted and grid-connected marine energy test site in the U.S., **PacWave**, is **expected to begin operation** and welcome new devices for testing.



In October 2020, Verdant began testing their latest tidal turbines with a new mounting system in New York's East River. The test will continue throughout 2021.



Jennette's Pier, located in North Carolina's Outer Banks, will be the staging ground for the final stage of the Waves to Water Prize.



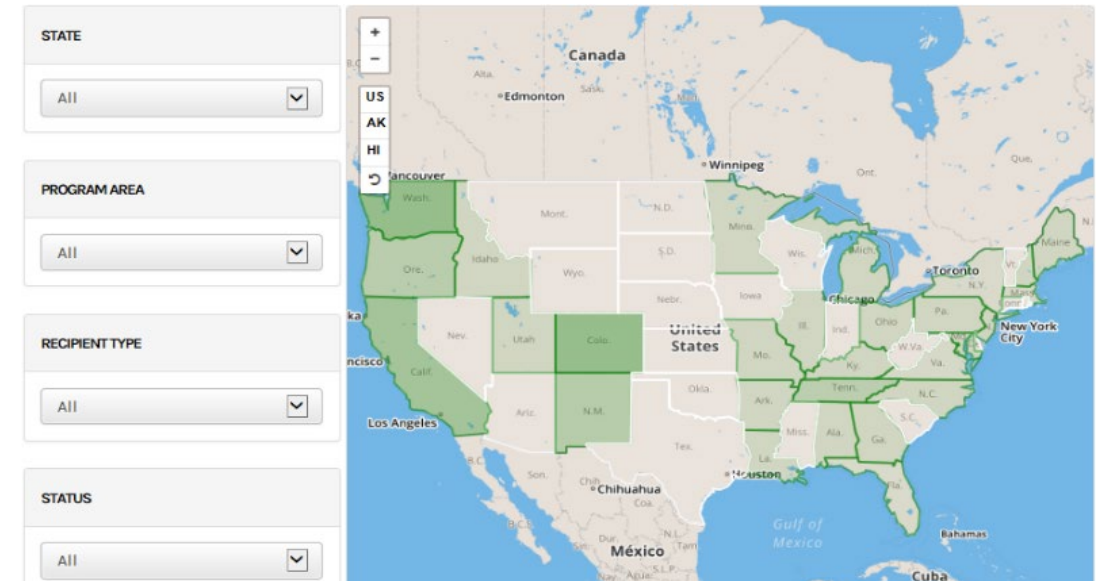
# Resources

*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>

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