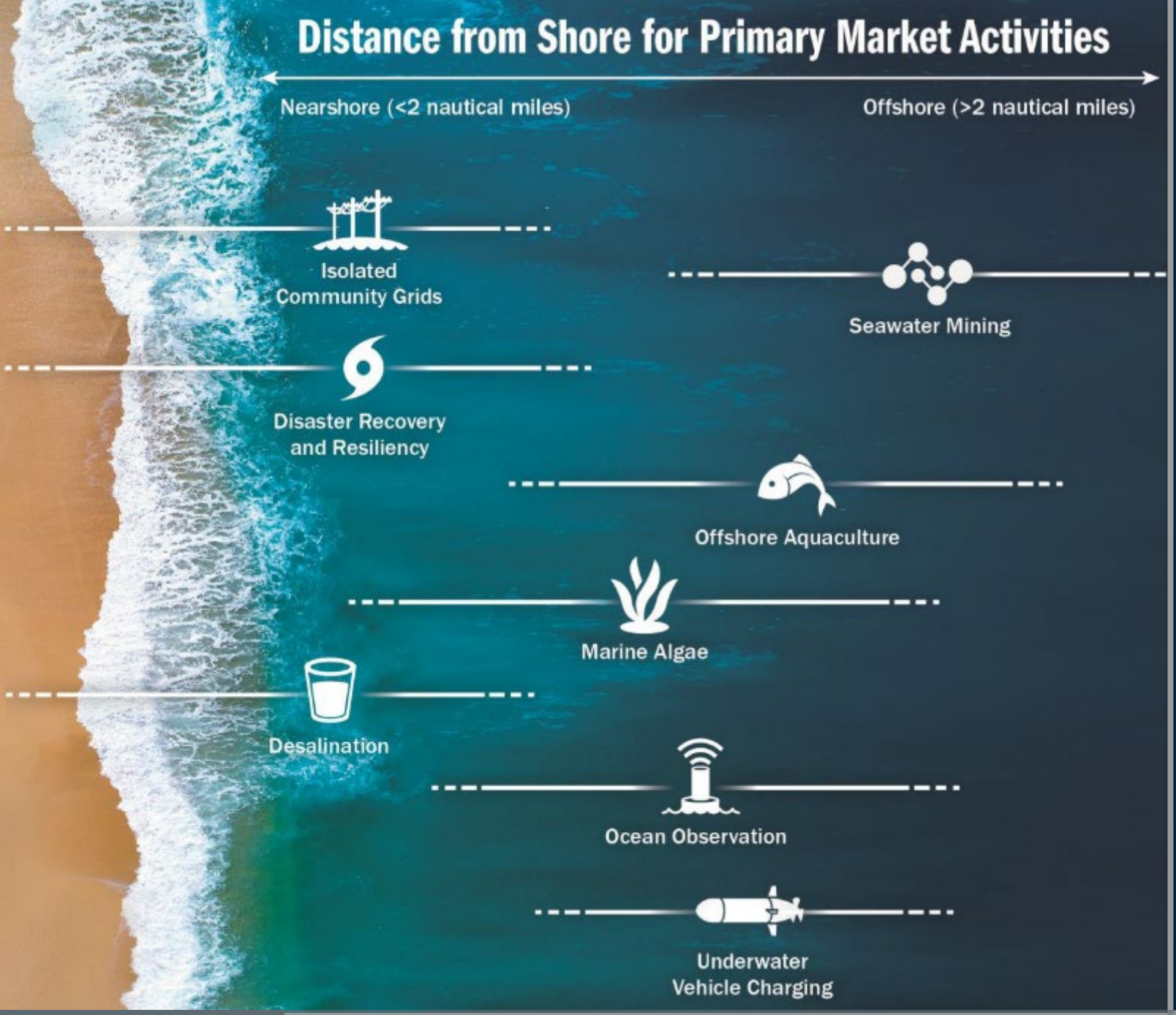

Tessa Greco
July 18, 2022

Agenda

- Evolution of the Powering the Blue Economy Initiative
- Program Goals
- Program Management Approach and Structure
- 2022 Program Portfolio and Activities
- Looking to the Future

Evolution of PBE: From then to now

- From 2019 to 2022, the PBE Initiative has explored the feasibility of marine energy to power the eight markets identified in the PBE Report and organized into two market themes: Resilient Coastal Communities and Power at Sea.
- Since its initiation, PBE has developed many active relationships with blue economy industries and end users.
- PBE is shifting focus toward rapid technology design and development so that the ME industry can meet blue economy industry and end user power needs



POWERING the BLUE ECONOMY

Launched in 2019, identified markets far out at sea, like ocean observing and mineral extraction, and near-shore applications like desalination.

Over 200 customers engaged, 150+ awards, including 7 regional innovation hubs funded, 6 community-based organizations supported, and multiple agency partnerships.

PBE on the Power Scale

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

PBE Focus

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

Program Goals

Goals of PBE

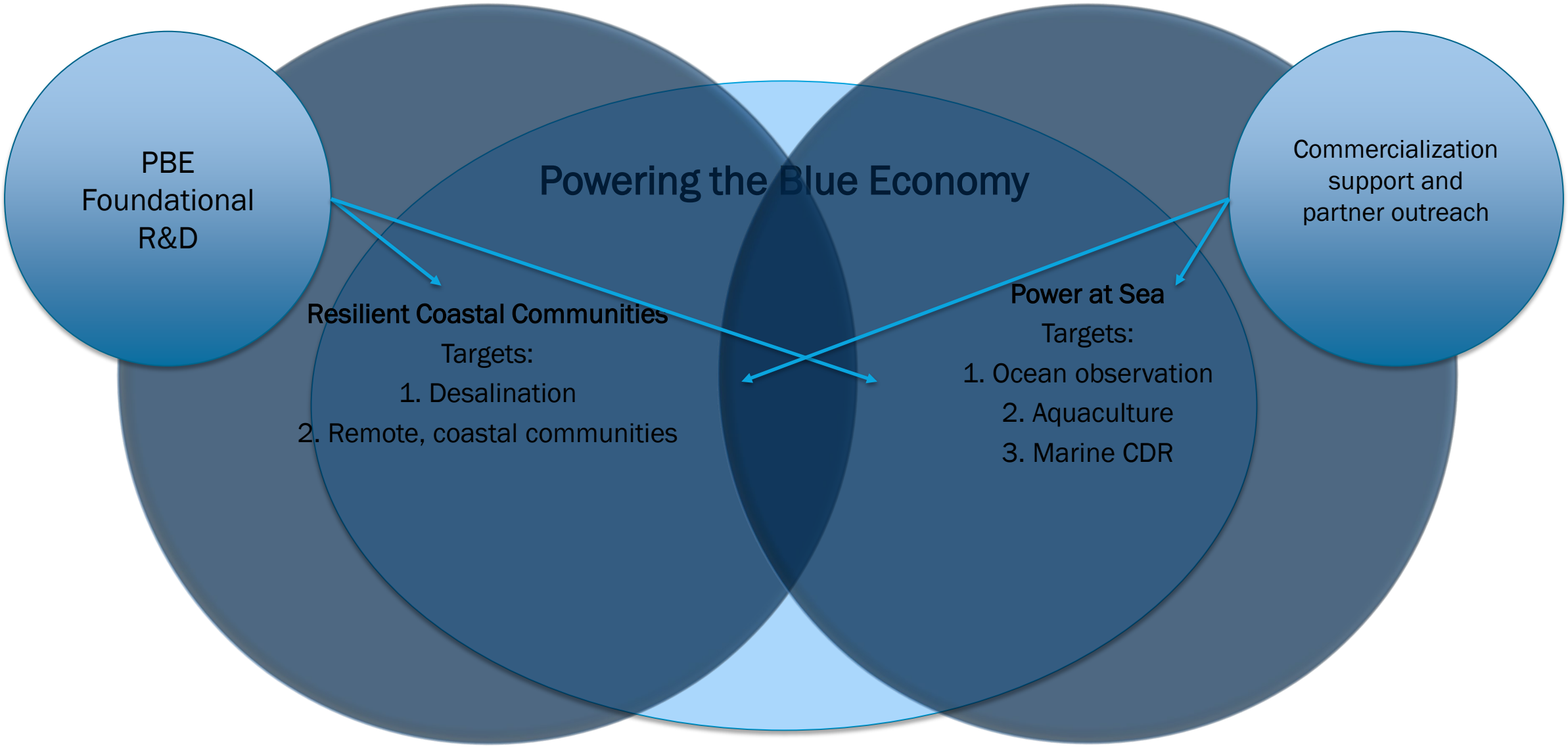
1. *To understand end-user needs and quantify the value of marine energy* in emerging ocean markets uniquely suited to marine renewable energy technology

2. *To accelerate marine energy technology readiness* through near-term opportunities, supporting WPTO's marine renewable energy strategy and mission

3. *To enable broader blue economy goals* by developing solutions to meet energy challenges facing private and public sector blue economy partners, including unlocking the potential of new ocean-enabled technologies; enhancing scientific capabilities in the ocean; and developing resilience in remote, coastal, and island communities.

Program Management Approach and Structure

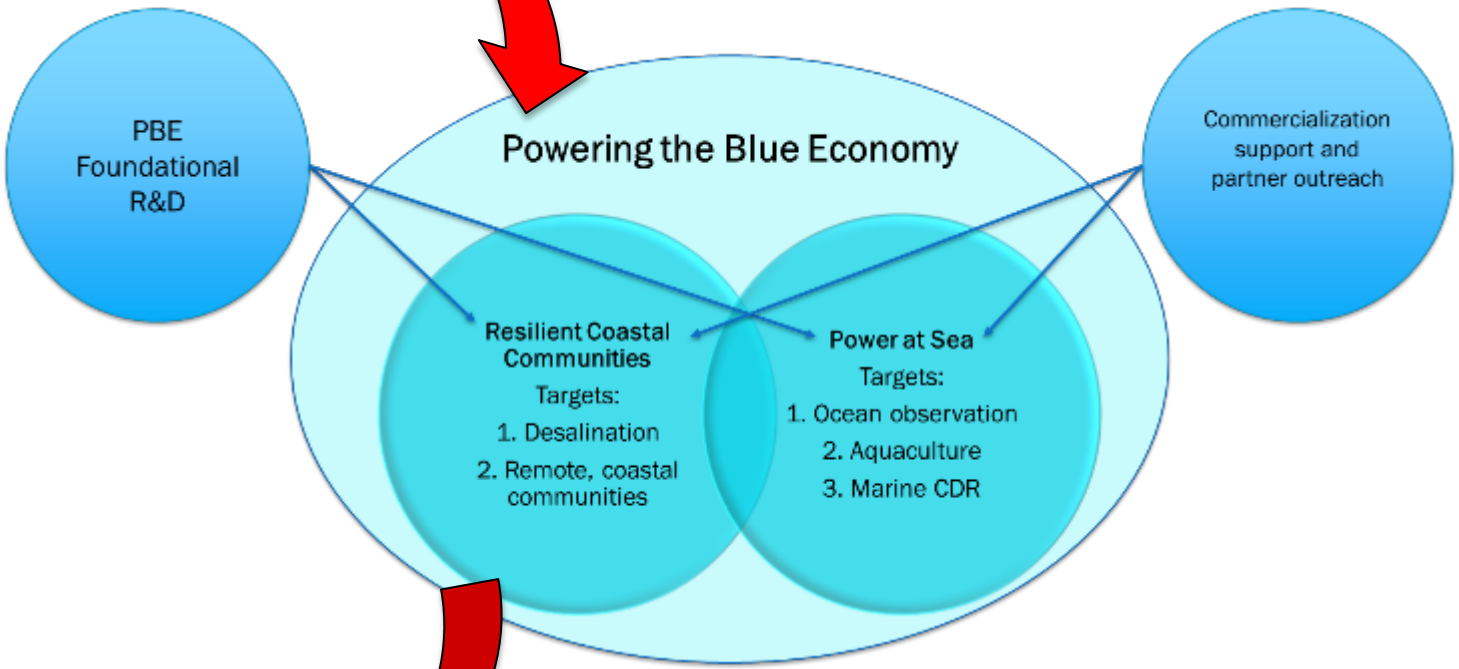
Existing breakdown of PBE portfolio with associated end-users



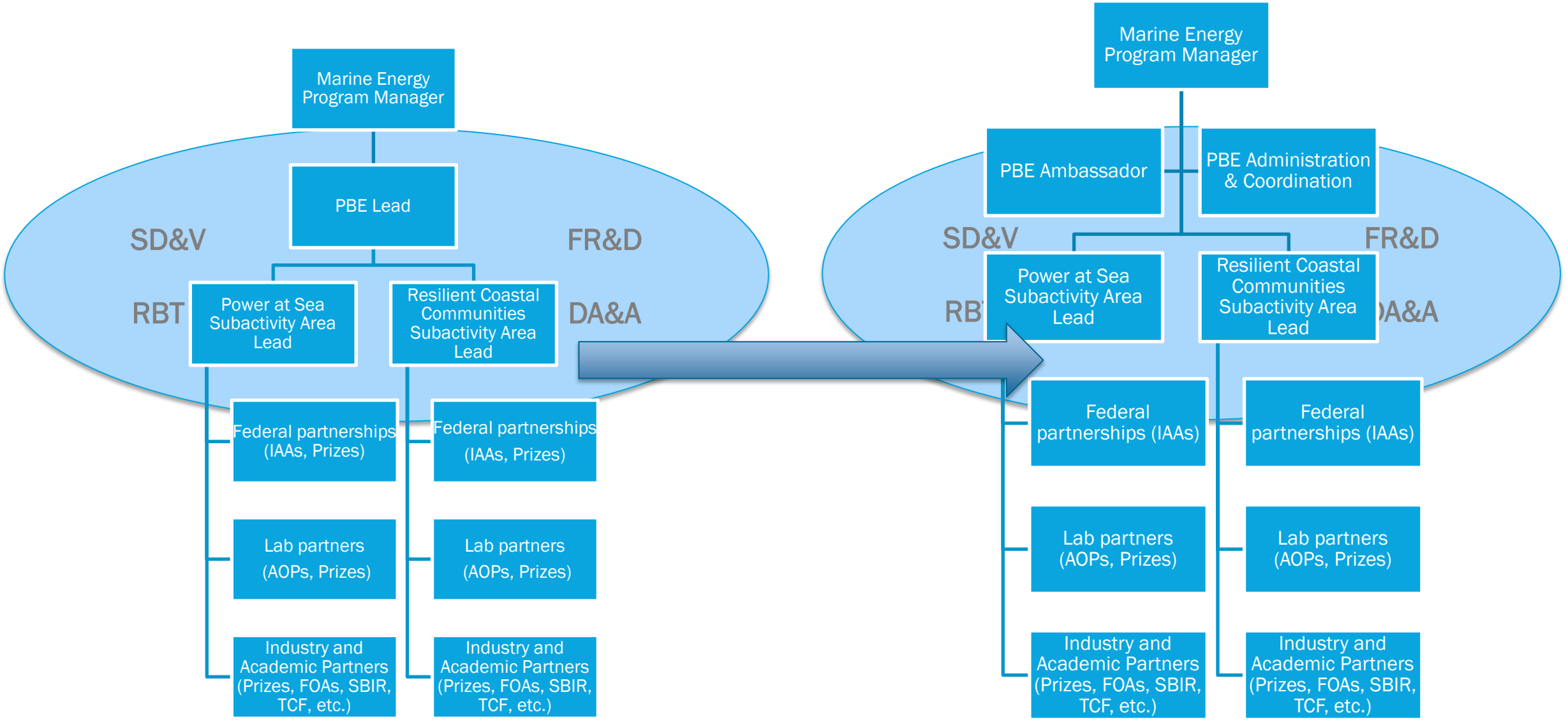
PBE in Marine Energy

Marine Energy Program

- Foundational R&D
- Technology-Specific System Design & Validation
- Reducing Barriers to Testing
- Data Access & Analytics



PBE Current and Proposed Organizational Structure



2022 Program Portfolio and Activities

PBE existing and proposed activities

1. Foundational R&D – small-scale WEC modeling, control schema/optimization, advanced manufacturing for PBE scale rotors and blades, innovative blade design, Triboelectric Nanogenerators (TENG), observation in extreme environments (deep ocean, arctic)
2. System Design & Validation – desalination (W2W), ocean observation (OOP), open source WEC, component level testing, Deployment Readiness Framework, NOAA SG extension and research, ETIPP, EJ – human-centered design
3. Reducing Barriers to Testing – PBE scale testing supported through TEAMER, PacWave demonstrations, industry-focused demonstration at NMRECs (aquaculture), mesocosm studies
4. Data Access & Analytics – Future PBE (STEM, workforce pipeline, regulatory analysis, data capture and availability)

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Marine Energy – PBE Deployment Potential

Near-Term Deployment Opportunities

- **Remote Communities** – Deploying tidal and current powered systems in remote communities can provide energy in areas without many other options. (ETIPP, DRF)
- **Aquaculture/Food** – Reduce emissions from fishing & aquaculture management.
- **Desalination** – Wave energy to directly power systems to desalinate seawater. (Waves to Water Prize)
- **Carbon Dioxide Removal** – Power the systems to monitor removal.
- **Science and Observations** - Provide the power needed to observe the planet. (Ocean Observing Prize)

Resilient Coastal Communities (Lead: Simon Gore)

- Waves to Water Prize
- ETIPP
- DOE-Sea Grant Partnership

Waves To Water Prize

The Waves to Water Prize was a 5-Stage, $3.3M contest to accelerate the development of small, modular, wave-powered desalination systems capable of providing potable drinking water in disaster relief scenarios and remote coastal locations.

Goals:

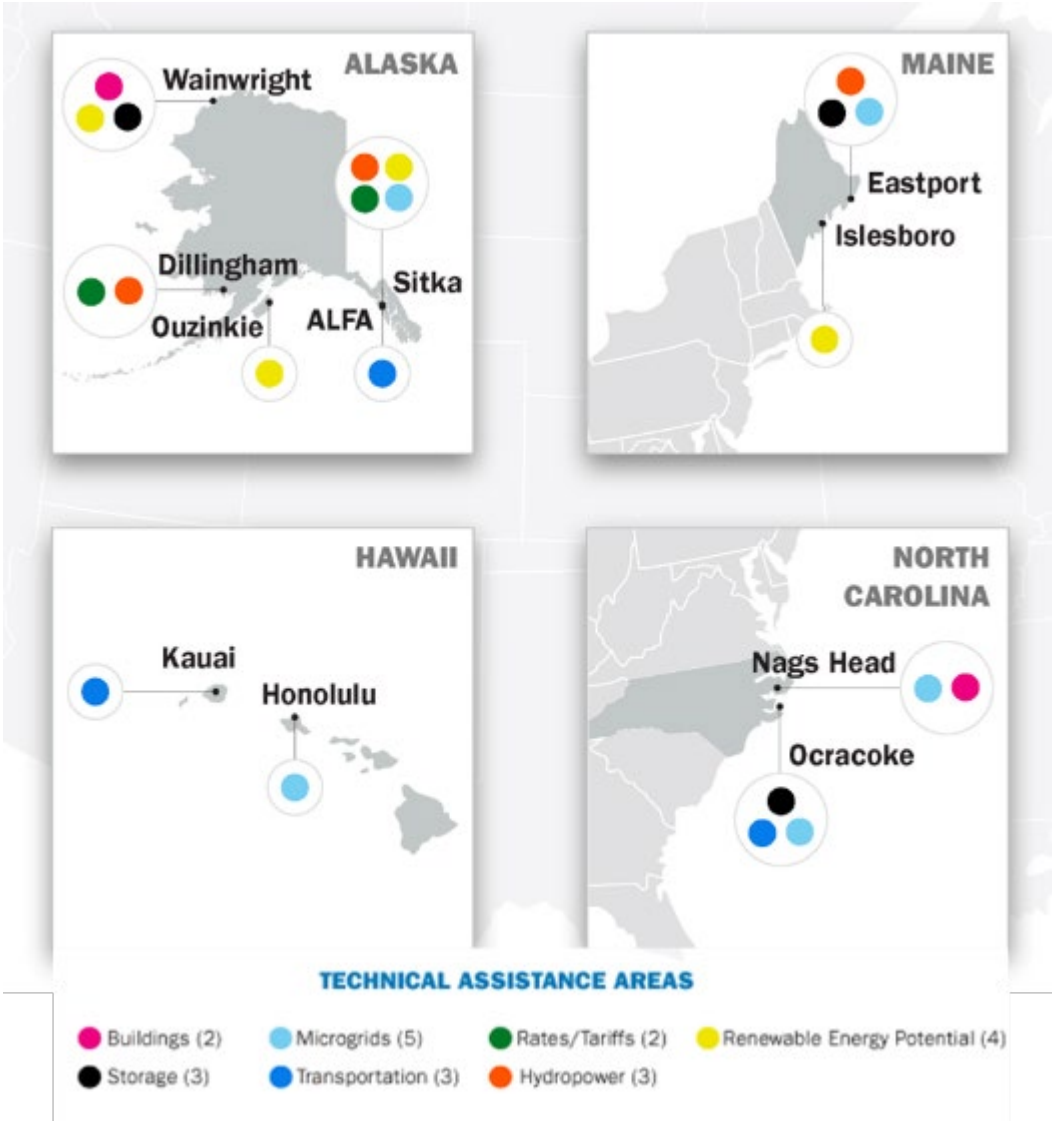
- Develop systems that are ***flexible in varied wave conditions.***
- Deploy systems in ***less than 48 hours.***
- Standardize shipping parameters.
- Deliver minimum ***water quality.***
- Operate without environmental degradation.

Energy Transitions Initiative Partnership Project

- **Holistic energy planning** and energy resilience in remote coastal and island locations
- Comprehensive, **technology-neutral technical assistance** that prioritizes **community challenges, values, and goals**

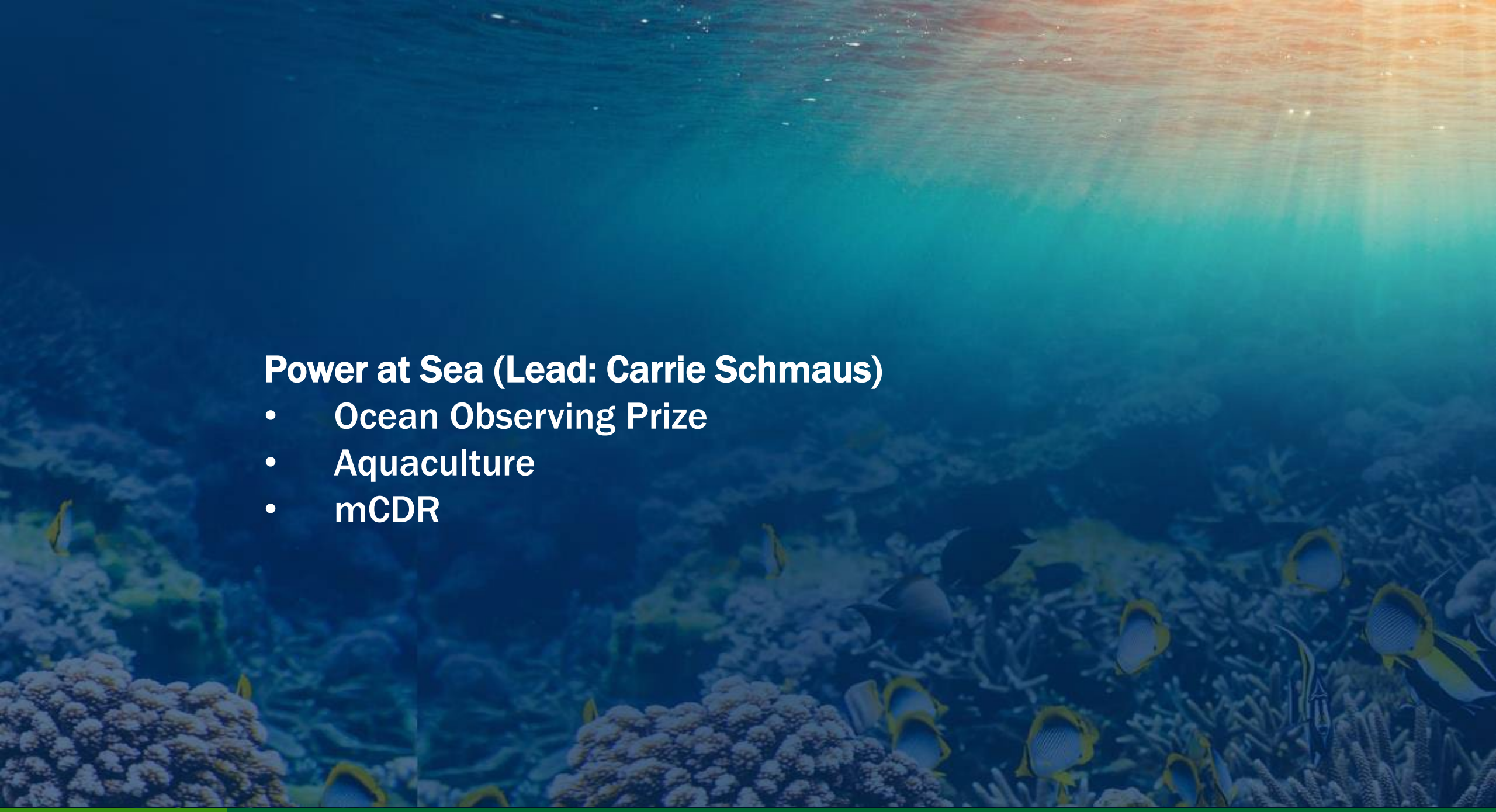
DOE offices supporting ETIPP include:

- Energy Transitions Initiative
- Office of Strategic Programs
- Geothermal Technologies Office
- Solar Energy Technologies Office
- Water Power Technologies Office
- Wind Energy Technologies Office



National Sea Grant Office Collaboration

- In 2022, cross-agency awards to advance research on the effects of ocean renewable energy on coastal communities i the Northeast was announced.
- Research priority areas:
  - Fisheries and fishing community resilience
  - Coastal community and economic resilience
  - Multi-use marine activities
- WPTO, WETO, and NOAA SG are exploring the regional consortium model for future work.



Power at Sea (Lead: Carrie Schmaus)

- Ocean Observing Prize
- Aquaculture
- mCDR

About the Ocean Observing Prize (OOP) Series

- Goals:
  - Integrate marine renewable energy with ocean observation systems
  - Add value to the blue economy
  - Accelerate maturation of the marine energy sector
- OOP 1.0: $3 million prize focused on wave powered rechargeable AUVs for hurricane monitoring
- OOP 2.0: Stay tuned!

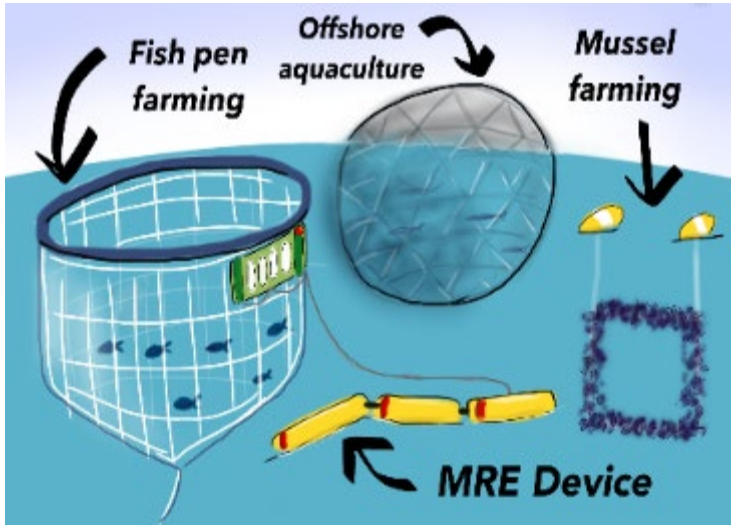
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

NAVSEA
WARFARE CENTERS

Aquaculture: Energy Needs for Ocean Farming

- The expansion of offshore aquaculture in the U.S. will require additional energy at sea
- Small coastal farms
  - Lights, monitoring, harvesting, processing, boats
- Large offshore autonomous farms (emerging interest and development)
  - Monitoring, harvesting, feeding, processing
- Other research & co-location opportunities for aquaculture and marine energy:
  - Permitting
  - Environmental assessment
  - Ocean data collection

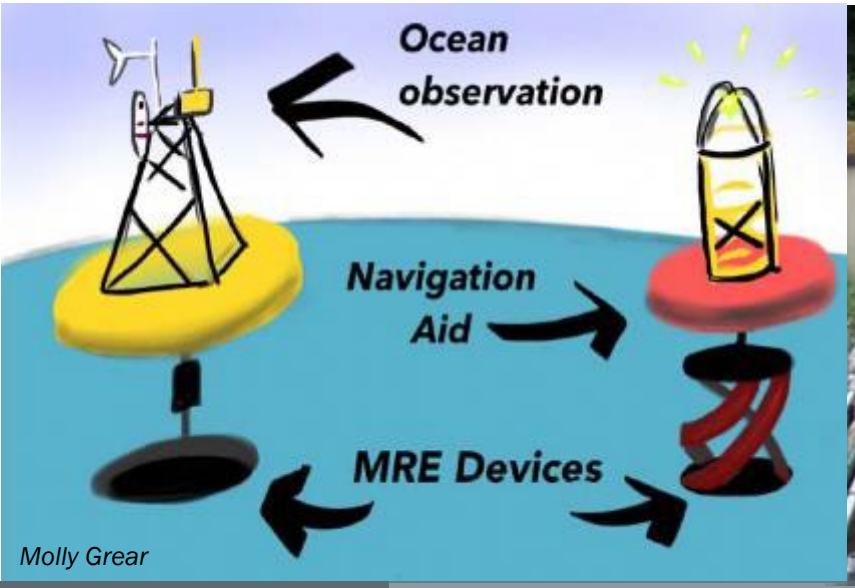
Harvesting ribbon kelp in Doyle Bay, Alaska
Photo: Seagrove Kelp Co.



Marine renewable energy (MRE) for aquaculture
Illustration: Molly Grear, PNNL

WPTO Interests in Marine Carbon Dioxide Removal (mCDR)

- Funding to date has been exploratory through National Lab seed funding program:
  - Topics include electrolytic limestone precipitation and CO_2 capture for de-acidification of aquaculture feedwaters
- Emerging interests:
  - Integrating marine energy with ocean observing to support mCDR monitoring and verification
  - Mesocosm studies to measure and validate water chemistry changes from mCDR
  - Technoeconomic analyses of mCDR approaches
  - Marine spatial analyses for marine energy and seaweed mariculture



Molly Grear


Douglas Klug

Guiding principles

- Rapid device design, develop, test, data capture, validate
  - Repeat!
- Narrowed focus on end users and industries
- Larger investments which enable demonstration and validation activities
- Continued collaboration with federal agencies, industry, academia, national laboratories, communities, DOE technology offices, and more!
- Regular review of goals and priorities

Thank you!

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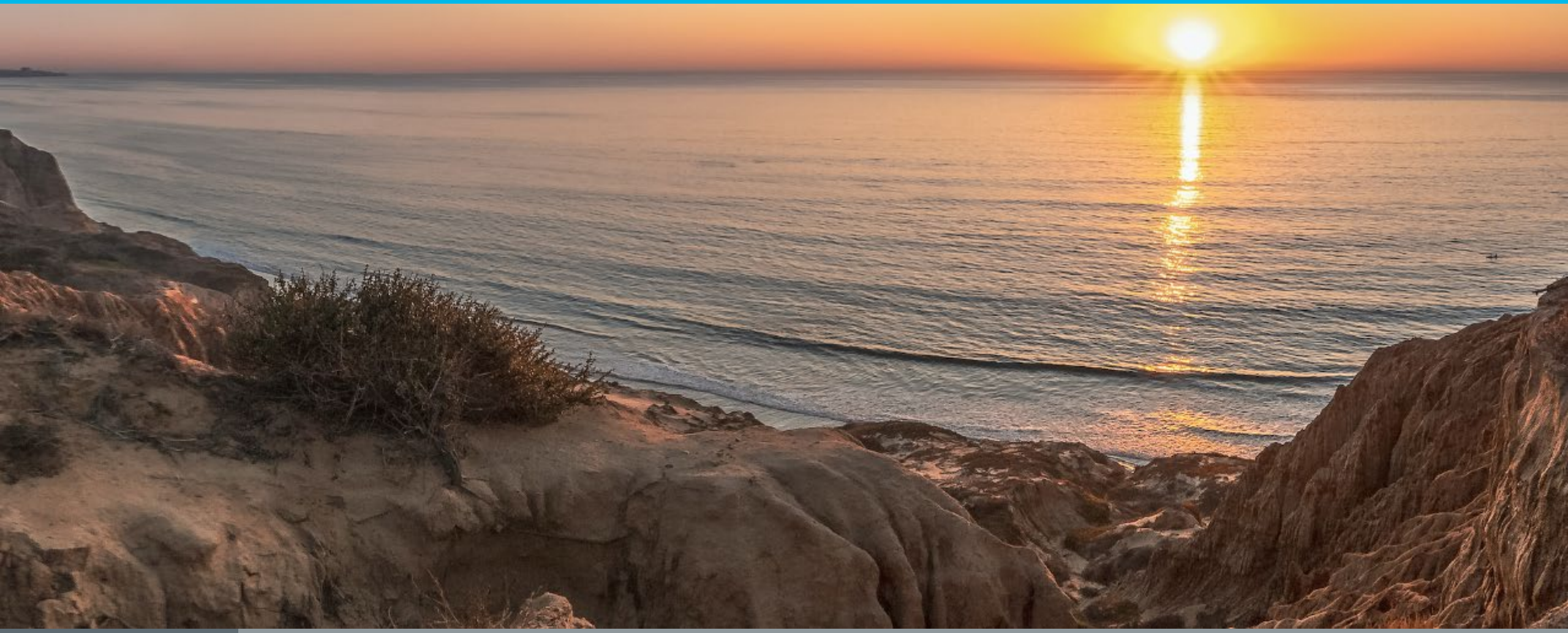

Q&A