

Powering the Blue Economy

Water Power Peer Review

October 10, 2019

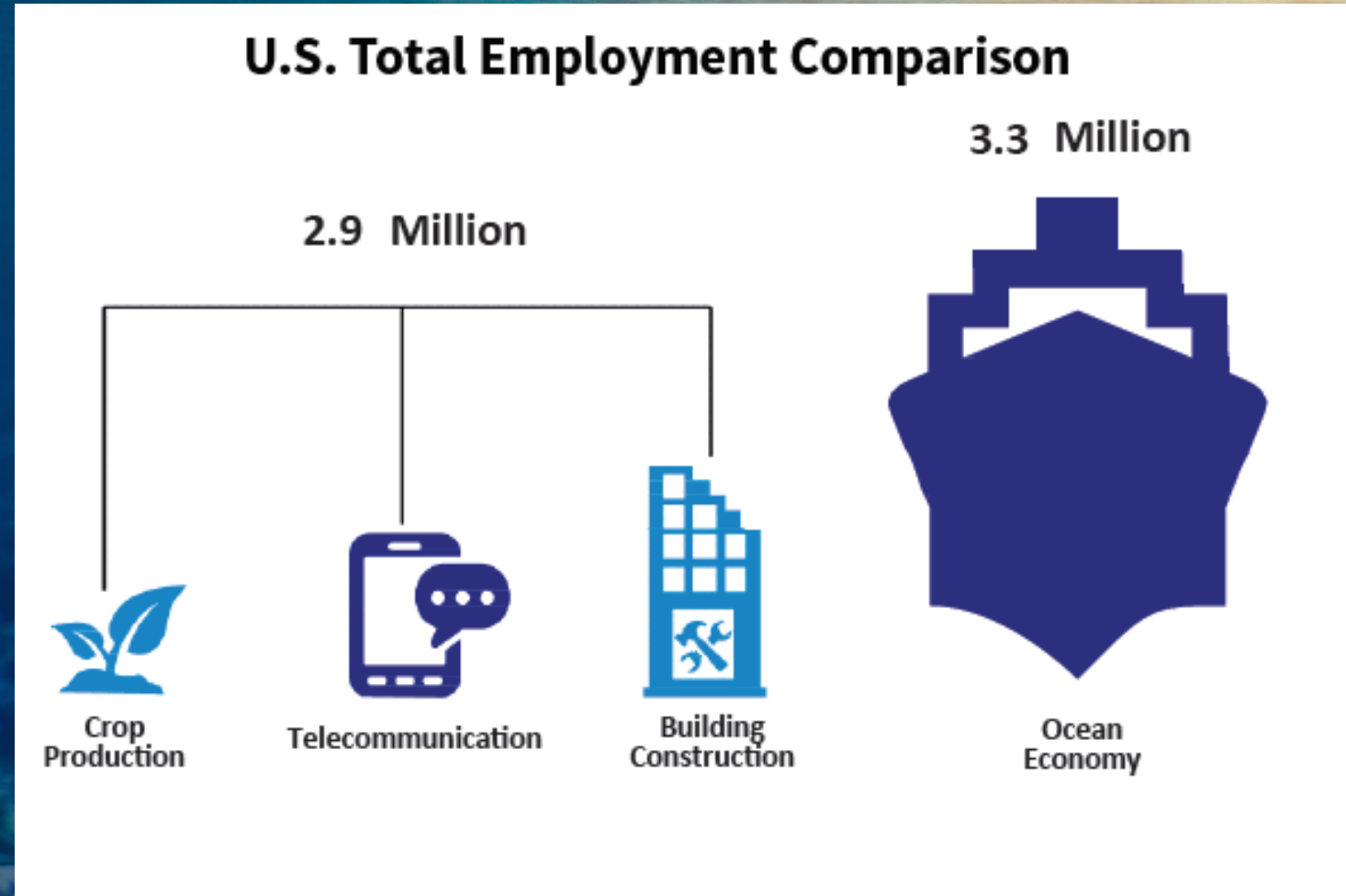


Outline

- Session Overview
- Background on Powering the Blue Economy Initiative
- Program Strategy and Objectives
- 2019 Program Portfolio and Activities (Includes Outreach)
- Program Management Approach

What is the "Blue Economy?"

- The World Bank defines the Blue Economy as “the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystems.”
- OECD predicts the “Blue Economy” will double from \$1.5 trillion to \$3 trillion in global economic value by 2030. Requires innovation!
- The Blue Economy is an Administration Priority, reflected in National Ocean Policy and the Decadal Vision for Ocean Science.



Marine energy has a dual role in the blue economy

1. Energy generation at sea is a stand-alone sector
2. Removing energy constraints enables development of other sectors

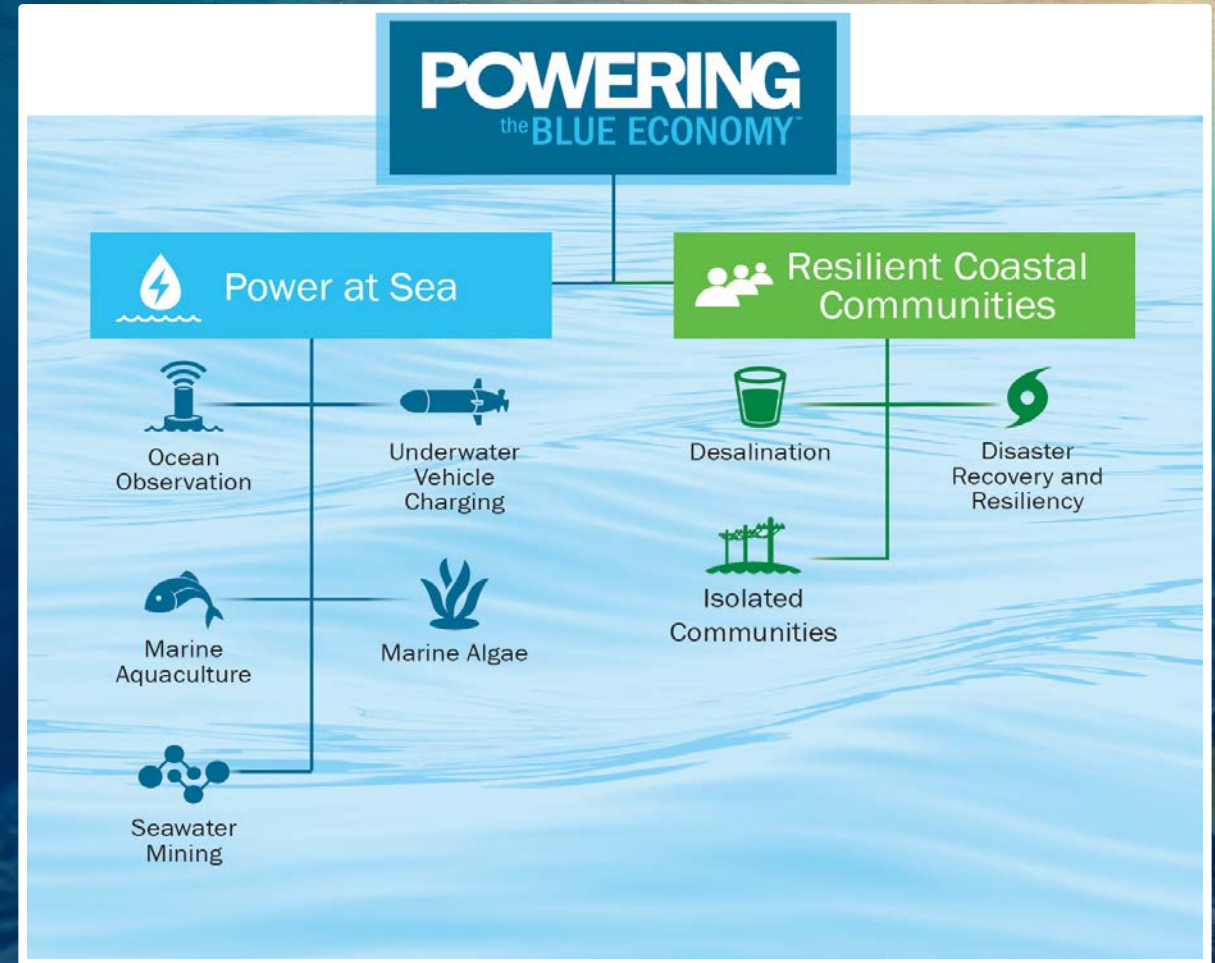
“In addition to generating electricity for use on-shore, power generated at sea (from waves, currents, or wind) could be used to serve the needs of other existing or emerging ocean industries (aquaculture, ocean mineral mining, oceanographic research, or military missions).”

Science and Technology for America's Ocean: A Decadal Vision



Exploring Coastal and Offshore Markets (New Sets of Partners and Energy End Users)

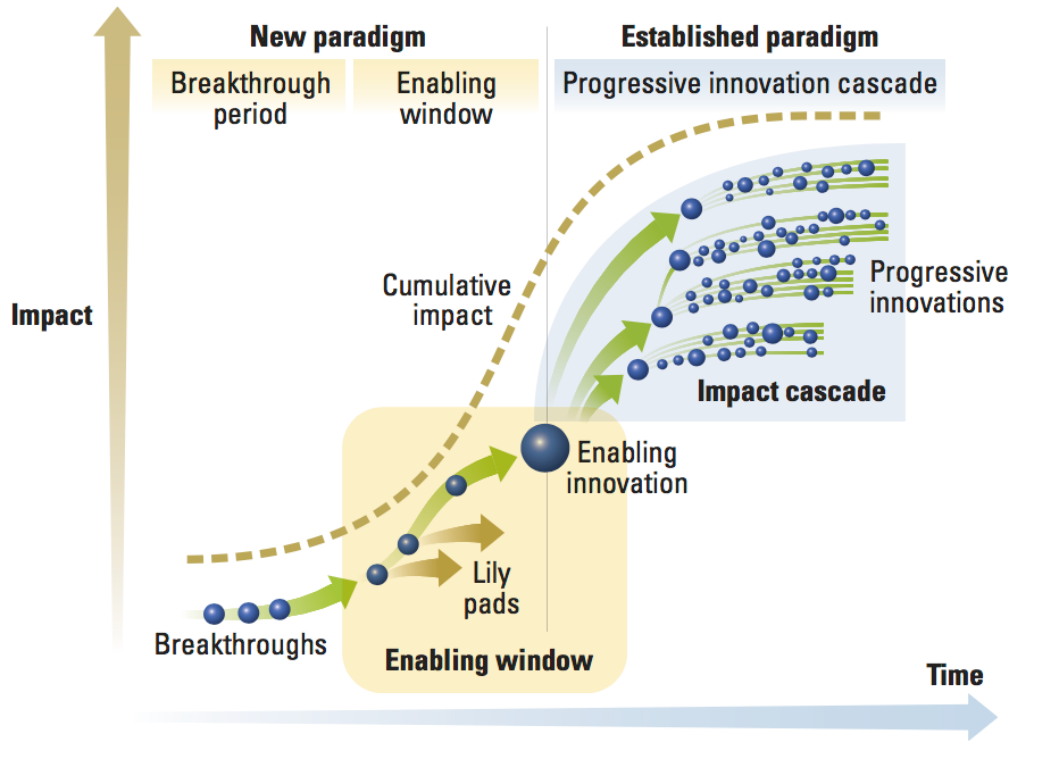
- The PBE report described a set of eight markets organized into two market themes: Resilient Coastal Communities and Power at Sea.
- These market themes offer multiple viable and valuable end points for a potential marine energy developer, as well as pathways towards other markets, such as the grid.
- These two themes, along with WPTO's existing market theme for Grid Scale Power provide a set of overlapping challenges and opportunities for the WPTO's marine energy program.



New End Points and New Pathways

Table 11.1 Perceived Blue Economy Market Readiness

| | Near Term | Emerging | Future |
|--|-----------|----------|--------|
| Power at Sea | | | |
| Ocean Observation and Navigation | X | | |
| Underwater Vehicle Charging | X | | |
| Marine Aquaculture | | X | |
| Marine Algae | | X | |
| Mining Seawater Minerals and Gasses | | | X |
| Resilient Coastal Communities | | | |
| Desalination | X | | |
| Disaster Resiliency and Recovery | | X | |
| Community-Scale Isolated Power Systems | X | | |



Paraphrasing Emily Reichert....Innovation is most often a “winding road of pivots”. How do we embrace both an evolutionary and revolutionary approach?

An underwater scene with a blue gradient background. Sunlight rays filter down from the top right. In the foreground, there are coral reefs and several yellow-striped tangs swimming. The text is overlaid on the left side of the image.

Program Strategy and Objectives

- Vision and Goals
- Impact and Value
- Near-term Opportunities
- Co-development for Blue Economy Energy System Innovation
- Summary of Guiding Principles

Program Strategy (High Level Vision and Goals)

Vision

Unlock growth in the Blue Economy through energy innovation and new applications of marine energy.

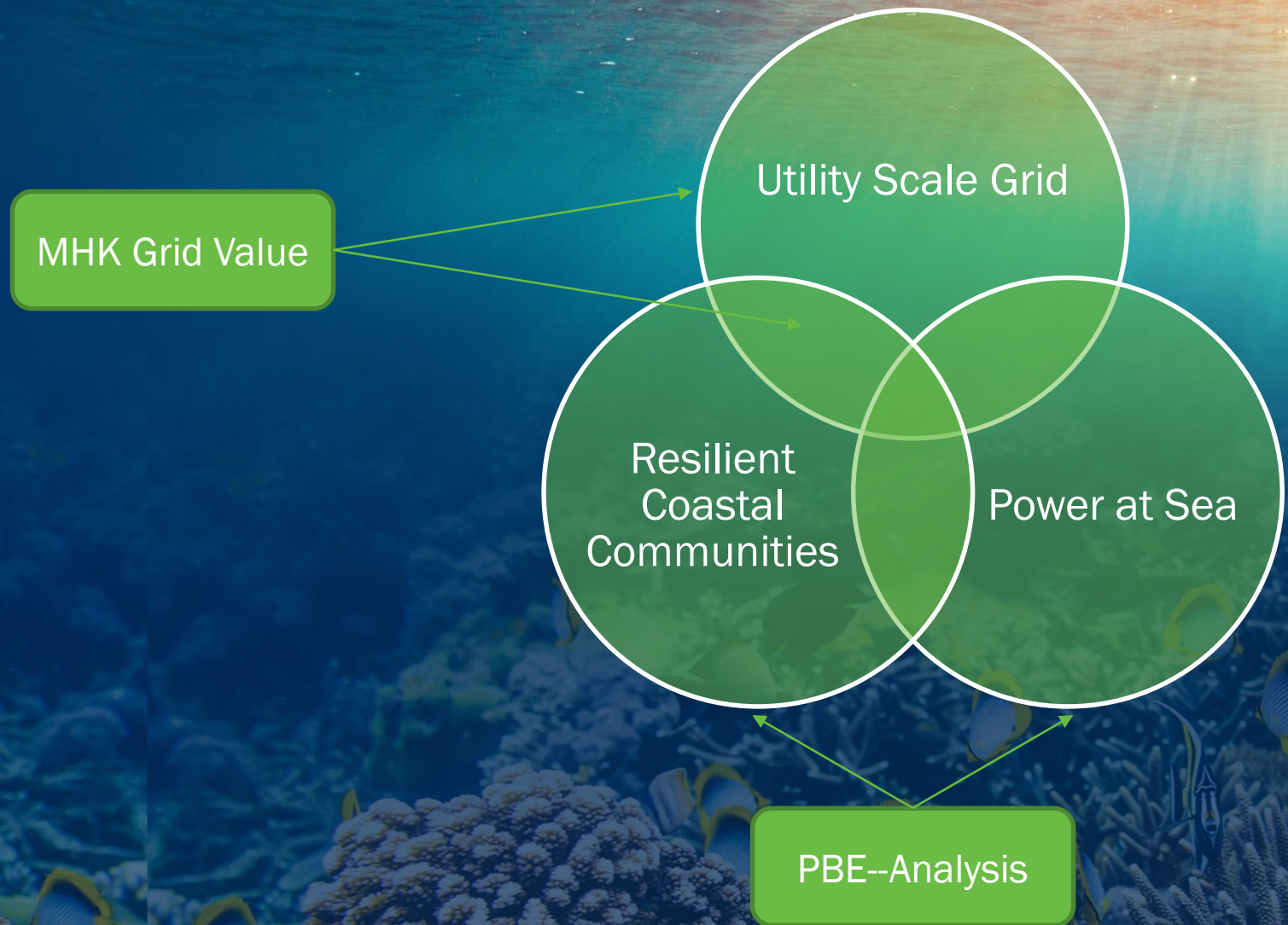
Working Goals—

1. Understand and quantify the **value** of marine energy in emerging ocean markets uniquely suited to MHK technology attributes.
2. Accelerate marine energy **technology-readiness** through near-term opportunities, supporting WPTO MHK strategy and mission.
3. Work directly with the private sector, across EERE offices, and other public sector partners to address blue economy energy system needs; contribute to national goals for growth in the blue economy.

Program Strategy—Impact and Value

Goal 1: Understand end user needs and quantify the value of marine energy in emerging ocean markets uniquely suited to MHK technology attributes.

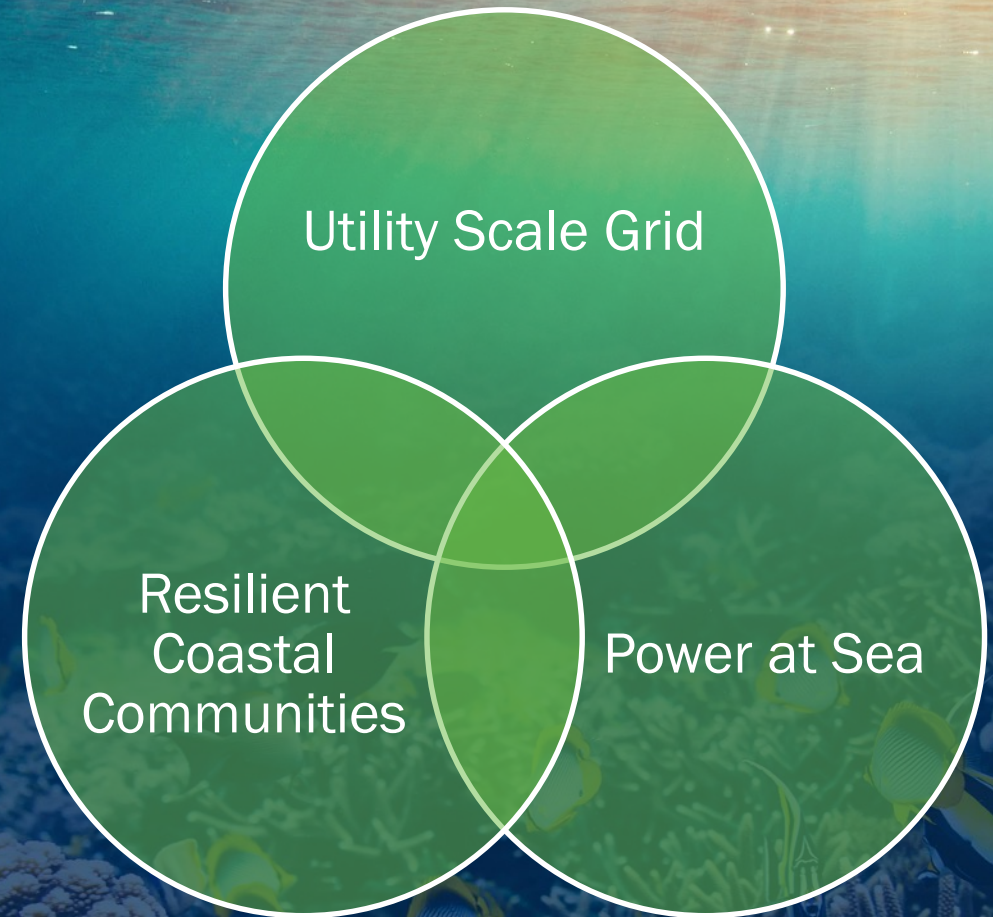
Unifying concept: New value proposition and end user focused design and innovation



Program Strategy—Near Term Opportunities.

Goal 2: Accelerate marine energy technology readiness through near-term opportunities, supporting WPTO MHK strategy and mission.

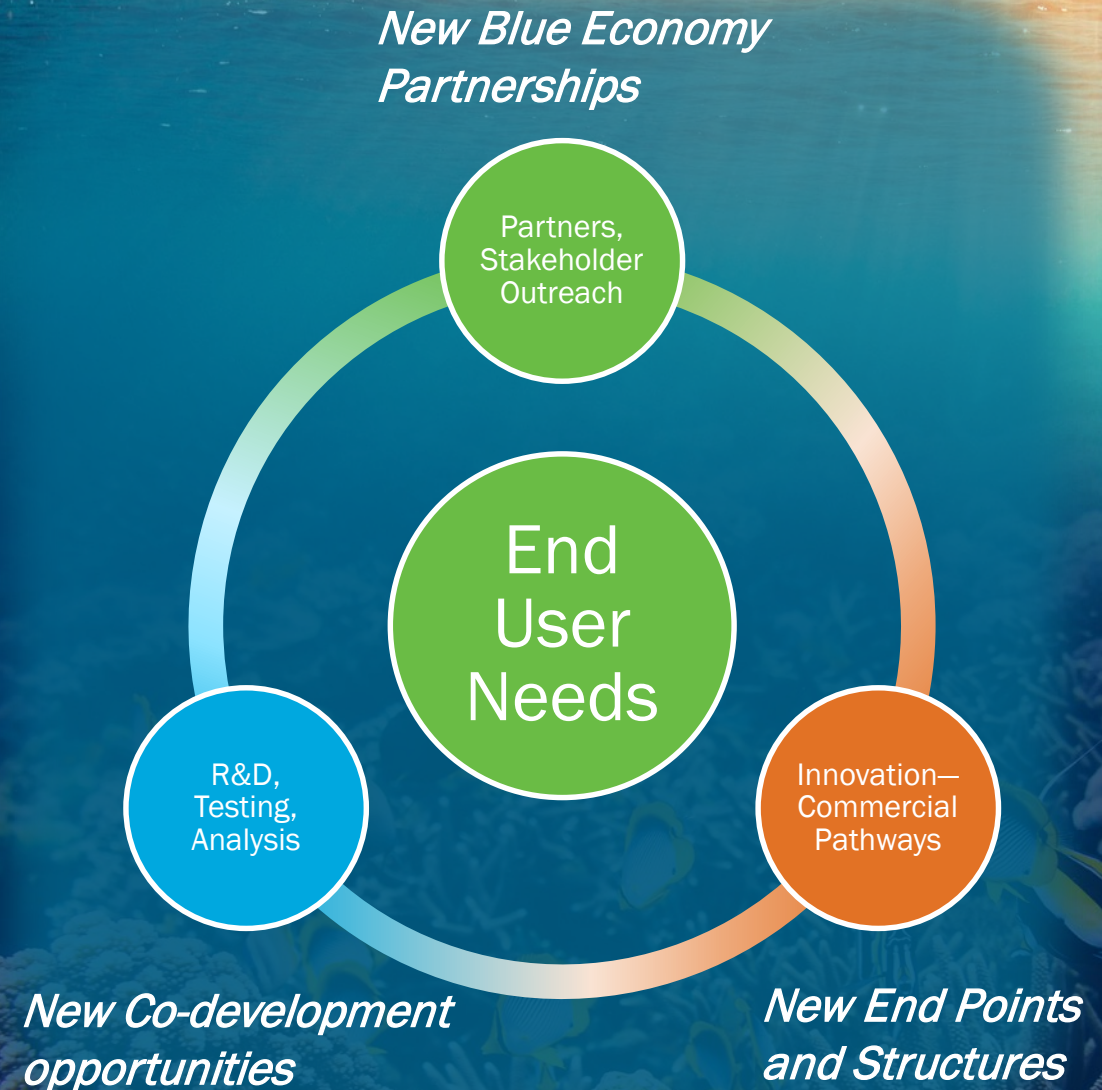
- Support multiple values and pathways for marine energy
- Major programmatic investments consider all three themes—learning across market themes.
- New market themes act as pathways to rapid innovation through small scale end user-driven applications



Program Strategy—Co-Development for Blue Economy Energy System Innovation

Goal 3: Work directly with the private sector, across EERE offices, and other public sector partners to address blue economy energy system needs. Develop PBE specific investments that accelerate co-development of marine energy and blue technologies:

- Outreach and Engagement to understand end user needs. Partnerships to leverage WPTO funding and advance co-development and commercialization.
- Analysis to understand the benefits (economic, environmental, social, human health and well-being) the ocean provides and how energy innovation unlocks those benefits.
- Supportive, cross market, and early-stage R&D at Laboratories and Universities.
- Early stage competitive industry funding through the SBIR program.
- Challenges and prizes focused on specific market opportunities and use cases and expand our problem-solving community.



Summary of General Principles

Understand and Articulate Value, Impact and Benefits: *How does our work enable new opportunities for marine energy, meet end user needs, and provide impactful and quantifiable societal benefit? How does PBE compliment grid scale work?*

Outcome Based Engagement: *Stakeholder and industry outreach processes will be designed to 1) understand end user needs, 2) to create connections between blue economy end users and energy innovators, and 3) to leverage WPTO resources towards program goals.*

Competitive Funding and Partnerships to Address End User Needs: *Including end users needs should limit risk in our investment portfolio and provide opportunities for early wins within Power at Sea and Resilient Coastal Community themes.*

Leverage our unique strengths: *National laboratories, universities, the established marine energy industry, and the emerging industry targeting energy innovation in the blue economy all have unique strengths. We will leverage these strengths in a systematic and coordinated way fostering a thriving and interconnected research ecosystem.*

Start with Near Term Opportunities; Learn by Doing: *Start by targeting opportunities in known near term markets where we know demand presently exists and where marine energy has a quantifiable competitive advantage.*

Collaboration Required: *Energy innovation for the Blue Economy is by definition a system-scale challenge: Inter-sector and inter-disciplinary research collaboration are essential, as is developing mechanisms that allow resources for development to be aggregated and directed at key challenge areas.*

The background of the slide is a vibrant underwater scene featuring a coral reef. In the foreground, there are large, textured coral formations. Numerous small, yellow and black striped fish, likely damselfish, are swimming around the coral. The water is a deep blue, and sunlight rays are visible filtering down from the surface in the upper right corner.

2019 Program Portfolio and Activities

- Initial Investments
- Program Planning, Partnerships, and Outreach

Initial Investments in 2019 (R&D, Analysis, Testing, and Innovation Pathways)

Fact Finding

- PBE report drafting, RFI, release, outreach

Foundational R&D, Testing, and Analysis Capabilities

- Joint Laboratory Annual Operating Plan
- Laboratory and University R&D Strategy
- Analysis—Focus on ocean observing and market value and impact
- Scoping early stage cross market foundational R&D
- Lab/University support for future design/testing activities (with prizes, FOAs, TEAMER, SBIR)

Expand our Community and Capacity for Innovation

- ***Resilient Coastal Communities:*** Waves to Water—2019: design, announce, launch, close phase 1.
- ***Power at Sea:*** Ocean Observing—2019: design (with NOAA), announce, launch early FY 20.
- ***Both Market Themes:*** Collegiate Competition—2019: design, announce, launch. ICOE 2020.

Establish a Pipeline of Smaller Scale Industry Projects

- **2019 SBIR Phase 1:** Marine Energy Storage Concepts, Microgrids, Mineral Extraction, Pumping and Compression (7 awards—Oscilla, ORPC, Blade Runner, PCCI, Pliant Energy Systems, Triton Systems)
- ORPC RivGen project at Igiugig (FOA)
- C-Power SeaRAY for seabed-hosted equipment and dataRay for ocean obs (FOA)
- Initiate planning for future opportunities



Program Planning, Partnerships, and Communications

Program Planning and Strategy

- Geerlofs M&O assignment
- PBE program plan
- Integrate with MHK Strategy
- Support US blue economy goals

Partnerships and Collaboration

- Regional clusters
- Interagency outreach through NOPP
- Blue economy end users
- Ocean tech and ocean observing (science, industry, defense)
- Remote coastal communities
- DOE internal engagement on water security, maritime energy innovation, ocean policy.

Communications and Outreach

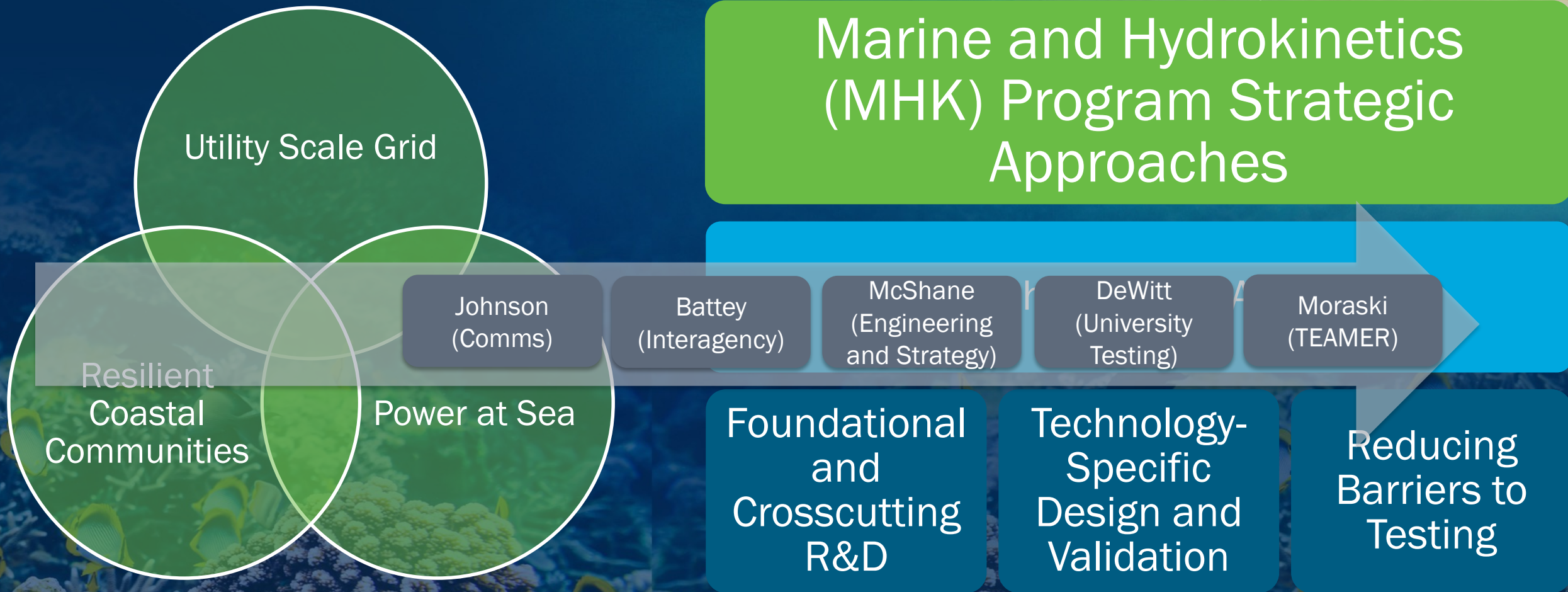
- Comms plans (HQ and Labs)
- PBE Report release, materials, and outreach
- PBE website and prize websites
- Blue economy conferences and PBE presentations at marine energy conferences,
- PBE booth materials and VR
- MEC presentations



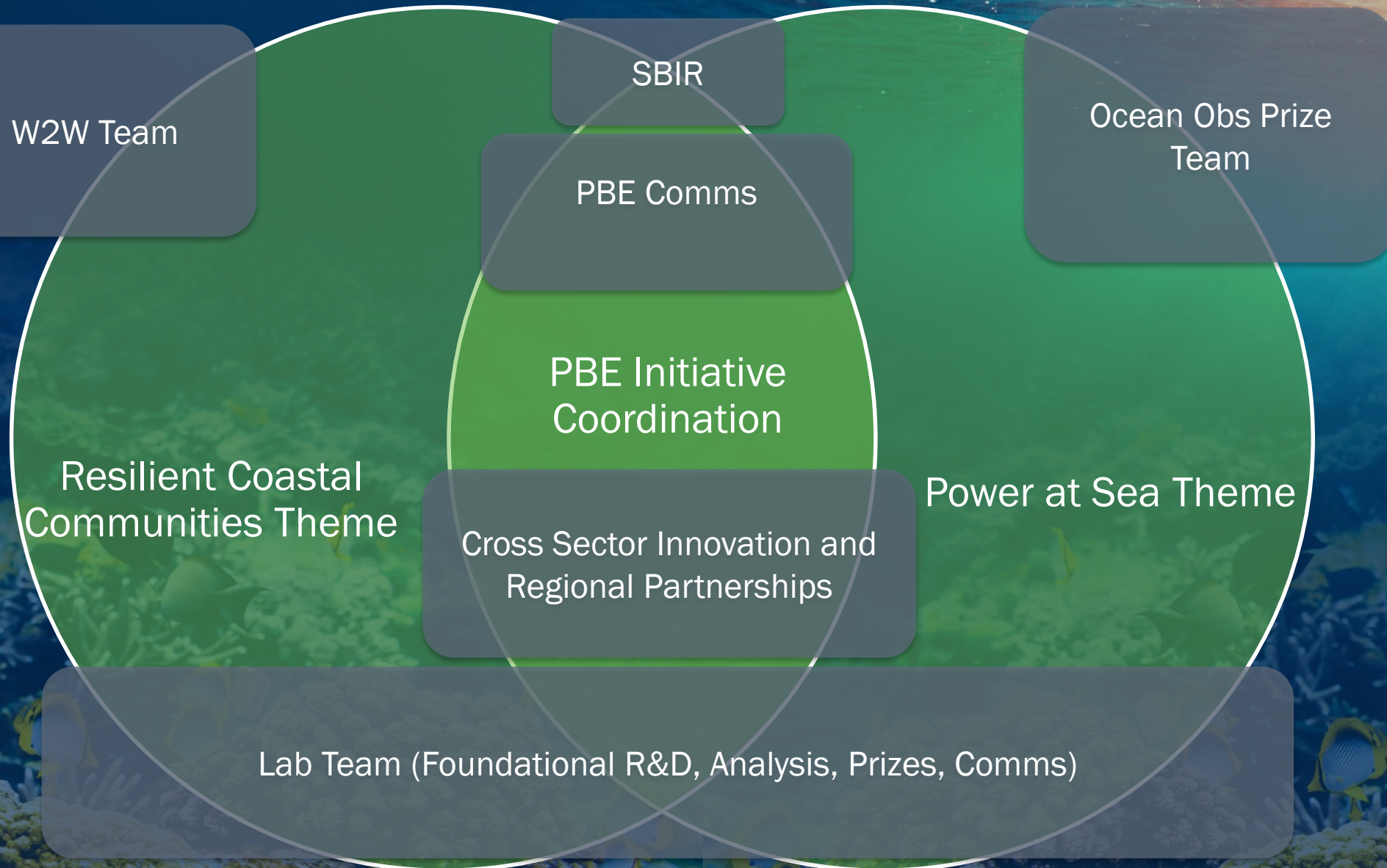
Program Management Approach

- Cross Cutting Initiative
- Core Team

PBE Cross Cuts our Existing Structure



PBE Core Team



PBE Team

Garson
McShane
Ramsey
Schmaus
Gore
Rohr
Spence
Hume
Vijayaraghavan
Geerlofs
Copping
Cavagnaro
Jenne
Livecchi
Greene
Green
Raye
Wiegele

THANK YOU!

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