Pacific Northwest NATIONAL LABORATORY

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Addressing Place-Based Environmental Questions to Enable Marine Energy Deployments

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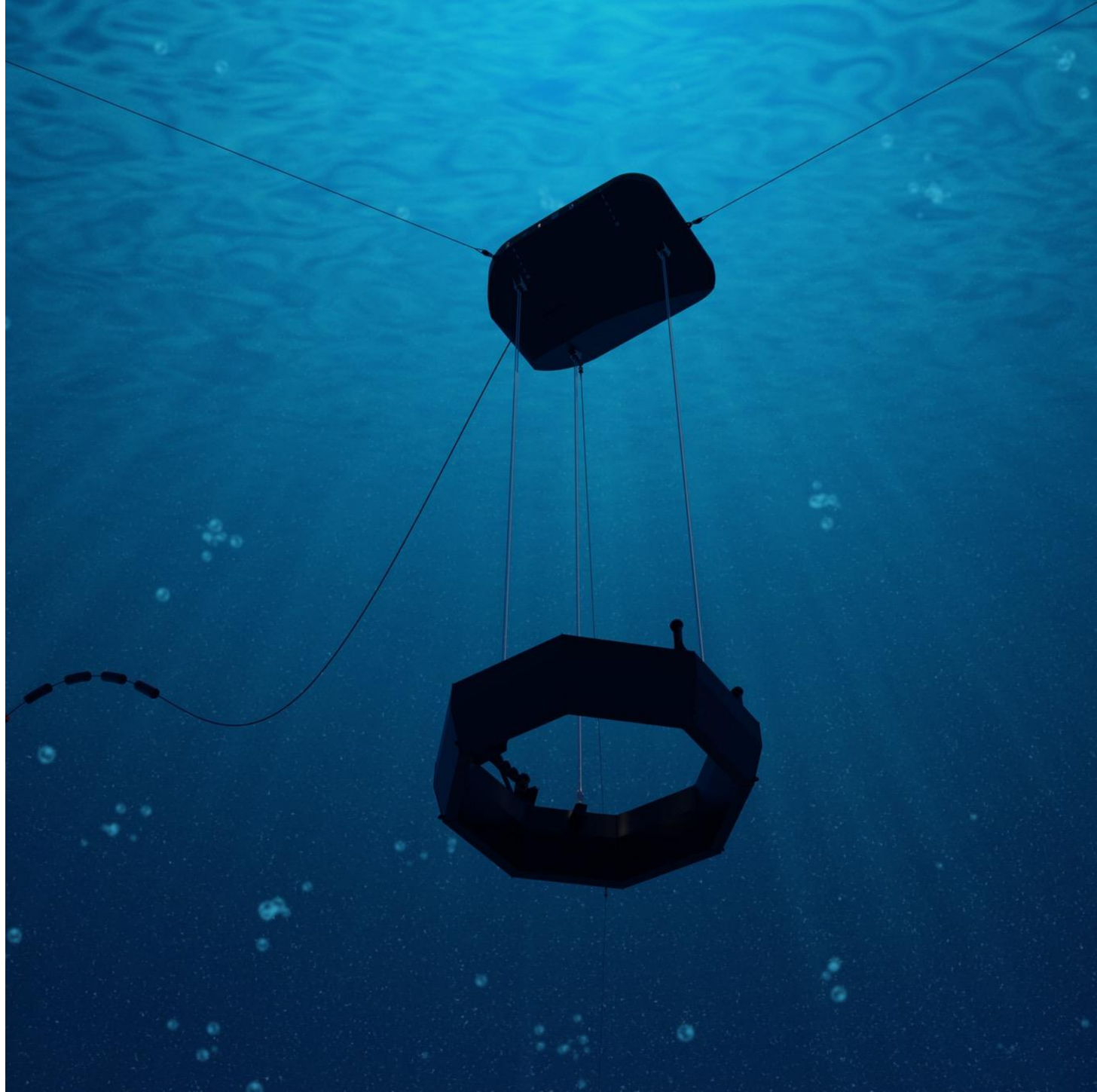
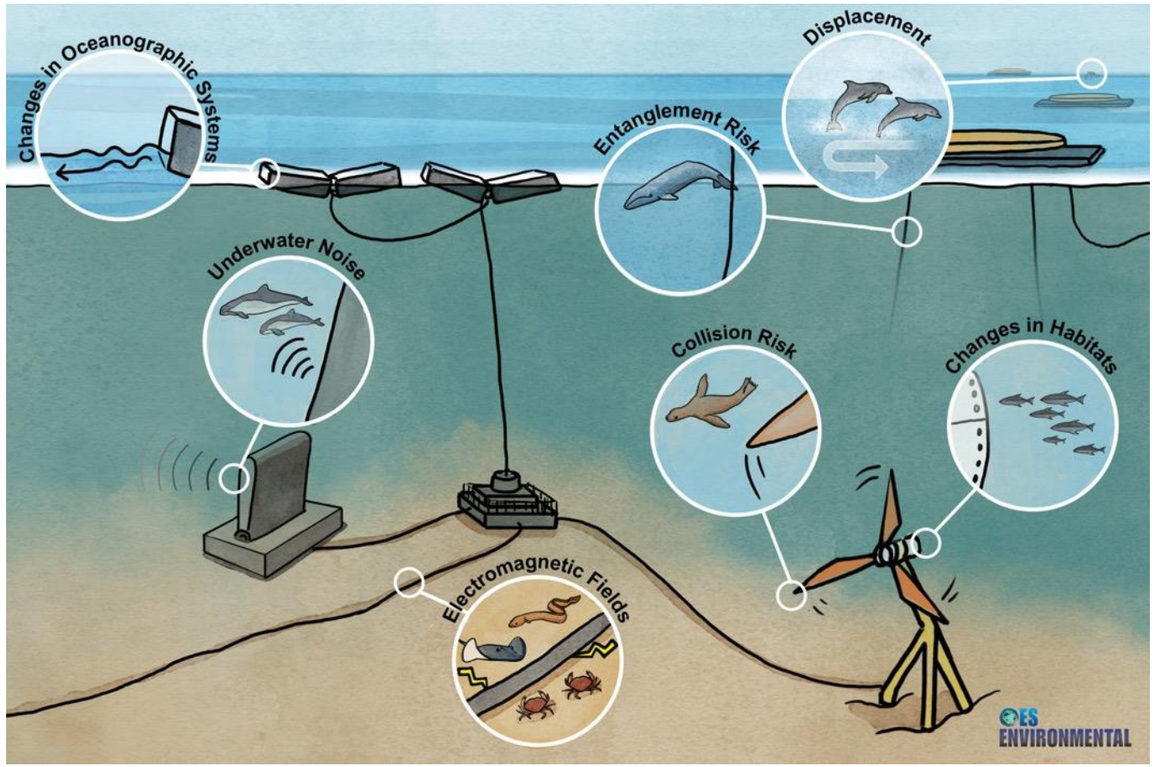


U.S. DEPARTMENT of ENERGY BATTELLE

PNNL is operated by Battelle for the U.S. Department of Energy

Why Environmental Effects of Marine Energy?

- Uncertainties around the effects of marine energy cause concerns among regulators and stakeholders
  - Species and/or populations at risk
  - Habitat alteration or loss
  - Effects on water quality and oceanographic systems
  - Effects on social and economic systems (including cultural and historic uses)
- Concerns can be driven by novel technologies, new uses of ocean space, unclear regulatory process, etc.
- Educated and engaged stakeholders can
  - Separate perceived risks from actual risks
  - Distinguish issues specific to marine energy
  - Participate in decision-making processes



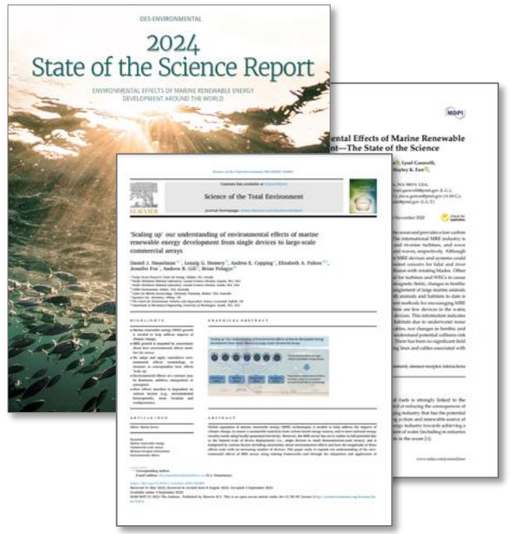
Marine Energy Environmental Research at PNNL

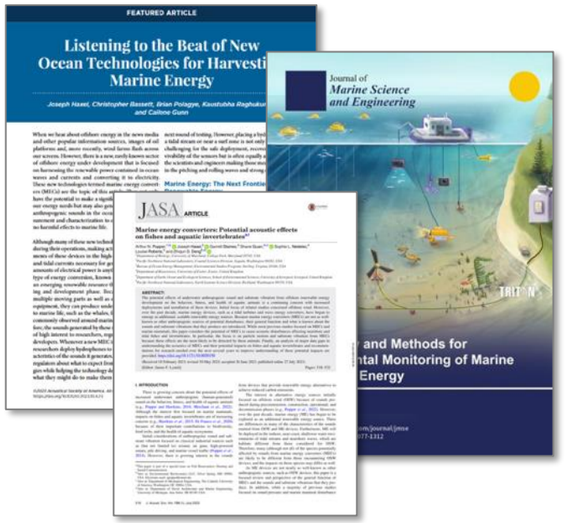
- OES-Environmental
  - International initiative (16 countries) that examines environmental effects of marine energy
  - Mobilizes information and practitioners to coordinate research that can progress the industry in an environmentally responsible manner

- Triton Initiative
  - Researches and develops monitoring technologies and methods to understand potential environmental effects of marine energy
  - Aims to reduce costs and provide valuable data to inform the U.S. marine energy industry's environmental permitting processes

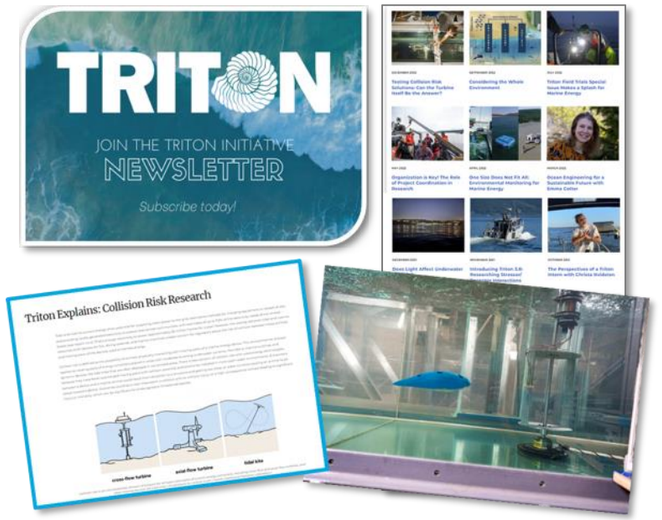
Product Development with Stakeholders in Mind

Scientific publications

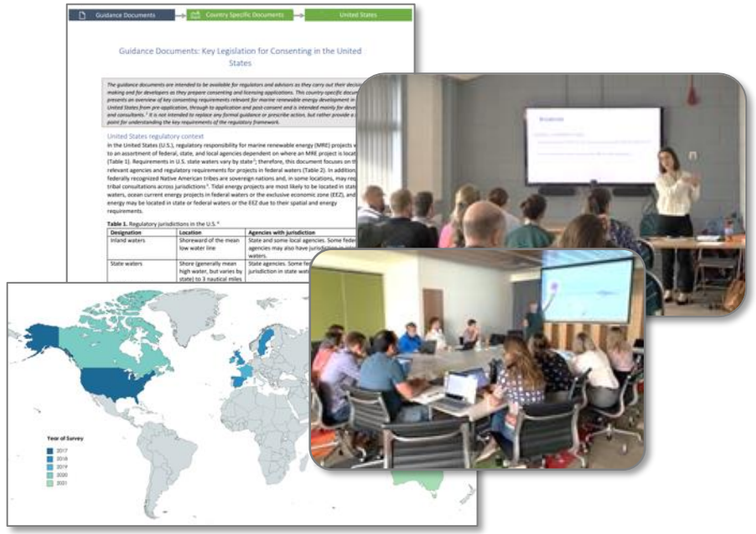


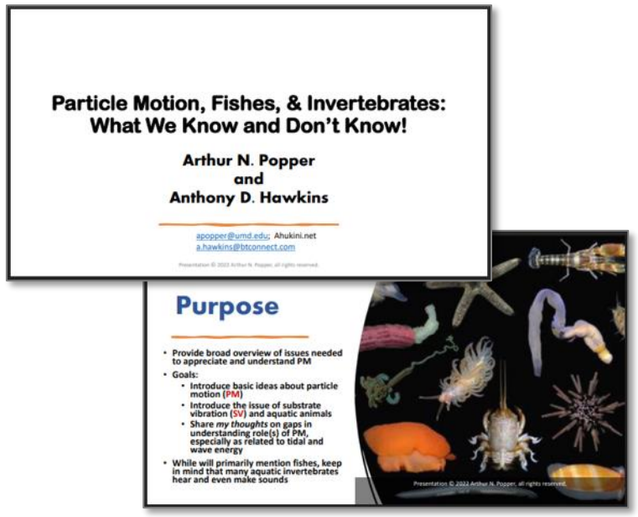


Outreach material



Stakeholder involvement

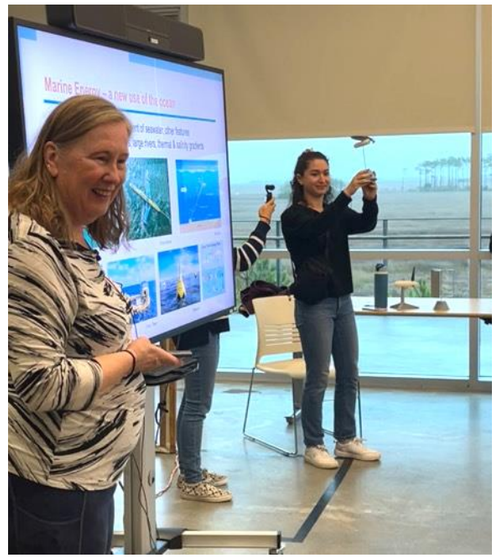




PNNL and AMEC

PNNL supports the AMEC “Marine Energy Stakeholders Engagement-Systems approach” task, led by the Coastal Studies Institute

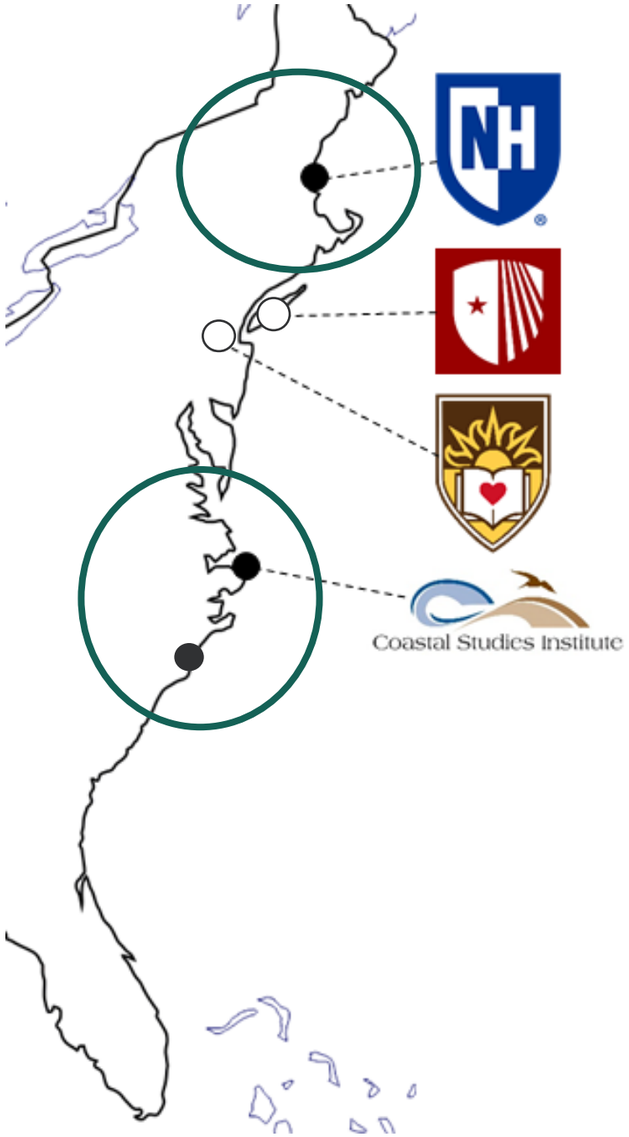
- University-led consortium that addresses research needs in support of marine energy development on the Atlantic coast
- AMEC is involved in:
  - Interdisciplinary research relevant to marine energy & the blue economy
  - Marine energy device and component testing
  - Stakeholder connections with researchers, industry, communities, etc.
  - Educational opportunities for all ages



PNNL/AMEC presentation at K-12 renewable energy event

PNNL / AMEC Workshops – Goals & Approach

- **3 workshops:** Portsmouth, NH; Wanchese, NC; Beaufort, NC
- **Goals:** Engage with a wide spectrum of stakeholders on the U.S. Atlantic coast to
  - Increase awareness of marine energy and its environmental and social effects
  - Create local support for the developing industry
  - Learn more about local stakeholder concerns
- **Approach:** Environmental and social effects of marine energy
  - Address similarities and differences between marine energy and offshore wind
  - Familiarize stakeholders with extensive resources available on environmental effects and permitting
  - Leverage local use cases
  - Focus on discussion and feedback from stakeholders



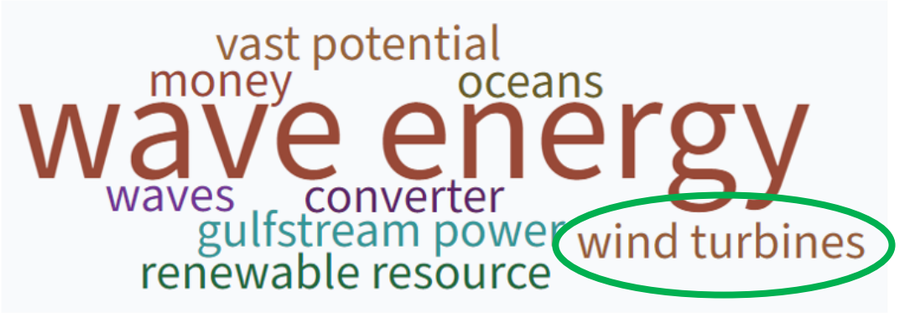
PNNL / AMEC Workshops – Implementation

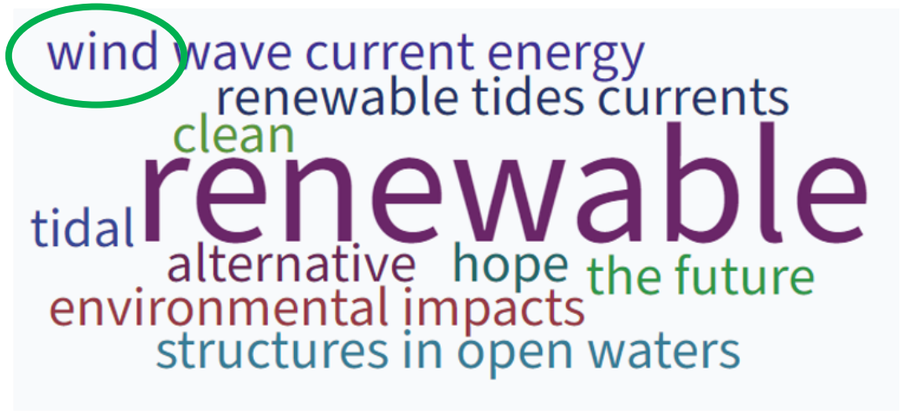
- **Attendees:**
  - NH: local tribe, marine conservation, advocacy business, federal agency
  - NC: research institutions, outreach organizations, marine conservation, state & federal agencies, offshore wind developer, concerned citizens
- **Use cases:**
  - Small tidal array for NH
  - Single wave device for coastal NC
  - Single ocean current turbine for offshore NC
- **Workshop content:**
  - Presentation on marine energy, environmental effects, and helpful educational resources
  - Used marine energy device props to show diversity
  - Interactive discussions leveraging the use cases
  - Focus on participants' concerns and providing answers

PNNL / AMEC Workshops – Implementation

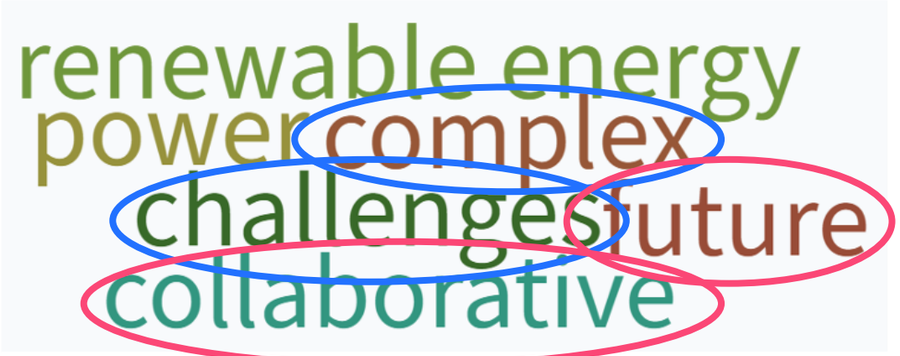
Words that came to the participants' mind when mentioning marine energy, at beginning and end of workshop:

Beginning



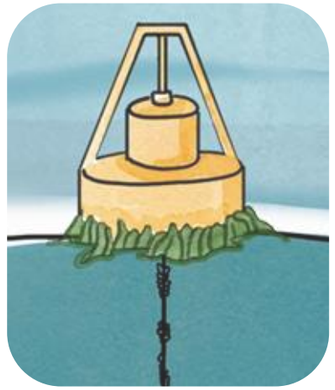


End



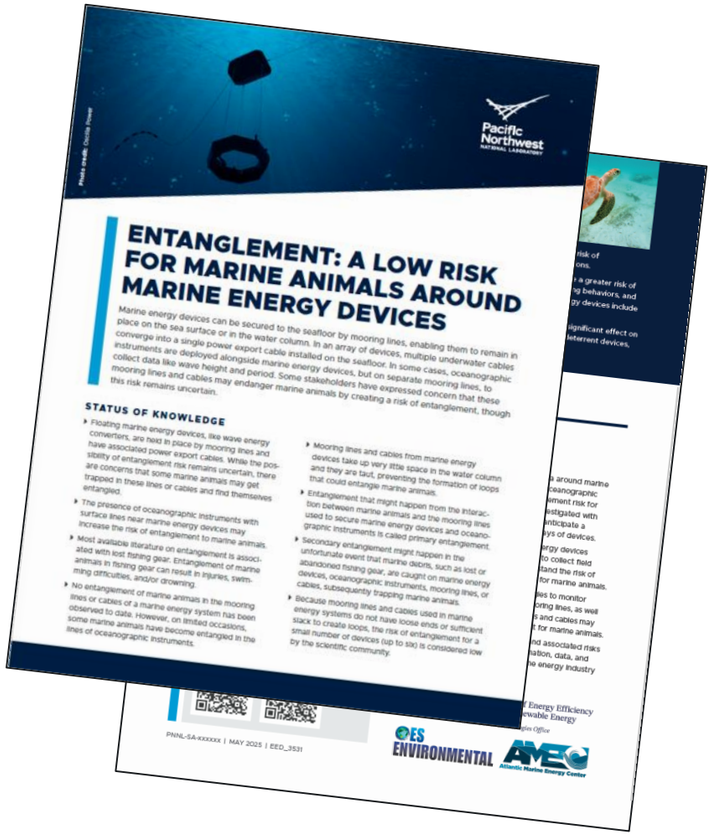
PNNL / AMEC Workshops – Main Takeaways

- **Greatest environmental concerns:**
  - Impacts to habitats of protected species
  - Interactions/overlap with fisheries
  - Scale of projects/arrays and cumulative effects
  - Entanglement risk with mooring lines and draped cables
- **Other topics of interest:**
  - Economic feasibility, benefits, energy equity
  - Device viability, project lifetime, decommissioning plan
- **Asks from participants:**
  - Learn from offshore wind missteps
  - Involve coastal communities as early as possible
  - Information dissemination and outreach material



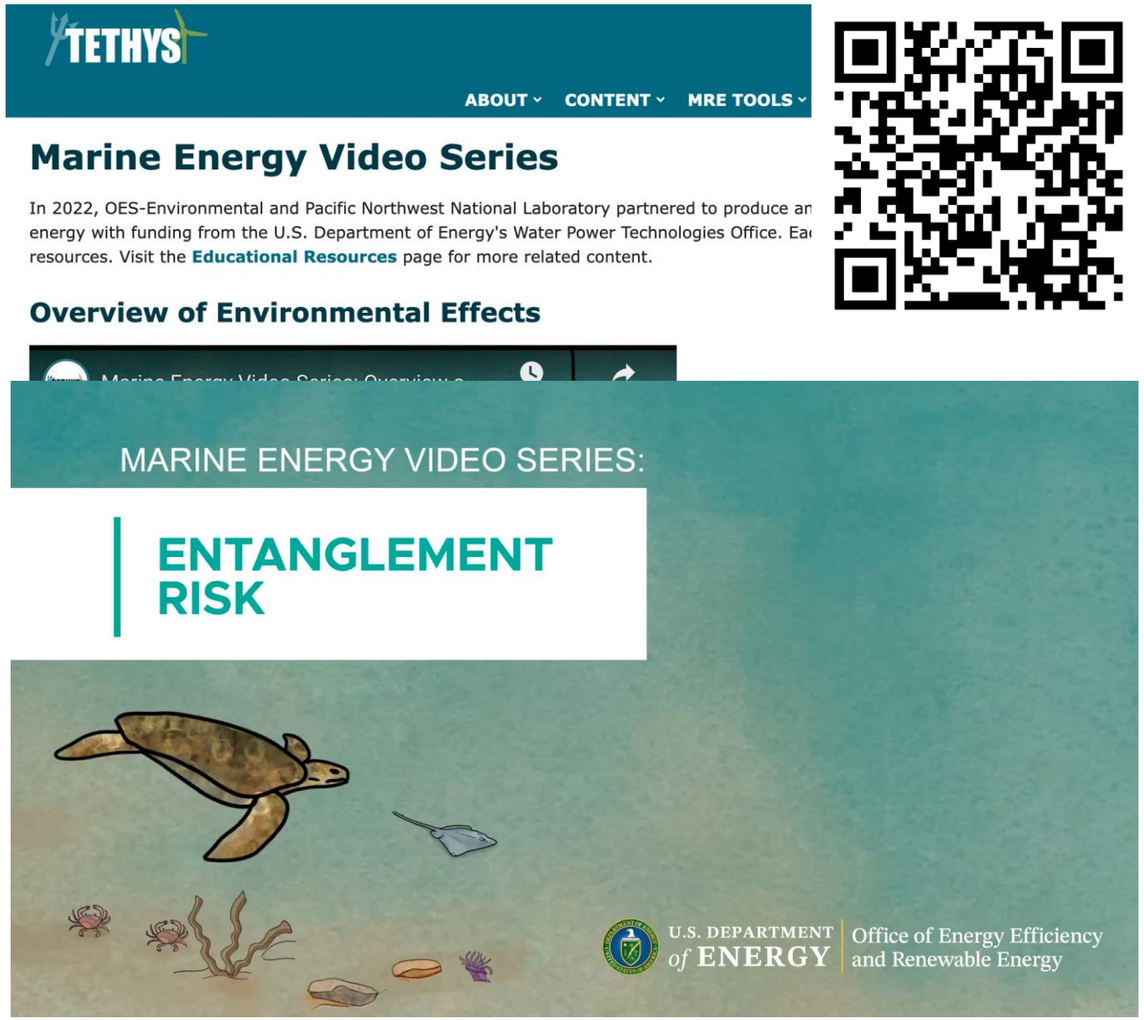
Stakeholders concern – Entanglement Risk

- **Concern:** Entanglement of marine animals with the mooring lines and draped cables of marine energy devices and oceanographic instruments
- **Entanglement factsheet:**
  - Status of knowledge
  - Potential influencing factors
  - Remaining uncertainties
  - Important considerations looking forward
- **In-depth white paper:**
  - Expand on entanglement literature
  - Explore risk around various mooring types and for different animal groups
  - Discuss possible strategies for mitigation



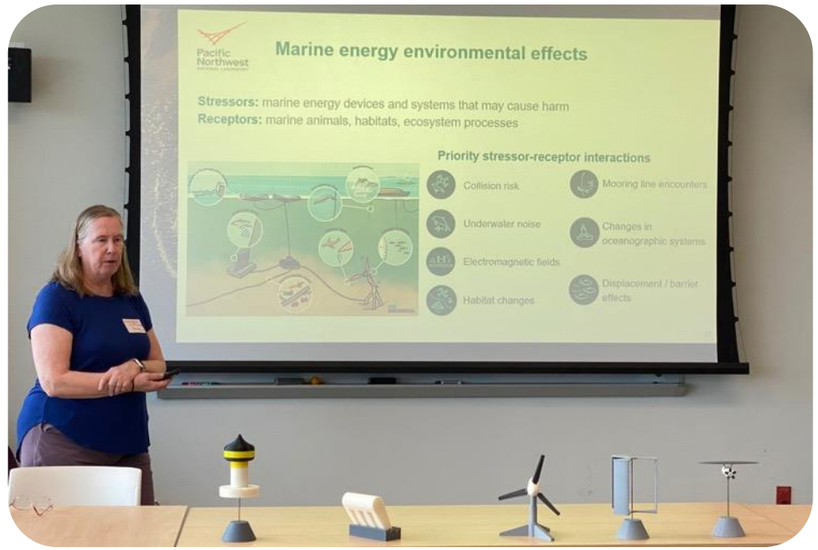
Stakeholders concern – Entanglement Risk

- **Marine energy video series:**
  - Overview of environmental effects
  - Underwater noise
  - Electromagnetic fields
  - Changes in habitat
- **Entanglement video overview:**
  - Description of risk around marine energy devices and oceanographic instruments
  - Status of scientific knowledge
  - Animals at risk and potential consequences



Conclusion

- In-person stakeholder engagements enabled to learn about specific place-based concerns, such as sea turtle entanglement risk
- Stakeholders and concerned citizens were eager to learn about marine energy
- Feedback from target audience on outreach material was essential for efficient communication



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Thank you

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