From Science to Consenting: Environmental Effects of Marine Renewable Energy

January 24, 2024
PAMEC

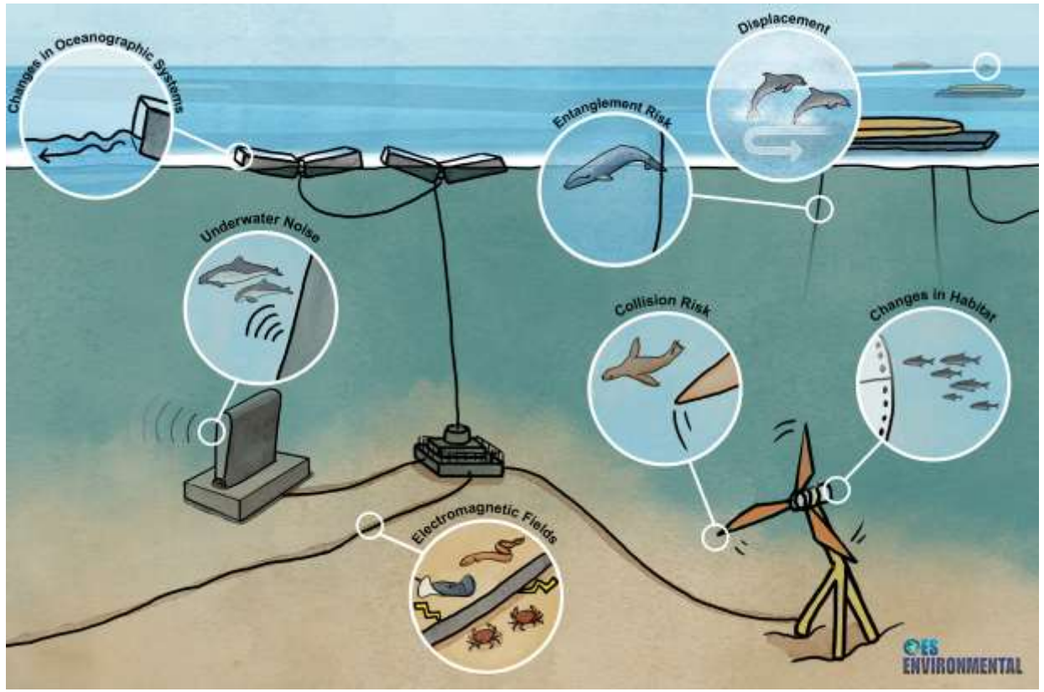
Mikaela Freeman, Debbie Rose, Andrea Copping, Lysel Garavelli, Lenaïg Hemery

Pacific Northwest National Laboratory

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

Marine Renewable Energy (MRE)

- Early stages of development, deployment, and commercialization
- Environmental concerns continue to slow consenting/permitting worldwide
- OES-Environmental international initiative examines environmental effects of MRE to advance the industry in a responsible manner



Key stressor-receptor interactions:

- Collision risk
- Entanglement
- Underwater noise
- Changes in oceanographic systems
- Electromagnetic fields (EMF)
- Displacement
- Habitat changes

Moving from Science to Consenting

Available data and information

Evidence bases

Risk retirement

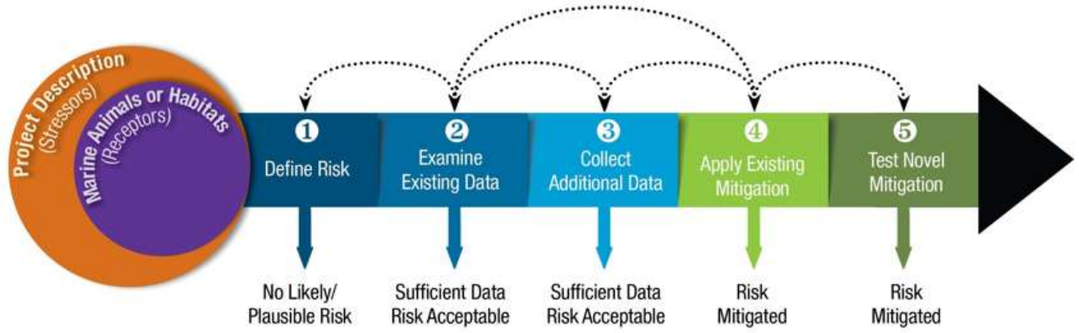
Data transferability

Guidance documents

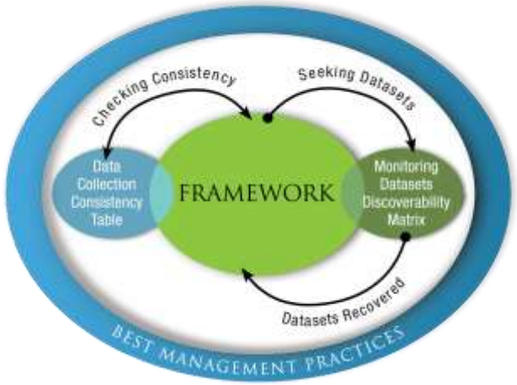
Feedback from MRE community

Risk Retirement and Data Transferability

- For certain interactions, potential risks need not be fully investigated for every project (risk retirement)
- New MRE projects informed by what is already known (data transferability)
- Important notes:
  - Does not replace/contradict regulatory processes
  - Site-specific data may be needed for new projects
  - A retired risk can be reexamined in the future



https://tethys.pnnl.gov/risk-retirement



https://tethys.pnnl.gov/data-transferability

Evidence Bases

- Key research papers, monitoring reports, and documents to inform risk retirement for small numbers of MRE devices
- Reviewed and discussed by experts
- Addressed by stressor-receptor interaction:

Collision risk – *66 documents*

Habitat change – *60 documents*

Underwater noise – *29 documents*

Entanglement – *11 documents*

EMF – *16 documents*

Changes in oceanographic systems – *23 documents*

https://tethys.pnnl.gov/risk-retirement-evidence-bases

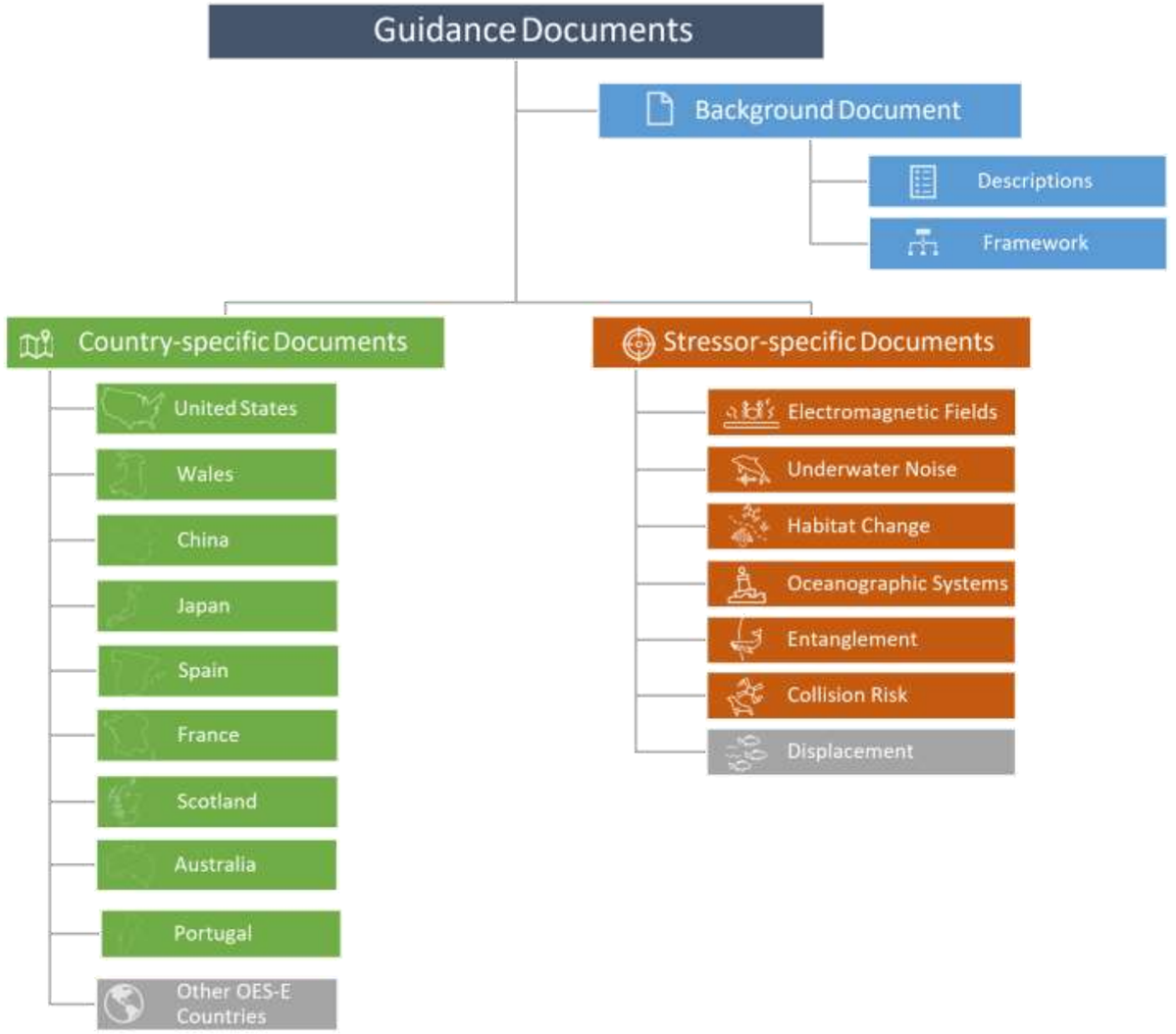
Status of Risks

	Interaction	Readiness for risk retirement
	Collision	Need more information as level of risk is uncertain. No fatal collisions have been observed to date.
	Underwater noise	Retired for small numbers of devices. The International Electrotechnical Commission has established standards for measurement. Regulatory thresholds and guidance for noise exist in the United States.
	Electromagnetic fields	Retired for small numbers of devices. Electromagnetic fields emitted from MRE power export cables are much lower than offshore wind or other subsea cables.
	Habitat change	Retired for small numbers of devices. Proper siting is key to minimize impacts.
	Oceanographic systems	Retired for small numbers of devices. No measurable impacts detected from small numbers of devices compared to natural variability.
	Entanglement	Need more information as the industry scales up to arrays.
	Displacement	Need more information as the industry scales up to arrays.

Guidance Documents

- Guidance documents developed to:
  - Bridge from scientific evidence to regulatory use
  - Make information accessible

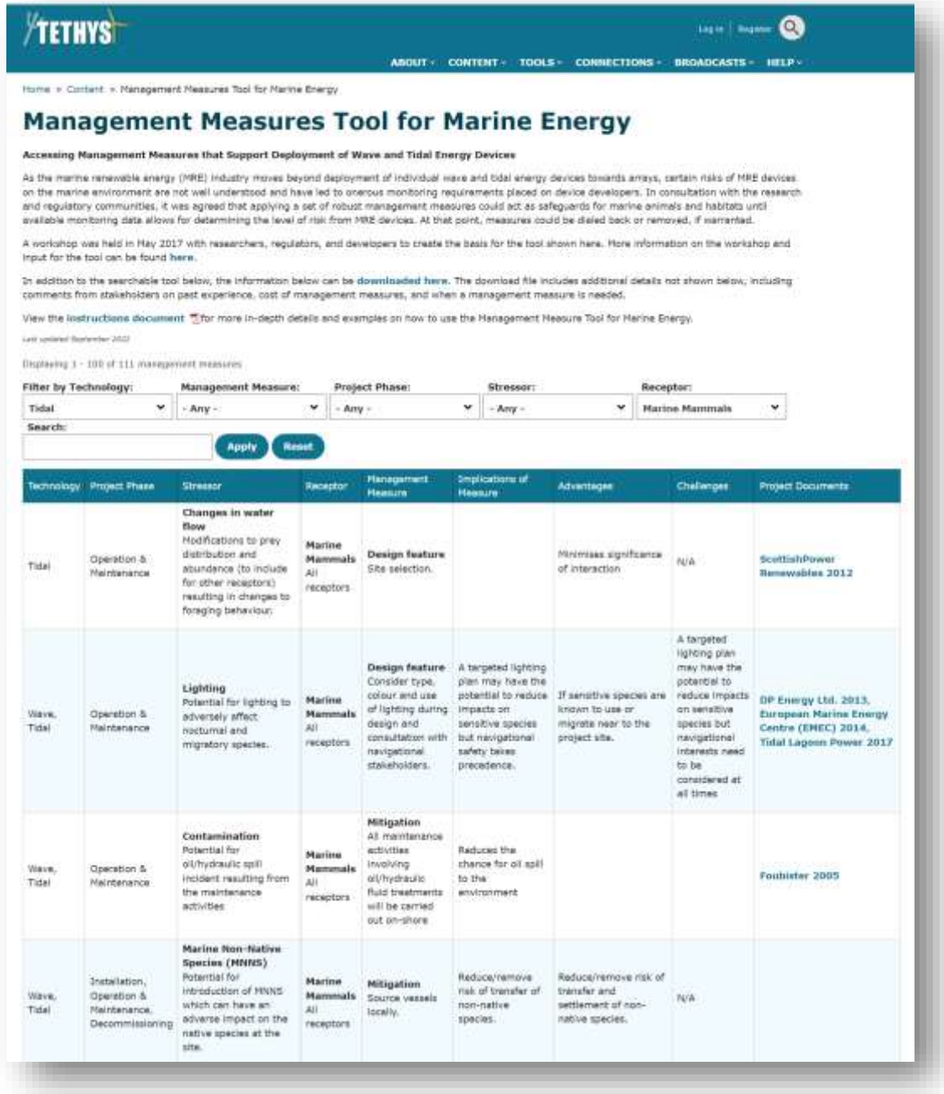
- Organization of the guidance documents:
  - Scheme for categories of regulation
  - Overview flowchart
  - 3 types of guidance documents:
    - ✓ Background
    - ✓ Country-specific
    - ✓ Stressor-specific



https://tethys.pnnl.gov/guidance-documents

Management Measures Tool

- Certain environmental risks from MRE devices not well understood → leads to onerous monitoring requirements
- Tool provides a reference to help manage potential risk before they can be retired
  - Help projects to move forward in the face of uncertainty, or until a risk can be retired
- Online tool collates measures used and tried for current and previous MRE projects



https://tethys.pnnl.gov/management-measures

Moving Beyond Barriers

Publicly sharing all available information	TETHYS
Sharing best practices for avoiding and minimizing harm	Management Measures Tool
Systematically using data collected at existing projects	Data Transferability + Risk Retirement
Making science accessible for regulatory uses	Guidance Documents + Evidence Bases
Expanding research foci into emerging areas	Systems Approach
Share information & results publicly	Conferences, webinars, etc. **2024 State of the Science Report**

Thank you!

Mikaela Freeman
mikaela.freeman@pnnl.gov

OES-Environmental Team:
Andrea Copping, Lysel Garavelli, Lenaïg Hemery, Debbie Rose, Hayley Farr, Jonathan Whiting, Marley Kaplan, Kristin Jones, Curtis Anderson