

## Brust, Jeffrey [DEP]

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**From:** Freeman, Mikaela C <mikaela.freeman@pnnl.gov>  
**Sent:** Friday, July 1, 2022 12:28 PM  
**Subject:** [EXTERNAL] Environmental Effects of Marine Energy Brochure Available from OES-Environmental

Hello colleagues,

[OES-Environmental](#) has recently released a brochure to provide an overview of environmental effects of marine renewable energy (MRE) and familiarize readers with the latest scientific information on the potential impacts of installation and operation of MRE devices. You may have already heard about this if you participated in our [regulator workshop](#) in February. For more information, view the brochure on *Tethys* here: <https://tethys.pnnl.gov/mre-brochure>.



This brochure is the result of conversations with the international MRE community around the need for a brief overview of environmental effects information for those who are new to the industry, including regulators and advisors. Included in the brochure is an overview of MRE technologies in addition to sections on key environmental interactions and risk and case studies from real-world applications. The brochure also includes a summary of the concepts of [risk retirement](#) and data transferability developed by OES-Environmental.

We hope this will be a useful resource for you and your colleagues, and please feel free to share with anyone who may be interested.

Best,  
The OES-Environmental Team

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# Marine Renewable Energy: An Introduction to Environmental Effects

[/mre-brochure](#)

## Summary

<b>Title:</b>	Marine Renewable Energy: An Introduction to Environmental Effects
<b>Author:</b>	<b>OES-Environmental</b> <a href="#">/author/oes-environmental-0</a>
<b>Publication Date:</b>	March 31, 2022
<b>Technology:</b>	<b>Marine Energy</b> <a href="#">/technology/marine-energy</a> , <b>Tidal</b> <a href="#">/technology/tidal</a> , <b>Wave</b> <a href="#">/technology/wave</a>
<b>Stressor:</b>	<b>Changes in Flow</b> <a href="#">/stressor/changes-flow</a> , <b>Collision</b> <a href="#">/stressor/collision</a> , <b>Displacement</b> <a href="#">/stressor/displacement</a> , <b>EMF</b> <a href="#">/stressor/emf</a> , <b>Entanglement</b> <a href="#">/stressor/entanglement</a> , <b>Habitat Change</b> <a href="#">/stressor/habitat-change</a> , <b>Noise</b> <a href="#">/stressor/noise</a>
<b>Receptor:</b>	<b>Birds</b> <a href="#">/receptor/birds</a> , <b>Ecosystem Processes</b> <a href="#">/receptor/ecosystem-processes</a> , <b>Fish</b> <a href="#">/receptor/fish</a> , <b>Invertebrates</b> <a href="#">/receptor/invertebrates</a> , <b>Marine Mammals</b> <a href="#">/receptor/marine-mammals</a> , <b>Physical Environment</b> <a href="#">/receptor/physical-environment</a> , <b>Human Dimensions</b> <a href="#">/receptor/human-dimensions</a>

## Introduction

This brochure was developed by OES-Environmental to provide an overview of the environmental effects of marine renewable energy (MRE) development. The goal of the brochure is to familiarize readers with the latest scientific information on the potential impacts of installation and operation of MRE devices.

First, MRE technologies are briefly described, as well as how effects on the environment are defined. Then, individual sections about each environmental risk are presented. Each section includes a description of the issue, the current status of the risk based on scientific data, recommendations for minimizing risk, and a case study from a real-world project or research study. The brochure concludes by sharing the concepts of risk retirement and data transferability as developed by OES-Environmental.

Information compiled in the brochure comes from the following sources:

- **OES-Environmental 2020 State of the Science Report** [/tethys.pnnl.gov/publications/state-of-the-science-2020](https://tethys.pnnl.gov/publications/state-of-the-science-2020)
- **Monitoring Datasets Discoverability Matrix** [/tethys.pnnl.gov/monitoring-datasets-discoverability-matrix](https://tethys.pnnl.gov/monitoring-datasets-discoverability-matrix)
- **Tethys Knowledge Base** [/tethys.pnnl.gov/knowledge-base-marine-energy](https://tethys.pnnl.gov/knowledge-base-marine-energy)

Click on the image below to open the **interactive version** of the brochure, or **download a printable version here** [/tethys.pnnl.gov/sites/default/files/summaries/mre\\_brochure\\_printable.pdf](https://tethys.pnnl.gov/sites/default/files/summaries/mre_brochure_printable.pdf).



<[https://tethys.pnnl.gov/sites/default/files/summaries/mre\\_brochureinteractivespreads.pdf](https://tethys.pnnl.gov/sites/default/files/summaries/mre_brochureinteractivespreads.pdf)>

## Additional Resources

These resources provide additional information on the topics contained in the brochure.

- **About OES-Environmental** <<https://tethys.pnnl.gov/about-oes-environmental>>
- **2020 State of the Science Report** <<https://tethys.pnnl.gov/publications/state-of-the-science-2020>>
- **Risk Retirement** <<https://tethys.pnnl.gov/risk-retirement>>
- **Evidence Bases** <<https://tethys.pnnl.gov/risk-retirement-evidence-bases>>
- **Monitoring Datasets Discoverability Matrix** <<https://tethys.pnnl.gov/monitoring-datasets-discoverability-matrix>>
- **Guidance Documents** <<https://tethys.pnnl.gov/guidance-documents>>
- **Overview Image of Marine Energy Devices (Copping et al. 2021)** <<https://tethys.pnnl.gov/publications/are-fish-danger-review-environmental-effects-marine-renewable-energy-fishes>>

## Case Study References

The references for information contained in the case studies for each section are listed below to provide additional context.

Collision:

- **SMRU Annual Report 2019** <<https://tethys.pnnl.gov/publications/marine-mammals-tidal-energy-annual-report-scottish-government>>
- **MeyGen Tidal Energy Project** <<https://tethys.pnnl.gov/project-sites/meygen-tidal-energy-project-phase-i>> (Metadata Form)

Underwater Noise:

- **Acoustic Characteristics of the Lifesaver Wave Energy Converter** <<https://tethys.pnnl.gov/publications/acoustic-characteristics-lifesaver-wave-energy-converter>> (Conference Paper)
- **International Electrotechnical Commission (IEC) Technical Committee 114 (TC 114)** <<https://webstore.iec.ch/publication/31031>>
- **National Marine Fisheries Service (NMFS) Technical Guidance** <<https://tethys.pnnl.gov/publications/2018-revisions-technical-guidance-assessing-effects-anthropogenic-sound-marine-mammal>> (Report)
- **Interim Sound Exposure Guidelines** <<https://link.springer.com/content/pdf/10.1007%2f978-3-319-06659-2.pdf>> (Report)

Electromagnetic Fields:

- **Assessing Potential Impacts of Energized Submarine Power Cables on Crab Harvests** <<https://tethys.pnnl.gov/publications/assessing-potential-impacts-energized-submarine-power-cables-crab-harvests>> (Journal Article)

Changes in Habitat:

- **Colonization of Wave Power Foundations by Mobile Mega- and Macrofauna - A 12 Year Study**  
<<https://tethys.pnnl.gov/publications/colonisation-wave-power-foundations-mobile-mega-macrofauna-12-year-study>> (Journal Article)

#### Oceanographic Systems:

- **Impacts of Tidal Energy Extraction on Sediment Dynamics in Minas Basin, Bay of Fundy, NS**  
<<https://tethys.pnnl.gov/publications/impacts-tidal-energy-extraction-sediment-dynamics-minas-basin-bay-fundy-nb>> (Journal Article)

#### Entanglement

- **Deep Green Holyhead Deep Project Phase I (0.5 MW) - Environmental Statement**  
<<https://tethys.pnnl.gov/publications/deep-green-holyhead-deep-project-phase-i-05-mw-environmental-statement>> (Marine mammals: p. 161)

#### Displacement:

- **No Evidence of Long-Term Displacement of Key Wildlife Species from Wave and Tidal Energy Testing** <<https://tethys.pnnl.gov/publications/no-evidence-long-term-displacement-key-wildlife-species-wave-tidal-energy-testing>> (Conference Paper)

#### Socioeconomics:

- **Fundy Ocean Research Center for Energy (FORCE) Test Site** <<https://tethys.pnnl.gov/project-sites/fundy-ocean-research-center-energy-force-test-site>> (Metadata Form)
- **Scoping Study on Socio-Economic Impacts of Tidal Energy Development in Nova Scotia: A Research Synthesis & Priorities for Future Action** <<https://tethys.pnnl.gov/publications/scoping-study-socio-economic-impacts-tidal-energy-development-nova-scotia-research>> (Report)

#### Risk Retirement:

- **Roosevelt Island Tidal Energy (RITE) Environmental Assessment Project**  
<<https://tethys.pnnl.gov/publications/roosevelt-island-tidal-energy-rite-environmental-assessment-project>> (Report)

#### Data Transferability:

- **PLAT-O at EMEC** <<https://tethys.pnnl.gov/project-sites/plat-o-emec>> (Metadata Form)

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